



Transport for NSW

Beaches Link and Gore Hill Freeway Connection

Appendix L

Aboriginal cultural heritage
assessment report

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

Technical working paper: Aboriginal cultural heritage assessment report

December 2020

Prepared for

Transport for NSW

Prepared by

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Contents

Executive Summary iii

Glossary and Abbreviations x

1. Introduction 1

1.1 Overview 1

1.2 The project 1

1.3 Project location 1

1.4 Key features of the project 2

1.5 Key construction activities 6

1.6 Purpose of this report 9

1.7 Secretary’s environmental assessment requirements 9

1.8 Study area 11

1.9 Authorship 12

2. Legislative and policy framework 13

3. Consultation 16

3.1 Summary of consultation 16

3.2 PACHCI Stage 1 17

3.3 PACHCI Stage 2 17

3.4 PACHCI Stage 3 19

3.5 Potential submerged sites assessment 21

4. Background information 22

4.1 Environmental context 22

4.2 Topography 22

4.3 Geology and soils 23

4.4 Hydrology 24

4.5 Climate 24

4.6 Vegetation 24

4.7 Historical and current land use 25

4.8 Key observations 26

4.9 Ethnography 26

4.10 AHIMS sites 30

5. Aboriginal cultural value assessment 37

5.1 Introduction 37

5.2 Methodology 37

5.3 Cultural significance 37

5.4 Identified Aboriginal cultural heritage values 37

5.5 Aboriginal cultural values within the study area 39

6. Summary of archaeological assessment 41

6.1 Assessment methodology 41

6.2	Results	43
7.	Significance assessment	45
7.1	Methodology	45
7.2	Statements of significance	46
7.3	Summary of significance	51
8.	Impact assessment	54
8.1	Impact avoidance	54
8.2	Potential impacts	54
8.3	Cumulative impacts	61
9.	Management recommendations	62
9.1	Terrestrial sites	62
9.2	Potential submerged terrestrial sites	62
10.	References	68
Annexure A - Consultation		
Annexure B - Standard Management Procedure: Unexpected Heritage Items (Roads and Maritime, 2015)		
Annexure C - Archaeological methodology		
Annexure D - Archaeological assessment report.....		
Annexure E - Potential submerged sites assessment		

Executive Summary

The Western Harbour Tunnel and Beaches Link is a NSW Government initiative to provide additional road network capacity across Sydney Harbour and Middle Harbour and to improve transport connectivity with Sydney's Northern Beaches. The Western Harbour Tunnel and Beaches Link program of works includes:

- The Western Harbour Tunnel and Warringah Freeway Upgrade project
- The Beaches Link and Gore Hill Freeway Connection project.

The Beaches Link and Gore Hill Freeway Connection project (the project) comprises a new tolled motorway tunnel connection across Middle Harbour from the Warringah Freeway and the Gore Hill Freeway to Balgowlah and Killarney Heights and including the surface upgrade of the Wakehurst Parkway from Seaforth to Frenchs Forest, and upgrade and integration works to connect to the Gore Hill Freeway at Artarmon.

This report documents the stages of the Aboriginal cultural heritage assessment of the study area (including any Aboriginal sites located within 50 metres of the project). It includes an environmental and historical background, an outline of the consultation carried out with Aboriginal stakeholders, a cultural values assessment, a significance assessment, an impact assessment and the development of management recommendations specific to each Aboriginal site identified within the study area.

This report has been prepared to meet the Secretary's environmental assessment requirements for the project, issued on 15 December 2017 and reissued on 22 April 2020 (Application number SSI 8862), and complies with the *Procedure for Aboriginal and Cultural Heritage Consultation and Investigation* (PACHCI) (Roads and Maritime Services, 2011).

A separate study was carried out to identify potential submerged Aboriginal sites (Cosmos Archaeology 2020). The assessment is included in Annexure E - Potential submerged sites assessment and is referenced in this report.

Summary of consultation

For this assessment, Aboriginal stakeholder consultation was carried out in accordance with the PACHCI (Roads and Maritime Services, 2011). The consultation procedures documented in the PACHCI ensure compliance for Transport for NSW projects with statutory requirements and Department of Premier and Cabinet (Heritage), also known as Heritage NSW (formerly the Office of Environment and Heritage (OEH)) policies.

- Identification of key Aboriginal stakeholders began in June 2017 when a search of the National Native Title Register and the Register of Aboriginal Owners established under the *Aboriginal Land Rights Act 1983* was carried out to identify key Aboriginal stakeholders for the project. Native title does not exist in the study area and there are no current claims. The Metropolitan Local Aboriginal Land Council (Metro LALC) was identified as the only LALC within the study area
- A letter introducing the project was sent to Metro LALC and advertisements were placed in newspapers in June 2017 to notify Aboriginal people with cultural knowledge of the study area of the proposed works and requesting their participation in the PACHCI process. Following the statutory response time of 28 days for responses to these letters, Registered Aboriginal Parties (RAPs) for the project were registered for subsequent consultation
- The next stage involved the engagement of Aboriginal stakeholders for a pedestrian site survey. Nominated site officers from the Metro LALC were engaged to participate in archaeological surveys carried out in June and August 2017. During these surveys, site officers were provided an opportunity to comment on the potential for Aboriginal cultural material to be present within the study area, the cultural significance of any Aboriginal cultural heritage sites identified during the survey and management recommendations, including recommendations for further assessment
- The first Aboriginal Focus Group (AFG) was held on the 28 September 2017 at The Old Northbridge Bowling Club. All RAPs were invited to this AFG. Before the AFG, the draft archaeological survey report and

archaeological methodology was issued to the RAPs for review and comment, allowing a statutory response time of 28 days

- At the end of the 28 day review period, the archaeological methodology had been approved by multiple RAPs. An email and a letter were sent to all RAPs confirming that no further changes would be made to the archaeological methodology
- Aboriginal site officers were engaged for archaeological fieldwork from 8 January to 24 January 2018. Additional site inspections were conducted with site officers from the Metro LALC in August 2018, March 2020 and September 2020.
- The second AFG was held on 3 November 2020 online using Microsoft Teams. All RAPs were invited to this AFG. Before the AFG, the draft Aboriginal cultural heritage assessment report was issued to the RAPs for review and comment, allowing for the minimum statutory response time of 28 days. At the end of the review and comment period, multiple RAPs had expressed approval of the level of assessment and environmental management measures proposed. One RAP provided comment in support of a heritage interpretation strategy and made a recommendation for ongoing maintenance of AHIMs sites, due to the existing presence of rubbish and graffiti at some sites. Metro Local Aboriginal Land Council also provided some detailed feedback on the ACHAR. Transport for NSW have responded to the issues raised.

Summary of assessment findings

The Aboriginal cultural heritage assessment involved consultation with RAPs for the project during all stages of fieldwork (inclusive of site survey and test excavation). The assessment was carried out by Andrew Costello and Andy Roberts (Senior Archaeologists, Jacobs). No specific knowledge holders for the study area were identified during the consultation process. However, the information provided by the RAPs contributed to an understanding of the cultural value of the broader landscape within which the project would be located. The RAP site officers provided information about the traditional presence of Aboriginal people in the landscape, ceremonial sites and the impact of post-contact land management practices on their traditional land, and subsequently their culture (refer Section 5).

The assessment identified 11 Aboriginal cultural places of local significance within the study area. These cultural places are associated with Aboriginal archaeological sites identified during the archaeological assessment and with the exception of the site 45-6-3032 which was observed to be damaged during field inspection, all were consistent with the existing recorded Aboriginal sites on the Aboriginal Heritage Information Management System (AHIMS). The location and condition of one of the sites (45-6-0662) could not be confirmed during field inspection and the Aboriginal Heritage Office has advised that the site was likely covered by gravel/vegetation. The identified sites were:

- Bantry Bay Aboriginal Engraving Site (45-6-0655)
- Rock engraving (Garigal National Park) (45-6-2940)
- Clive Park 8; Shelter and Midden (45-6-3012)
- Clive Park 1; Northbridge (45-6-0654)
- Clive Park 2; Taplin's Cicada Pupa Cave (45-6-0996)
- Artarmon Park artefact scatter (45-6-3599)
- Artarmon Park potential archaeological deposit (PAD) (45-6-3362)
- Flat Rock Creek PAD (45-6-3361)
- Burnt Bridge Creek PAD (45-6-3363)
- Frenchs Forest; Bantry Bay; Wakehurst Parkway (45-6-0662) (unable to confirm location during field inspection as the site was likely covered by gravel/vegetation)
- Wakehurst Engraving MAN 104 (45-6-3032) (observed to be damaged during field inspection).

The majority of potential impacts to Aboriginal sites within the study area would occur during the construction phase of the project. Potential impacts may include:

- Direct impacts such as the removal, modification or destruction of an Aboriginal site
- Indirect impacts associated with construction vibration generated by tunnelling or surface works and the settlement of land due to tunnelling below or near Aboriginal sites.

Potential impacts during operation are expected to be limited and may include indirect impacts associated with Aboriginal site setting (visual impacts, changes to vistas/landscapes), changes to ongoing use or environmental association.

No previously recorded Aboriginal heritage sites that could be verified during field inspections are located within the construction footprint at the surface. However, the location and condition of site 45-6-0662 could not be confirmed during field inspection, as well as there being several sites located directly above or within 50 metres of construction activities or the mainline/ramp tunnel alignments.

Based on the results of this assessment and in consultation with the RAPs:

- The location and condition of one Aboriginal site (45-6-0662) could not be confirmed but is considered likely to be within the construction footprint
- Five Aboriginal sites (45-6-0655, 45-6-2940, 45-6-3362, 45-6-3361 and 45-6-3363) are located within 50 metres of surface works including two sites that may be subject to indirect impacts associated with vibration and settlement (45-6-0655 and 45-6-2940)
- Five Aboriginal sites (45-6-3032, 45-6-3012, 45-6-0654, 45-6-0996 and 45-6-3599) are located above or within 50 metres of the tunnel alignment and may be subject to indirect impacts associated with vibration and settlement.
- Operational impacts are considered to be negligible.

Management recommendations

Management recommendations were developed for the Aboriginal sites located in or within 50 metres of the study area. In general, the first principle of cultural heritage management is to avoid impact before applying mitigation. Where complete avoidance of sites by the project is not possible, mitigation measures for impacted areas of each of the archaeological sites are presented.

A summary of the recommendations for archaeological sites is included below, with full recommendations presented in Section 9.

Table E-1 Summary of management and mitigation measures for Aboriginal sites within the study area

Ref	Phase	Potential Impact	Management and mitigation measures	Application
AH1	Pre-construction and construction	Aboriginal heritage – vibration and settlement impacts	<p>Before the start of construction, further consultation with Heritage NSW, the Metro Local Aboriginal Land Council, the Aboriginal Heritage Office and the Registered Aboriginal Parties should be carried out to decide an appropriate course of action for the Aboriginal site 45-6-0662 on Wakehurst Parkway, as the condition and location of this site could not be confirmed during field inspection as the site is likely covered by gravel/vegetation.</p> <p>If considered appropriate, an archaeological investigation may be carried out at the possible site</p>	Frenchs Forest; Bantry Bay; Wakehurst Parkway (45-6-0662)

Ref	Phase	Potential Impact	Management and mitigation measures	Application
			<p>location to carefully remove the gravel/vegetation, to confirm its presence and record the underlying site condition.</p> <p>If new information regarding site condition is identified during inspection or consultation suggesting the site may be subject to impacts due to vibration and settlement, then mitigation measures AH2, AH3 and AH4 should apply.</p> <p>In the absence of confirming the site, if during construction works a site is located, the unexpected finds protocol prescribed in AH5 would apply.</p> <p>Further, Heritage NSW, an appropriately qualified archaeologist and the Metro Local Aboriginal Land Council should be contacted and the site should be re-recorded in situ.</p>	
AH2	Pre-construction and construction	Aboriginal heritage – vibration impacts	<p>The following process should be carried out to confirm where vibration monitoring at those terrestrial sites within 50 metres of the project corridor will be required:</p> <ol style="list-style-type: none"> Terrestrial Aboriginal site condition surveys of sites should be completed by an appropriately qualified person using those techniques appropriate in determining which sites are considered to be structurally unsound Where this determination cannot be made, as a precaution the site should be considered to be structurally unsound A screening of vibration intensive activities within 50 metres of structurally unsound sites should be carried out to identify activities that have the potential to exceed vibration levels of 2.5 millimetres per second Sites identified as being both structurally unsound and having potential for exceedance in vibration level of 2.5 millimetres per second should be identified as requiring vibration monitoring, where this cannot be reduced at the source. 	All registered AHIMS sites subject to vibration intensive activities determined to be structurally unsound (see AH2)
AH3	Construction	Aboriginal heritage – vibration impacts	<p>Vibration monitoring should be carried out at sites that have been identified as requiring monitoring in accordance with the process outlined in management measure AH2. The monitoring program should:</p> <ul style="list-style-type: none"> Be developed by a suitably qualified person Be risk-based Include appropriate frequency and duration of monitoring including adequate benchmark recording before works commence 	All registered AHIMS sites subject to vibration intensive activities determined to be structurally

Ref	Phase	Potential Impact	Management and mitigation measures	Application
			<ul style="list-style-type: none"> Include appropriate management protocols for any exceedances. <p>Where possible, project works should be conducted in a manner to minimise vibration levels, to less than 2.5 millimetres per second at all structurally unsound AHIMS sites.</p>	unsound (see AH2).
AH4	Construction	Aboriginal heritage – vibration impacts	<p>Where monitoring identifies that vibration levels exceed 2.5 millimetres per second or following vibration intensive activities, subsequent condition survey of sites that are subject to monitoring in AH3 should be carried out.</p> <p>The subsequent condition surveys should record any changes to the integrity of the site that may have resulted from construction vibration. Additional surveys must be carried out by a suitably qualified person and include a Metro Local Aboriginal Land Council representative. AHIMS site cards should be updated accordingly where any changes are observed. Condition surveys may include further photogrammetry and 3D-capture techniques, in which case comparison against the baseline should be carried out.</p>	All registered AHIMS sites subject to vibration monitoring (see AH3).
AH5	Construction	Unexpected discovery of heritage materials features or deposits	If at any time during the construction of the project, any items of potential Aboriginal archaeological or cultural heritage conservation significance or Ancestral remains are discovered, they should be managed in accordance with the <i>Standard Management Procedure: Unexpected Heritage Items</i> (Road and Maritime Services, 2015a).	BL/GHFC
AH6	Construction	Aboriginal heritage - impacts	Cultural and historic heritage awareness training should be carried out for personnel engaged in work that may impact heritage items before commencing works for the project.	BL/GHFC
AH7	Pre-construction and construction	Aboriginal heritage – impacts	As part of the project urban design and landscape plan, an Aboriginal heritage interpretation strategy will be developed for the project in consultation with Registered Aboriginal Parties and other relevant Stakeholders. Appropriate Aboriginal heritage interpretation will be incorporated into the project urban design and landscape plan in accordance with the interpretation strategy.	BL/GHFC

Ref	Phase	Potential Impact	Management and mitigation measures	Application
AH8	Pre-construction	Potential Aboriginal submerged sites heritage impacts	<p>The effectiveness of using high resolution geophysical survey to identify rock overhangs concealed by marine sediments should be assessed. If it is determined that a high resolution geophysical survey could produce the desired results, then the survey should be carried out.</p> <p>If the geophysical survey conclusively shows that there are no rock overhangs measuring at least 1.5 metres in height (from the rock base to the rock ceiling), there would be no further archaeological work carried out and any residual risk should be managed through an unexpected finds procedure. However, if the geophysical survey is inconclusive or distinct rock overhangs are identified, then an archaeological dive investigation should be implemented. Much of the diving would be done in near zero visibility and should therefore be limited to what a diver can feasibly and safely do.</p>	Potential rock shelter(s) at Seaforth outside of Middle Harbour north construction support site (BL8) cofferdam footprint
AH9	Pre-construction and construction	Potential Aboriginal submerged sites	<p>The effectiveness of using high resolution geophysical survey to identify rock overhangs concealed by marine sediments should be assessed. If it is determined that a high resolution geophysical survey could produce the desired results, then the survey should be carried out.</p> <p>If the geophysical survey conclusively shows that there are no rock overhangs measuring at least 1.5 metres in height (from the rock base to the rock ceiling), there would be no further archaeological work carried out and any residual risk should be managed through an unexpected finds procedure. However, if the geophysical survey is inconclusive or distinct rock overhangs are identified, then onsite visual monitoring within the cofferdam should be carried out during the construction period, after the cofferdam has been de-watered. The aim of the monitoring would be to identify voids within the bedrock close to the interface with marine sediments.</p> <p>In the event that a void in the bedrock appears that displays the characteristics of a potential rock shelter, then the marine sediments should be removed by pump. Should the marine sediments bottom out onto the rock no further action would be taken. If the characteristics of the marine sediments change or if fissures are evident, then samples of the sediments should be taken, preferably as an intact core sample.</p> <p>In consultation with a suitably experienced geomorphologist, and where feasible and reasonable a set of criteria should be established for the identification of pre-inundation soil deposits (peat, charcoal, roots, etc). If pre-inundation soil deposits</p>	Middle Harbour south and north cofferdams construction support sites (BL7 and BL8)

Ref	Phase	Potential Impact	Management and mitigation measures	Application
			<p>are evident within samples, a controlled archaeological investigation to recover any artefacts should take place. However, the extent of the archaeological investigation and method of recovery should be determined by the constraints of the bed rock conditions and workplace health and safety protocols and constraints within the cofferdams, including safety protocols for handling of potentially contaminated sediment. Environmental, engineering and workplace health and safety factors such as operating space within an overhang, viscosity of the pre-inundation soil and elevated contamination levels would have an influence on the method of archaeological investigation, which should nonetheless aim to retain spatial and stratigraphic control if at all feasible.</p>	

Glossary and Abbreviations

Abbreviation	Description
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHCRP	Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010
AFG	Aboriginal Focus Group
AHIMS	Aboriginal Heritage Information Management System
DEC	Department of Environment and Conservation (now Heritage NSW)
DECCW	Department of Environment, Climate Change and Water (now Heritage NSW)
DPIE	Department of Planning, Industry and Environment
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
GIS	Geographic Information Systems
Jacobs	Jacobs Group (Australia) Pty Ltd
LALC	Local Aboriginal Land Council
LEP	Local environmental plan
NPW Act	<i>National Parks and Wildlife Act 1974</i>
Metro LALC	Metropolitan Local Aboriginal Land Council
OEH	Office of Environment and Heritage (now Heritage NSW)
PACHCI	<i>Procedure for Aboriginal Cultural Heritage Consultation and Investigation (Roads and Maritime, 2011)</i>
PAD	Potential archaeological deposit
RAP	Registered Aboriginal Party
Roads and Maritime	Roads and Maritime Services (now part of Transport for NSW)
The project	Beaches Link and Gore Hill Freeway Connection

1. Introduction

This section provides an overview of the Beaches Link and Gore Hill Freeway Connection (the project), including its key features and location. It also outlines the Secretary's environmental assessment requirements addressed in this technical working paper.

1.1 Overview

The Greater Sydney Commission's *Greater Sydney Region Plan – A Metropolis of Three Cities* (Greater Sydney Commission, 2018) proposes a vision of three cities where most residents have convenient and easy access to jobs, education and health facilities and services. In addition to this plan, and to accommodate for Sydney's future growth the NSW Government is implementing the *Future Transport Strategy 2056* (Transport for NSW, 2018), that sets the 40 year vision, directions and outcomes framework for customer mobility in NSW. The Western Harbour Tunnel and Beaches Link program of works is proposed to provide additional road network capacity across Sydney Harbour and Middle Harbour and to improve transport connectivity with Sydney's Northern Beaches. The Western Harbour Tunnel and Beaches Link program of works include:

- The Western Harbour Tunnel and Warringah Freeway Upgrade project which comprises a new tolled motorway tunnel connection across Sydney Harbour, and an upgrade of the Warringah Freeway to integrate the new motorway infrastructure with the existing road network and to connect to the Beaches Link and Gore Hill Freeway Connection project
- The Beaches Link and Gore Hill Freeway Connection project which comprises a new tolled motorway tunnel connection across Middle Harbour from the Warringah Freeway and the Gore Hill Freeway to Balgowlah and Killarney Heights and including the surface upgrade of the Wakehurst Parkway from Seaforth to Frenchs Forest and upgrade and integration works to connect to the Gore Hill Freeway at Artarmon.

A combined delivery of the Western Harbour Tunnel and Beaches Link program of works would unlock a range of benefits for freight, public transport and private vehicle users. It would support faster travel times for journeys between the Northern Beaches and areas south, west and north-west of Sydney Harbour. Delivering the program of works would also improve the resilience of the motorway network, given that each project provides an alternative to heavily congested existing harbour crossings.

1.2 The project

Transport for NSW is seeking approval under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* to construct and operate the Beaches Link and Gore Hill Freeway Connection project, which would comprise two components:

- Twin tolled motorway tunnels connecting the Warringah Freeway at Cammeray and the Gore Hill Freeway at Artarmon to the Burnt Bridge Creek Deviation at Balgowlah and the Wakehurst Parkway at Killarney Heights, and an upgrade of the Wakehurst Parkway (the Beaches Link)
- Connection and integration works along the existing Gore Hill Freeway and surrounding roads at Artarmon (the Gore Hill Freeway Connection).

A detailed description of these two components is provided in Section 1.4.

1.3 Project location

The project would be located within the North Sydney, Willoughby, Mosman and Northern Beaches local government areas, connecting Cammeray in the south with Killarney Heights, Frenchs Forest and Balgowlah in the north. The project would also connect to both the Gore Hill Freeway and Reserve Road in Artarmon in the west.

Commencing at the Warringah Freeway at Cammeray, the mainline tunnels would pass under Naremburn and Northbridge, then cross Middle Harbour between Northbridge and Seaforth. The mainline tunnels would then split under Seaforth into two ramp tunnels and continue north to the Wakehurst Parkway at Killarney Heights

and north-east to Balgowlah, linking directly to the Burnt Bridge Creek Deviation to the south of the existing Kitchener Street bridge.

The mainline tunnels would also have on and off ramps from under Northbridge connecting to the Gore Hill Freeway and Reserve Road east of the existing Lane Cove Tunnel. Surface works would also be carried out at the Gore Hill Freeway in Artarmon, Burnt Bridge Creek Deviation at Balgowlah and along the Wakehurst Parkway between Seaforth and Frenchs Forest to connect the project to the existing arterial and local road networks.

1.4 Key features of the project

Key features of the Beaches Link component of the project are shown in Figure 1-1 and would include:

Twin mainline tunnels about 5.6 kilometres long and each accommodating three lanes of traffic in each direction, together with entry and exit ramp tunnels to connections at the surface. The crossing of Middle Harbour between Northbridge and Seaforth would involve three lane, twin immersed tube tunnels

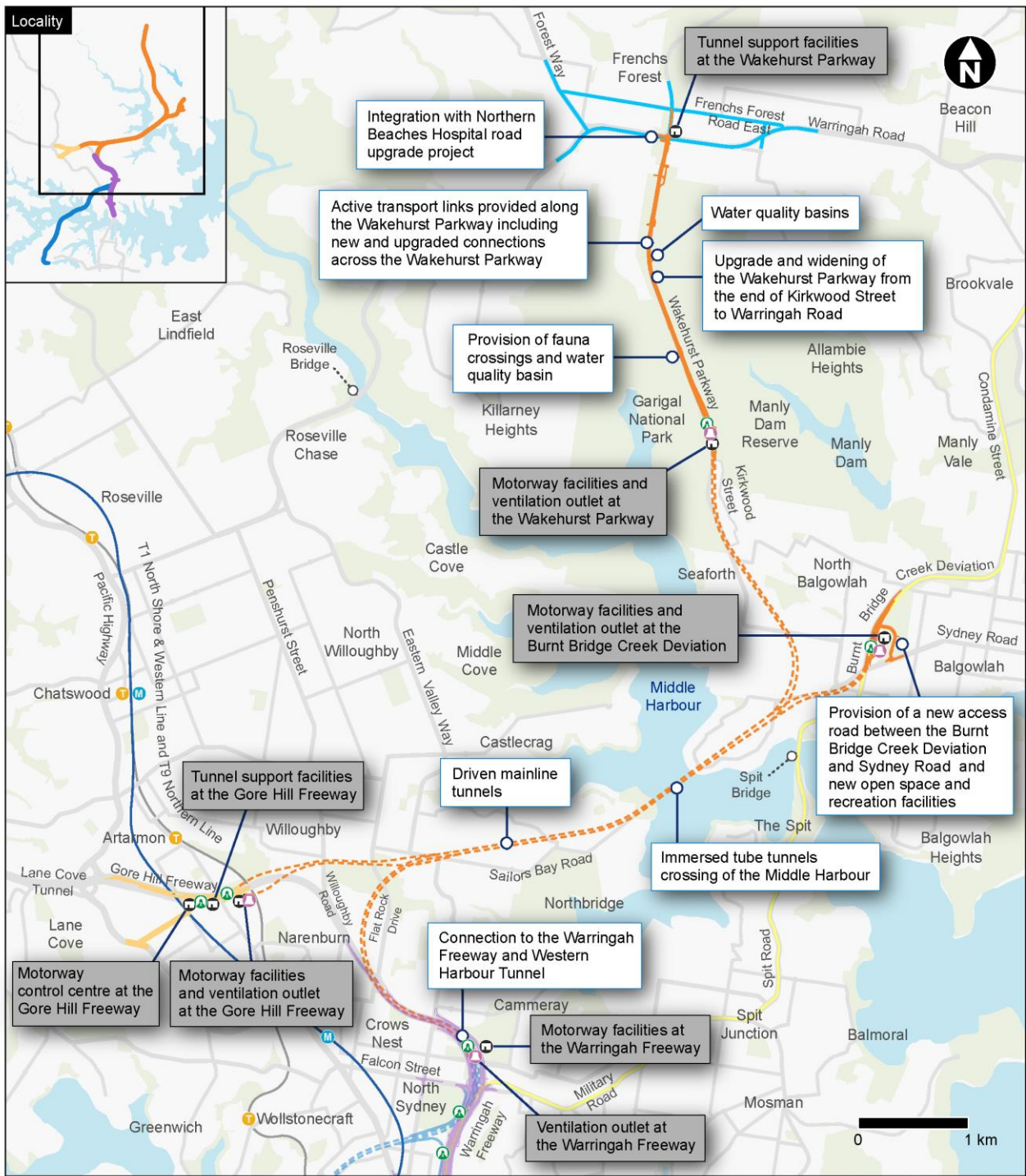
- Connection to the stub tunnels constructed at Cammeray as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project
- Twin two lane ramp tunnels:
 - Eastbound and westbound connections between the mainline tunnel under Seaforth and the surface at the Burnt Bridge Creek Deviation, Balgowlah (about 1.2 kilometres in length)
 - Northbound and southbound connections between the mainline tunnel under Seaforth and the surface at the Wakehurst Parkway, Killarney Heights (about 2.8 kilometres in length)
 - Eastbound and westbound connections between the mainline tunnel under Northbridge and the surface at the Gore Hill Freeway and Reserve Road, Artarmon (about 2.1 kilometres in length).
- An access road connection at Balgowlah between the Burnt Bridge Creek Deviation and Sydney Road including the modification of the intersection at Maretimo Street and Sydney Road, Balgowlah
- Upgrade and integration works along the Wakehurst Parkway, at Seaforth, Killarney Heights and Frenchs Forest, through to Frenchs Forest Road East
- New open space and recreation facilities at Balgowlah
- New and upgraded pedestrian and cyclist infrastructure
- Ventilation outlets and motorway facilities at the Warringah Freeway in Cammeray, the Gore Hill Freeway in Artarmon, the Burnt Bridge Creek Deviation in Balgowlah and the Wakehurst Parkway in Killarney Heights
- Operational facilities, including a motorway control centre at the Gore Hill Freeway in Artarmon, and tunnel support facilities at the Gore Hill Freeway in Artarmon and the Wakehurst Parkway in Frenchs Forest
- Other operational infrastructure including groundwater and tunnel drainage management and treatment systems, surface drainage, signage, tolling infrastructure, fire and life safety systems, roadside furniture, lighting, emergency evacuation and emergency smoke extraction infrastructure, Closed Circuit Television (CCTV) and other traffic management systems.

Key features of the Gore Hill Freeway Connection component of the project are shown in Figure 1-2 and would include:

- Upgrade and reconfiguration of the Gore Hill Freeway between the T1 North Shore & Western Line and T9 Northern Line and the Pacific Highway
- Modifications to the Reserve Road and Hampden Road bridges
- Widening of Reserve Road between the Gore Hill Freeway and Dickson Avenue
- Modification of the Dickson Avenue and Reserve Road intersection to allow for the Beaches Link off ramp
- Upgrades to existing roads around the Gore Hill Freeway to integrate the project with the surrounding road network
- Upgrade of the Dickson Avenue and Pacific Highway intersection
- New and upgraded pedestrian and cyclist infrastructure
- Other operational infrastructure, including surface drainage and utility infrastructure, signage and lighting, CCTV and other traffic management systems.

A detailed description of the project is provided in Chapter 5 (Project description) of the environmental impact statement.

Subject to obtaining planning approval, construction of the project is anticipated to commence in 2023 and is expected to take around five to six years to complete.



Legend

Operational features

- Beaches Link
- Gore Hill Freeway Connection
- ⊙ Surface connection
- Permanent operational facility
- △ Ventilation outlet

Connecting projects

- Western Harbour Tunnel
- Warringah Freeway Upgrade
- Northern Beaches Hospital road upgrade project (Completed 2020)

Other projects

- Sydney Metro City & Southwest – Chatswood to Sydenham (under construction)

Existing transport network

- Northern Beaches B-Line
- Suburban/Metro rail
- ⊙ Train station

Design features

- Surface
- Tunnel

Figure 1-1 Key features of the Beaches Link component of the project

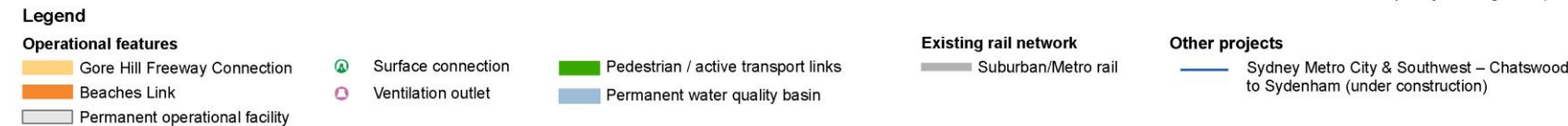
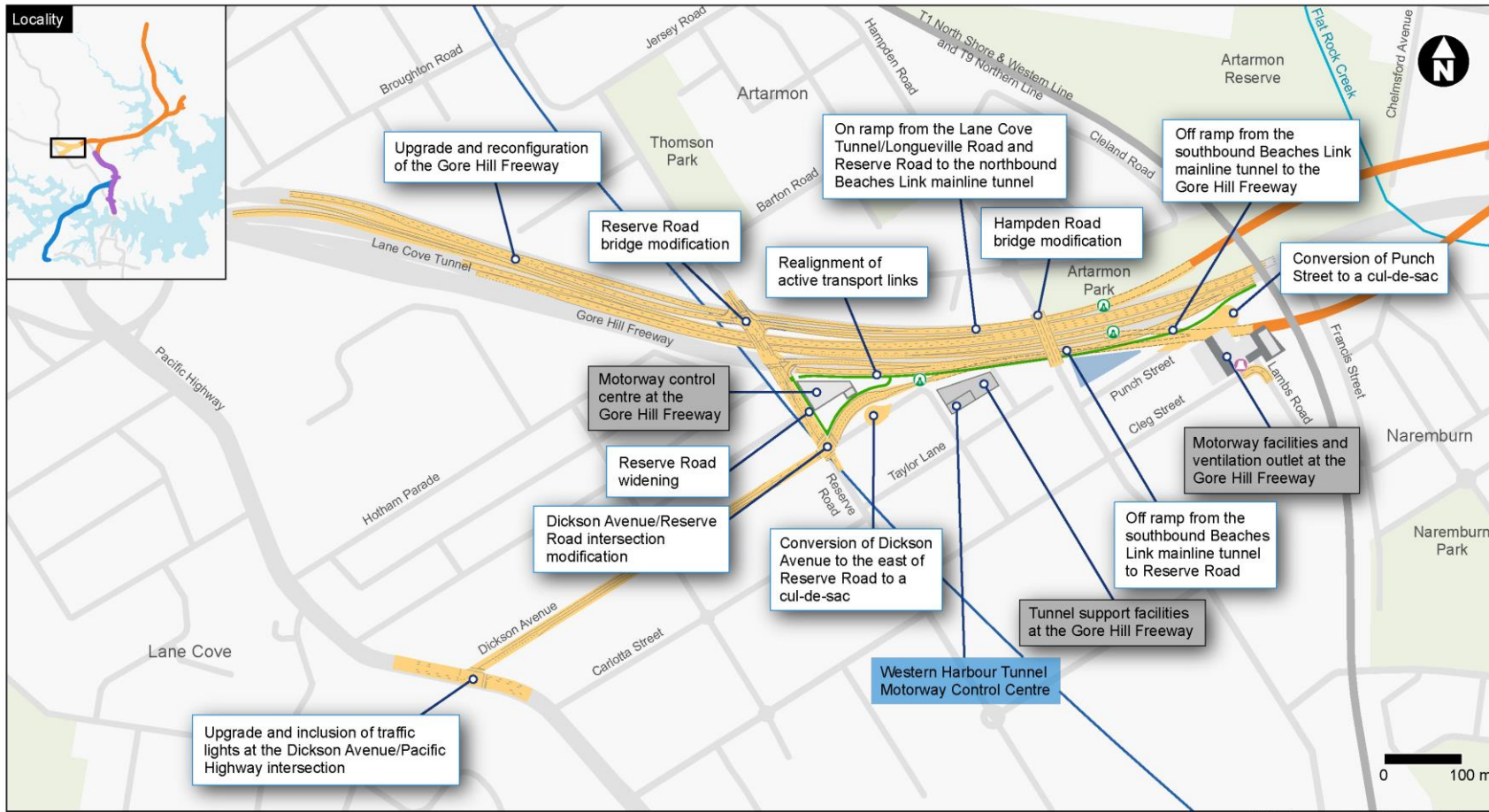


Figure 1-2 Key features of the Gore Hill Freeway component of the project

1.5 Key construction activities

The area required to construct the project is referred to as the construction footprint. The majority of the construction footprint would be located underground within the mainline and ramp tunnels. However, surface areas would also be required to support tunnelling activities and to construct the tunnel connections, tunnel portals, surface road upgrades and operational facilities.

Key construction activities would include:

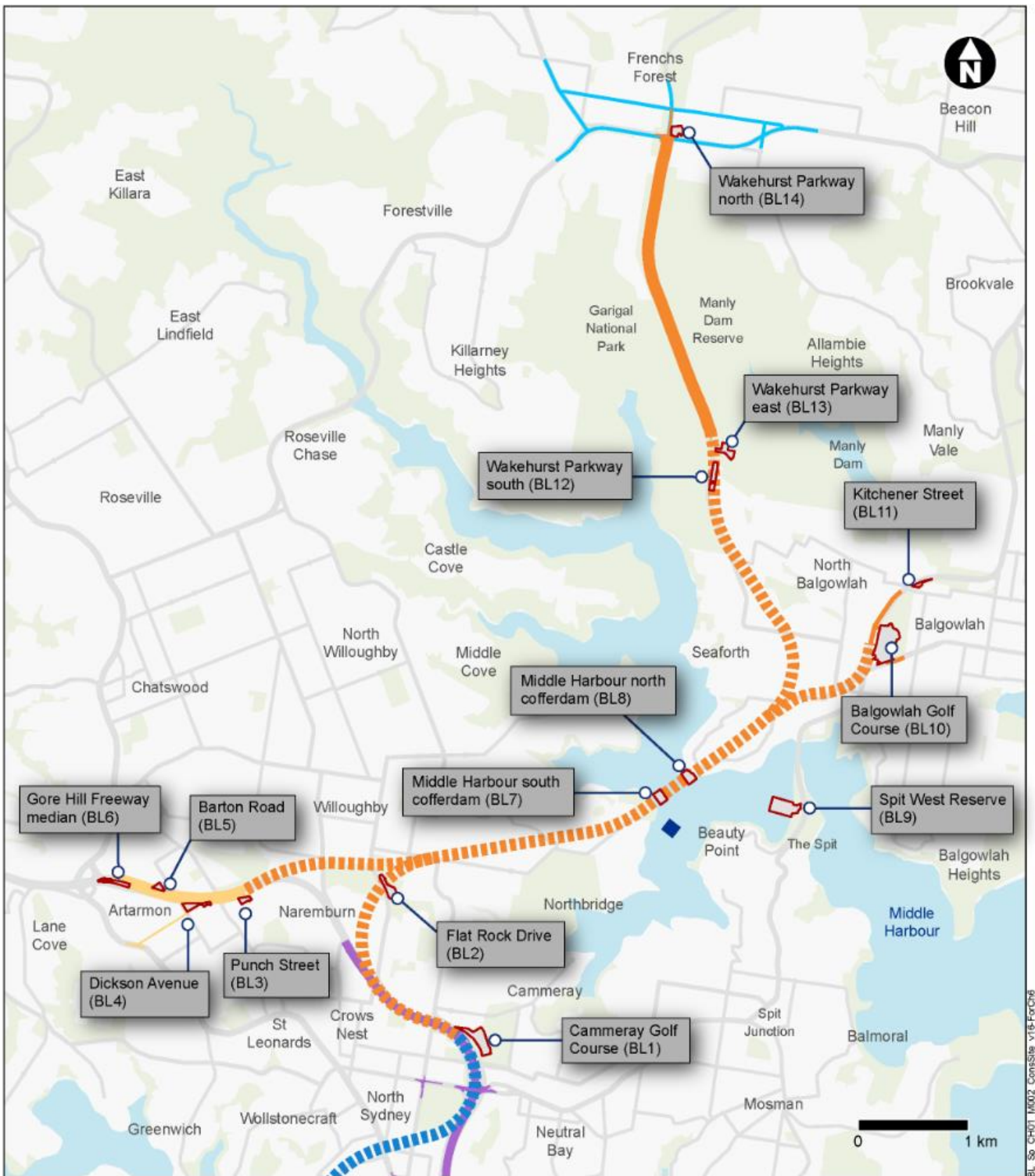
- Early works and site establishment, with typical activities being property acquisition and condition surveys, utilities installation, protection, adjustments and relocations, installation of site fencing, environmental controls (including noise attenuation and erosion and sediment control), traffic management controls, vegetation clearing, earthworks, demolition of structures, building construction support sites including acoustic sheds and associated access decline acoustic enclosures (where required), construction of minor access roads and the provision of property access, temporary relocation of pedestrian and cycle paths and bus stops, temporary relocation of swing moorings and/or provision of alternative facilities (mooring or marina berth) within Middle Harbour
- Construction of the Beaches Link, with typical activities being excavation of tunnel construction access declines, construction of driven tunnels, cut and cover and trough structures, construction of surface upgrade works, construction of cofferdams, dredging and immersed tube tunnel piled support activities in preparation for the installation of immersed tube tunnels, casting and installation of immersed tube tunnels and civil finishing and tunnel fitout
- Construction of operational facilities comprising:
 - A motorway control centre at the Gore Hill Freeway in Artarmon
 - Tunnel support facilities at the Gore Hill Freeway in Artarmon and at the Wakehurst Parkway in Frenchs Forest
 - Motorway facilities and ventilation outlets at the Warringah Freeway in Cammeray (fitout only of the Beaches Link ventilation outlet at the Warringah Freeway (being constructed by the Western Harbour Tunnel and Warringah Freeway Upgrade project), the Gore Hill Freeway in Artarmon, the Burnt Bridge Creek Deviation in Balgowlah and the Wakehurst Parkway in Killarney Heights
 - A wastewater treatment plant at the Gore Hill Freeway in Artarmon
 - Installation of motorway tolling infrastructure
- Staged construction of the Gore Hill Freeway Connection at Artarmon and upgrade and integration works at Balgowlah and along the Wakehurst Parkway with typical activities being earthworks, bridgeworks, construction of retaining walls, stormwater drainage, pavement works and linemarking and the installation of roadside furniture, lighting, signage and noise barriers
- Testing of plant and equipment and commissioning of the project, backfill of access declines, removal of construction support sites, landscaping and rehabilitation of disturbed areas and removal of environmental and traffic controls.

Temporary construction support sites would be required as part of the project (refer to Figure 1-3) and would include tunnelling and tunnel support sites, civil surface sites, cofferdams, mooring sites, wharf and berthing facilities, laydown areas, parking and workforce amenities. Construction support sites would include:

- Cammeray Golf Course (BL1)
- Flat Rock Drive (BL2)
- Punch Street (BL3)
- Dickson Avenue (BL4)
- Barton Road (BL5)
- Gore Hill Freeway median (BL6)
- Middle Harbour south cofferdam (BL7)
- Middle Harbour north cofferdam (BL8)
- Spit West Reserve (BL9)
- Balgowlah Golf Course (BL10)





- Kitchener Street (BL11)
- Wakehurst Parkway south (BL12)
- Wakehurst Parkway east (BL13)
- Wakehurst Parkway north (BL14).

A detailed description of construction works for the project is provided in Chapter 6 (Construction work) of the environmental impact statement.



Legend

Construction features

-  Beaches Link
-  Gore Hill Freeway Connection
-  Construction support site
-  Temporary mooring facility for completed immersed tube tunnel units

Connecting projects




-  Western Harbour Tunnel
-  Warringah Freeway Upgrade
-  Northern Beaches Hospital road upgrade project (completed 2020)

Figure 1-3 Overview of the construction support sites

1.6 Purpose of this report

This report has been prepared to support and inform the environmental impact statement for the project and to address the environmental assessment requirement of the Secretary of the Department of Planning, Industry and Environment.

This report has been prepared generally in accordance with the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (DECCW, 2011) and the *Procedure for Aboriginal and Cultural Heritage Consultation and Investigation* (PACHCI) (Roads and Maritime Services, 2011). The scope of this Aboriginal Cultural Heritage Assessment Report (ACHAR) is as follows:

- Carry out consultation with Aboriginal stakeholders in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (ACHCRP)* (DECCW 2010a) as part of the heritage assessment process to determine potential impacts of proposed activities on Aboriginal objects and places
- Conduct a detailed cultural values assessment for the study area, including desktop review of available ethnographic information and interviews with registered Aboriginal knowledge holders
- Conduct an archaeological assessment of the study area, including a desktop assessment (with register search), archaeological field survey and, if required, further assessment via test excavation. Full details of this assessment are documented in the Archaeological Assessment Report, included as Annexure D (Archaeological Assessment Report)
- Complete a significance assessment of Aboriginal cultural heritage values identified to be potentially impacted by the project. This includes both scientific (archaeological) and cultural significance for Aboriginal heritage sites and places. Cultural significance will be determined in consultation with the Registered Aboriginal Parties (RAPs) for the project
- Provide an assessment of the potential impacts to Aboriginal archaeological sites and cultural heritage values as a result of the project
- Develop recommended management and mitigation measures for the impacts to archaeological sites as a result of the project.

1.7 Secretary's environmental assessment requirements

The Secretary's environmental assessment requirements relating to heritage, and where these requirements are addressed in this report are outlined in Table 1-1. Matters relating to impacts on Non-Aboriginal heritage which are referred to in the table below are addressed separately in Appendix J (Technical working paper: Non-Aboriginal heritage).

Table 1-1 Secretary's environmental assessment requirements –Heritage

Secretary's environmental assessment requirements	Where addressed
1) The Proponent must identify and assess any direct and/or indirect impacts (including cumulative, vibration and visual impacts) to the heritage significance of listed (and nominated) heritage items inclusive of:	
a) Aboriginal places and objects, as defined under the <i>National Parks and Wildlife Act 1974</i> and in accordance with the principles and methods of assessment identified in the current guidelines	This report, in particular Sections 2, 4, 5, 6, 7 and 8.
b) Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan	Sections 2, 4, 5, 6, 7 and 8.

Secretary's environmental assessment requirements	Where addressed
c) environmental heritage, as defined under the Heritage Act 1977 (including potential items of heritage value, conservation areas, open space heritage landscapes, built heritage landscapes and archaeology)	Refer to Appendix J (Technical working paper: Non-Aboriginal heritage) (Jacobs, 2020) of the environmental impact statement.
d) items listed on the State, National and World Heritage lists	Refer to Appendix J (Technical working paper: Non-Aboriginal heritage) (Jacobs, 2020) of the environmental impact statement.
e) heritage items and conservation areas identified in local and regional planning environmental instruments covering the project area	Refer to Appendix J (Technical working paper: Non-Aboriginal heritage) (Jacobs, 2020) of the environmental impact statement.
f) marine items of potential heritage significance within Middle Harbour, such as any shipwrecks	Refer to Appendix K (Technical working paper: Maritime heritage) (Cosmos Archaeology, 2020) of the environmental impact statement.
2) Where impacts to State or locally significant heritage items or archaeology are identified, the assessment must:	
a) include a significance assessment and statement of heritage impact for all heritage items (including any unlisted places that are assessed of heritage value	Section 7
b) provide a discussion of alternative locations and design options that have been considered to reduce heritage impacts	Chapter 4 of the environmental impact statement
c) in areas identified as having potential archaeological significance, undertake a comprehensive archaeological assessment and management plan in line with Heritage Council guidelines which includes a methodology and research design to assess the impact of the works on the potential archaeological resource and to guide physical archaeological test excavations and include the results of these excavations. This is to be carried out by a suitably qualified archaeologist and is to discuss the likelihood of significant historical, maritime and Aboriginal archaeology on the site, how this may be impacted by the project, and includes measures to mitigate any impacts	For Aboriginal cultural heritage impacts, refer to Section 8 and Section 9. For non-Aboriginal heritage matters, refer to Appendix L (Technical working paper: Non-Aboriginal heritage) (Jacobs, 2020) of the environmental impact statement.
d) consider potential impacts to the item of significance caused by, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, increased traffic, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment (as relevant)	Refer to Appendix J (Technical working paper: Non-Aboriginal heritage) (Jacobs, 2020) of the environmental impact statement.
e) provide a comparative analysis to inform the rarity and representative value of any heritage places proposed for demolition;	No sites are proposed for demolition

Secretary's environmental assessment requirements	Where addressed
f) outline mitigation measures to avoid and minimise identified impacts in accordance with the current guidelines; and	Section 9
g) be carried out by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria).	Section 1
3) Where archaeological investigations of Aboriginal objects are proposed these must be conducted by a suitably qualified archaeologist, meeting the minimum qualification requirements specified in section 1.6 of the <i>Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW</i> (DECCW 2010b).	Section 1
4) The Proponent must identify and describe the Aboriginal cultural heritage values that exist across the whole area that would be affected by the development and document these in an Aboriginal Cultural Heritage Assessment Report (ACHAR). This may include the need for surface survey and test excavation. The identification of cultural heritage values must be conducted in accordance with <i>Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW</i> (OEH 2010), and guided by <i>the Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW</i> (DECCW, 2011).	Section 6 & Section 5.4
5) Consultation with Aboriginal people must be undertaken and documented in accordance with the Aboriginal cultural heritage consultation requirements for proponents 2010 (DECCW). The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the ACHAR.	Section 3 & Section 7 Annexure A
6) Impacts on Aboriginal cultural heritage values are to be assessed and documented in the ACHAR. The ACHAR must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the ACHAR must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to the Environment, Energy and Science Group in the Department of Planning, Industry and Environment..	Section 8 & Section 9 Annexure D
Note that due diligence is not an appropriate assessment, and an ACHAR is required	Section 6 and Annexure D

1.8 Study area

For the purposes of this report, the study area is defined as the construction footprint associated with surface works, plus land above the tunnel alignments for the Beaches Link and Gore Hill Freeway Connection project. To account for potential impacts due to vibration or settlement, a 50 metre search area around the surface works and tunnel alignments has also been considered in this impact assessment.

A separate study was carried out to identify potential submerged Aboriginal sites (Cosmos Archaeology 2018). The study area applied to the consideration of potential submerged Aboriginal sites is outlined in Annexure E - Potential submerged sites assessment.

1.9 Authorship

This report has been written by Alistair Carr and Andrew Costello (Senior Archaeologists, Jacobs) and Chelsea Jones (Graduate Archaeologist, Jacobs). Alistair and Andrew hold appropriate qualifications for carrying out the following investigation as required by the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b). The report was reviewed by Dr David Collard (Technical Lead, Roads and Heritage, Jacobs).

The Potential Submerged Sites Assessment (Cosmos Archaeology, 2020) (Annexure E) was written by Cosmos Coroneos, a qualified maritime archaeologist.

Table 1.2 provides a summary of qualifications held by those involved in the preparation of the assessment.

Table 1.2 Qualifications of Aboriginal cultural heritage assessment report authors

Name	Qualifications
Alistair Carr	Bachelor of Arts (Archaeology, Ancient History, English) University of Sydney, 2000 Bachelor of Arts (Honours – Archaeology) La Trobe University, 2012
Andrew Costello	Bachelor of Arts (Honours - Classics and Archaeology, Double major Anthropology) University of Melbourne, 2003
Chelsea Jones	Bachelor of Arts (Honours) - University of Queensland, 2016
David Collard (Technical Reviewer)	Doctor of Philosophy (Archaeology), University of Nottingham, 2011 Master of Arts (Archaeology), University of Melbourne, 2005 Postgraduate Diploma of Arts (Archaeology), University of Melbourne, 2003 Graduate Diploma of Arts (Archaeology), University of Melbourne, 2001 Bachelor of Engineering (Aerospace), Royal Melbourne Institute of Technology, 1999
Cosmo Coroneos	BA (Hons) Archaeology, University of Sydney, 1988 Grad. Dip. Maritime Archaeology, Curtin University, 1990

2. Legislative and policy framework

The following State and Commonwealth legislation is relevant to the Aboriginal cultural heritage assessment:

- Commonwealth legislation:
 - *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
 - *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*
 - *Native Title Act 1993.*
- NSW legislation:
 - *Environmental Planning and Assessment Act 1979 (EP&A Act)*
 - *National Parks and Wildlife Act 1974 (NPW Act)*
 - *Heritage Act 1977.*

These Acts and their relevant sections and subordinate instruments and guidelines (eg codes of practice, guidelines, etc) that govern the project are described in Table 2-1.

Aboriginal cultural heritage investigative works for the project have also followed the PACHCI (RMS, 2011). The process outlined in the PACHCI is consistent with and gives effect to the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b) and consultation requirements across all Transport for NSW projects. The PACHCI outlines a four-stage process for investigating potential impacts to Aboriginal cultural heritage. It includes a process of consultation with Aboriginal people who hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or places(s) in a study area.

Table 2-1 Legislative and policy framework for Aboriginal cultural heritage

Reference	Requirements
Commonwealth legislation and guidelines	
<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i>	This Act provides for the protection of Aboriginal cultural property including places, objects and folklore that 'are of particular significance to Aboriginals in accordance with Aboriginal tradition'. The Act may apply to contemporary Aboriginal cultural property as well as ancient sites. The Environment Minister may make a declaration under Section 10 in situations where state or territory laws do not provide adequate protection of heritage places.
<i>Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)</i>	<p>The EPBC Act provides for the protection of the environment, particularly matters of national environmental significance. The Act also aims to recognise the role of Indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity, and to promote the use of Indigenous peoples' knowledge of biodiversity with the involvement of, and in cooperation with, the owners of the knowledge. The EPBC Act also establishes the National Heritage List, which includes natural, Indigenous and historic places that are of outstanding heritage value to the nation. The Act also establishes the Commonwealth Heritage List, which includes places on Commonwealth lands and waters or under Australian Government control that have Indigenous heritage significance.</p> <p>An independent expert body, the Australian Heritage Council, advises the Environment Minister on the listing and protection of heritage places. In terms of heritage, protected matters include:</p> <ul style="list-style-type: none"> • Places on the National Heritage List • Places on the Commonwealth Heritage List.

Reference	Requirements
	There are no Aboriginal heritage items in the study area for this assessment that are registered on either the National or Commonwealth lists.
<p><i>Native Title Act 1993</i></p>	<p>This Act recognises and protects native title. The National Native Title Tribunal is a Commonwealth Government agency set up under this Act and mediates native title claims under the direction of the Federal Court of Australia.</p> <p>The National Native Title Tribunal maintains the following registers:</p> <ul style="list-style-type: none"> • National Native Title Register • Register of Native Title Claim • Unregistered claimant applications • Register of Aboriginal land use agreements. <p>The <i>Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010</i> (DECCW 2010a) stipulates that, where relevant, consultation must be conducted with native title holders or registered native title claimants in accordance with the <i>Native Title Act 1993</i>.</p> <p>There are no current native title claimants or native title holders for the study area (as of March 2019).</p>
State legislation	
<p><i>Environmental Planning and Assessment Act 1979</i> (EP&A Act)</p>	<p>The EP&A Act and the <i>Environmental Planning and Assessment Regulation 2000</i> provide the framework for environmental planning and assessment in NSW. This Act requires environmental impacts to be considered before development or project approval. In NSW, environmental impacts are interpreted as including impacts on cultural heritage.</p> <p>The project is declared to be State significant infrastructure under Division 5.2 of the EP&A Act. This is because the project is a type of activity listed under clause 1(1) in Schedule 3 of <i>State Environmental Planning Policy (State and Regional Development) 2011</i>. Clause 14 of the planning policy declares development listed in Schedule 3 to be State significant infrastructure pursuant to section 5.12(2) of the EP&A Act. The Minister for Planning is the approval authority for State significant infrastructure.</p>
<p><i>National Parks and Wildlife Act 1974</i> (NPW Act)</p>	<p>The NPW Act provides for the protection of Aboriginal objects and Aboriginal places in NSW.</p> <p>Under the NPW Act (Section 5):</p> <ul style="list-style-type: none"> • An Aboriginal object is defined as any deposit, object or material evidence (not being a handicraft for sale) relating to indigenous and non-European habitation of the area that comprises NSW, being habitation both before and concurrent with the occupation of that area by persons of European extraction, and includes Ancestral remains • An Aboriginal place is a place declared so by the Minister administering the NPW Act because the place is or was of special significance to Aboriginal culture. It may or may not contain Aboriginal objects. <p>Part 6 (Section 90) of the NPW Act requires an Aboriginal Heritage Impact Permit to be obtained if impacts to Aboriginal objects and/or places are anticipated. Consultation with Aboriginal communities is required under Heritage NSW policy when an application for an Aboriginal Heritage Impact Permit is required. While an Aboriginal Heritage Impact Permit is not required if the project is approved under Division 5.2, Part 5, of the EP&A Act, a similar level of assessment is nonetheless required in accordance with the Secretary's environmental assessment requirements for the project.</p>
<p><i>Heritage Act 1977</i></p>	<p>The <i>Heritage Act 1977</i>, administered by Heritage NSW, protects the States' natural and cultural heritage. Aboriginal heritage is primarily protected under the NPW Act but may</p>

Reference	Requirements
	be subject to the provisions of the <i>Heritage Act 1997</i> if the item is listed on the State Heritage Register or subject to an interim heritage order.
Relevant guidelines and policies	
<p><i>Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW</i> (DECCW, 2011)</p>	<p>This document provides guidelines for the investigation and assessment of Aboriginal cultural heritage (under Part 6 of the NPW Act) to explore the harm of a proposed activity on Aboriginal objects and declared Aboriginal places and to clearly set out which impacts are avoidable and which are not.</p> <p>The document provides:</p> <ul style="list-style-type: none"> • Guidance on the process for investigation and assessing Aboriginal cultural heritage in NSW • Heritage NSW requirements for an Aboriginal cultural heritage assessment report (ACHAR). <p>This assessment has been carried out in accordance with the <i>Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW</i> (DECCW, 2011).</p>
<p><i>Aboriginal Cultural Heritage Consultation Requirements for Proponents</i> (ACHCRP) (DECCW 2010a)</p>	<p>The <i>Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010</i> (DECCW 2010a) establishes the requirements for consultation (under Part 6 of the NPW Act) with Aboriginal stakeholders as part of the heritage assessment process to determine potential impacts of proposed activities on Aboriginal objects and places and to inform decision making for any application for an Aboriginal Heritage Impact Permit. The ACHCRP comprises four stages with associated timeframes which must be adhered to:</p> <ul style="list-style-type: none"> • Stage 1 — Notification of project proposal and registration of interest (14 days from date letter sent to register as a registered Aboriginal stakeholder) • Stage 2 — Presentation of information about the proposed project (set up Aboriginal Focus Group (AFG) meetings, prepare info, etc) • Stage 3 — Gathering information about cultural significance (28 days for registered Aboriginal stakeholders to provide a review and feedback of the methodology) • Stage 4 — Review of draft Aboriginal cultural heritage assessment report (registered Aboriginal stakeholders have 28 days from sending of the report to make submissions). <p>This assessment has been carried out in accordance with <i>Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010</i> (DECCW, 2010a).</p>
<p><i>Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW</i> (DECCW 2010c)</p>	<p>The <i>Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW</i> (DECCW 2010b) sets out the detailed requirements for archaeological investigations of Aboriginal objects in NSW for activities that require assessment under Part 4, Part 5 or Part 5.1 of the EP&A Act. An Aboriginal Heritage Impact Permit to carry out test excavation is not required if complying with this code, as sub-surface testing complying with it are excluded from the definition of harm to an Aboriginal object. The code sets out the following in detail:</p> <ul style="list-style-type: none"> • Minimum qualifications for anyone carrying out archaeological investigation under the code in NSW • Assessment steps required to be carried out for all archaeological investigation • Assessment steps that may be required to be carried out to adequately characterise the Aboriginal objects being investigated. <p>This assessment has been carried out in accordance with the Code of Practice.</p>

3. Consultation

Aboriginal stakeholder engagement and involvement is an important component in the identification of Aboriginal sites and cultural values in the study area. This section presents a summary of consultation carried out to date for the project and outlines the various stages of consultation. Annexure A - Consultation contains documents of the consultation carried out for the project, including AFG meeting minutes, examples of letters sent to RAPs and knowledge holders, native title search results, records of cultural heritage values interviews and a detailed consultation log.

3.1 Summary of consultation

For this assessment, Aboriginal stakeholder consultation was carried out in accordance with the PACHCI (Roads and Maritime, 2011), which ensures compliance with statutory requirements and Heritage NSW policies, particularly the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a). Initial consultation was carried out jointly with the Western Harbour Tunnel and Warringah Freeway Upgrade project to cover the whole Western Harbour Tunnel and Beaches Link program of works. More recent consultation has been specific to the Beaches Link and Gore Hill Freeway Connection project.

The PACHCI provides Aboriginal people with the opportunity to participate in decision making regarding the management of their cultural heritage by providing Transport for NSW with information regarding cultural significance and providing input into management options. It includes a process of community consultation with Aboriginal people who hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places in a study area.

The following consultation activities have been carried out to date:

- Identification of key Aboriginal stakeholders began in June 2017 with a search of the National Native Title Register and the Register of Aboriginal Owners established under the *Aboriginal Land Rights Act 1983*. The Metropolitan Local Aboriginal Land Council (Metro LALC) were identified as the only LALC within the study area. There is one existing native title claim on a parcel of land adjacent to the Gore Hill Freeway. However, the project would not affect land subject to native title or to which an Indigenous Land Use Agreement applies and would not trigger the provisions of the *Aboriginal Land Rights Act 1983*
- A letter introducing the project was sent to the Metro LALC as the only LALC identified within the study area
- Advertisements were placed in newspapers in June 2017 to notify Aboriginal people with cultural knowledge of the study area
- Following the statutory response time of 28 days following these notifications, the RAPs for the project were registered for subsequent consultation
- Nominated site officers representing the Metro LALC were engaged to participate in archaeological surveys carried out in May, June and August 2017. During these surveys, site officers were provided an opportunity to comment on the potential for Aboriginal cultural material to be present within the study area, the cultural significance of any Aboriginal cultural heritage sites identified during the survey and proposed management recommendations, including recommendations for further assessment
- All RAPs were invited to attend an initial AFG held on 28 September 2017 at The Old Northbridge Bowling Club, Northbridge. The draft archaeological survey report and archaeological methodology were issued to the RAPs before the AFG for review and comment
- At the end of the 28 day review and comment period, multiple RAPs had expressed approval of the archaeological methodology. An email and a letter were sent to the RAPs confirming that no further changes would be made to the archaeological methodology. The methodology proposed no test excavations within the project study area.
- Aboriginal site officers were engaged for archaeological fieldwork from 8 January to 24 January 2018

- Additional assessments were undertaken with nominated site officers representing the Metro LALC in August 2018, February 2020 and September 2020. During these surveys, site officers were provided an opportunity to comment on the potential for Aboriginal cultural material to be present within the study area, the cultural significance of any Aboriginal cultural heritage sites identified during the survey and proposed management recommendations, including recommendations for further assessment
- All RAPs were invited to attend a second AFG held on 3 November 2020. Due to the COVID19 pandemic restrictions, this AFG was held online using Microsoft Teams. The draft Aboriginal cultural heritage assessment report was issued to the RAPs before the AFG for review and comment, allowing for the minimum statutory response time of 28 days. The main findings of the Aboriginal cultural heritage assessment report were presented and discussed at the AFG
- At the end of the review and comment period, multiple RAPs had expressed approval of the level of assessment). One RAP provided comment in support of a heritage interpretation strategy, and made a recommendation for ongoing maintenance of AHIMs sites due to the existing presence of rubbish and graffiti at some sites. Metro Local Aboriginal land Council also provided some detailed feedback on the ACHAR.

The following sections provide further details of the consultation carried out to date, following the four-stage process outlined in the PACHCI. Only actions relating directly to the consultation process are referred to below.

3.2 PACHCI Stage 1

Stage 1 of the PACHCI involved a desktop risk assessment to determine whether the project would potentially impact Aboriginal cultural heritage and require further assessment or investigation. This included an assessment of potential impacts on Aboriginal lands, objects and places defined under the NPW Act.

The desktop risk assessment determined that impacts to Aboriginal cultural heritage were possible given the study area and locations to be impacted through construction works. As such, the assessment progressed to the next stage of the PACHCI.

3.3 PACHCI Stage 2

Consultation activities carried during Stage 2 of the PACHCI are summarised in Table 3-1.

Table 3-1 Consultation activities carried out during Stage 2 of the PACHCI

Stage 2 PACHCI action	Consultation activities
Action 1 – Identification of key Aboriginal stakeholders	<p>The National Native Title Tribunal was contacted on 1 June 2017 to identify any registered native title claimants or native title holders for the options assessment area. Documents provided in response by the National Native Title Tribunal are presented in Annexure A - Consultation.</p> <p>The documents provided by the National Native Title Tribunal indicated that there were no current native title claimants or native title holders for the study area at the time.</p> <p>The Metro LALC was identified as the relevant LALC for the entirety of the study area.</p> <p>A search of the Register of Aboriginal Owners established under the <i>Aboriginal Land Rights Act 1983</i> was requested on 19 June 2017 and a response was received on 26 June 2017. The response stated that there did not</p>

Stage 2 PACHCI action	Consultation activities
	<p>appear to be any Registered Aboriginal Owners connected to the study area. It was suggested that the Metro LALC be contacted to assist with identifying other Aboriginal stakeholders for the project.</p>
<p>Action 2 – Engage Aboriginal stakeholders to undertake a site survey</p>	<p>Site officers nominated by the Metro LALC were engaged to participate in the archaeological survey. Details of this participation are presented in the consultation records in Annexure A - Consultation.</p>
<p>Actions 3 and 4 – Carry out the pedestrian site survey</p>	<p>Site officers nominated by the Metro LALC participated in archaeological surveys, including consultation during the surveys (refer to Annexure A - Consultation):</p> <ul style="list-style-type: none"> • Pedestrian survey of the St Leonards Park, Cammeray Golf course and ANZAC Park study areas on 17 May 2017 • Pedestrian survey of Spit West Reserve, North Balgowlah, Balgowlah Golf Course, Burnt Bridge Creek and Wakehurst Parkway study areas on 18 May 2017 • Pedestrian survey of Wakehurst Parkway on 1 June 2017 and 9 August 2017 • Pedestrian survey of Artarmon Reserve on 9 August 2017 • Pedestrian survey of Flat Rock Baseball Diamond, Flat Rock Creek walking track and bush reserve, Seaforth Oval and Wakehurst Parkway on 24 August 2018 • Pedestrian survey of two proposed temporary construction support sites at Flat Rock Drive, Flat Rock Reserve, Wilksch Walk and Wakehurst Parkway on 20 March 2020 • Pedestrian survey and site inspection of Lister Avenue (AHIMS ID: 45-6-3032) • Site inspection of Wakehurst Engraving MAN 104 (AHIMS ID 45-6-3032) site and Wakehurst Parkway (AHIMS ID: 45-6-0662) on 15 September 2020. The location and condition of AHIMS ID 45-6-0662 could not be confirmed during field inspection as the site was likely covered by gravel/vegetation.
<p>Action 5 – Aboriginal stakeholder(s) prepare cultural heritage survey report</p>	<p>In accordance with the PACHCI, the Metro LALC was requested to provide a cultural heritage survey report to Transport for NSW advising on Aboriginal cultural heritage issues that may arise as a result of the project. A cultural heritage survey report from the Metro LALC was received following their site inspection on 20 March 2020 (refer Annexure A – consultation) stating they see no Aboriginal archaeological constraints to the project, but if unexpected Aboriginal significant objects are discovered in future activities then Heritage NSW and Metro MLALC should be contacted to advise on an appropriate course of action. Metro LALC also attended</p>

Stage 2 PACHCI action	Consultation activities
	other site inspections but no further reports have been received to date.

3.4 PACHCI Stage 3

As outlined in PACHCI and the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010a), where harm to Aboriginal objects or places is likely to occur, formal consultation would be carried out as per the process outlined in these documents.

As the initial Stage 2 archaeological survey identified that harm to Aboriginal objects or places had the potential to occur, formal consultation began in accordance with Stage 3 of PACHCI (Roads and Maritime Services, 2011). Due to the anticipated complexity of the consultation process for the project, including predictions that a large number of stakeholder groups would register an interest in the project, Actions one to six of the PACHCI Stage 3 process began before the completion of Stage 2. Stage 3 consisted of several subsequent actions, as summarised in Table 3-2.

Table 3-2 Consultation activities carried out during Stage 3 of the PACHCI

Stage 3 PACHCI (consultation actions only)	Consultation activities
Action 1 – Seek the names of Aboriginal people with cultural knowledge by letter or notify native title holders	<p>The following organisations were written to during June 2017 and July 2017 seeking the details of Aboriginal people who may have an interest in the project and who may hold cultural knowledge about objects and places in the study area:</p> <ul style="list-style-type: none"> • The OEH (Sydney office) (now Heritage NSW) • The NSW Aboriginal Land Council • The Metro LALC • The Aboriginal Heritage Office, a regional organisation that partners with councils predominantly in the Sydney metropolitan area • The Registrar appointed under the Aboriginal Land Rights Act 1983 • The National Native Title Tribunal • The Native Title Services Corporation Limited • Northern Beaches Council. <p>Following the statutory response time of 14 days, a list of 20 Aboriginal groups (including Metro LALC and the Aboriginal Heritage Office) with potential cultural knowledge of the study area was compiled. Annexure A - Consultation provides a complete list of nominated groups or people.</p>
Action 2 – Notify Aboriginal people with cultural knowledge by letter	On 1 August 2017, a letter of notification was sent to all of the Aboriginal groups or people identified at that time (refer to Action 1) inviting them to register their interest in the project.
Action 3 – Notify Aboriginal people with cultural knowledge by advertisement	<p>Advertisements inviting Aboriginal groups or people to register their interest in the project were placed in the public notices section of the following newspapers on 14 June 2017:</p> <ul style="list-style-type: none"> • Koori Mail • Indigenous Times • Inner West Courier • North Shore Times

Stage 3 PACHCI (consultation actions only)	Consultation activities
	<ul style="list-style-type: none"> • Manly Daily • Mosman Daily • Central Sydney Magazine.
Action 5 – Prepare a register of Aboriginal parties	A register of Aboriginal parties who responded to the notification letters and advertisements was compiled and continues to be maintained for the project. Each RAP was sent a letter confirming receipt of their registration. A total of 19 RAPs were registered for the project.
Action 6 – Send the names of registered parties to OEH and LALCs	The list of the RAPs was issued to OEH and the Metro LALC on 11 October 2017.
Action 7 – Send invitation to attend an Aboriginal focus groups meeting and draft methodology for review	<p>On 13 September 2017, invitations to attend the initial AFG meeting were sent to OEH and all RAPs registered at the time. Included with the invitation letters was:</p> <ul style="list-style-type: none"> • An agenda for the AFG meeting • A copy of the PACHCI (Roads and Maritime, 2011) Resource 19 – Aboriginal site officer application form • A draft copy of the Western Harbour Tunnel and Beaches Link archaeological methodology (Carr and Costello 2017). <p>On 19 October 2020, invitations to attend a second AFG meeting were sent to Heritage NSW and all RAPs registered at the time. Included with the invitation letters was an agenda for the AFG meeting.</p>
Action 8 – Hold an Aboriginal Focus Group (AFG) meeting	<p>Two AFG meetings have been held for the project to date:</p> <p>AFG 1</p> <p>An initial AFG for the project was held on 28 September 2017. The agenda and minutes for this meeting are presented in Annexure A - Consultation. At this meeting, several presentations to the RAPs were made including a project overview, results of the archaeological survey and the proposed archaeological methodology. Consultation with the RAPs at this meeting was recorded and is presented in Annexure A - Consultation. Some of the RAPs also completed site officer application forms at the meeting.</p>
Action 9 – Provide meeting minutes to Aboriginal parties	Written summary of comments and minutes from the AFGs were provided to the RAPs via email and letter and presented at subsequent meetings.
Action 10 – Finalise methodology	<p>Review of the archaeological methodology began on 11 September 2017 when the draft methodology was sent to the RAPS and OEH. Multiple RAPs approved the methodology in draft form.</p> <p>The review period ended on 9 October 2017 and an email was sent to the RAPs confirming that there had been no changes requested to the archaeological methodology and that it was finalised following the statutory review period of 28 days.</p>
Action 14 – Engage Aboriginal site officers	<p>Aboriginal site officers were engaged for archaeological fieldwork from 8 January to 24 January 2018.</p> <p>Discussions about the process of the cultural values assessment occurred at AFG1. Letters were sent to the RAPs on 9 November 2017 specifying that all nominations for Aboriginal cultural knowledge holders were required</p>

Stage 3 PACHCI (consultation actions only)	Consultation activities
	before 22 November 2017. Refer to Section 5 for further details on the cultural values assessment.
Action 15 – Implement archaeological testing methodologies	Aboriginal site officers were engaged for archaeological fieldwork from 8 January to 24 January 2018.
Action 19 – Prepare cultural heritage assessment report OR amend existing cultural heritage assessment report	<p>The ACHAR was provided to the Heritage NSW and all RAPs for the project for review and comment. At the end of the review and comment period, multiple RAPs had expressed approval of the level of assessment and environmental management measures proposed (refer Annexure A – Consultation). One RAP provided comment in support of a heritage interpretation strategy and made a recommendation for ongoing maintenance of AHIMs sites due to the existing presence of rubbish and graffiti at some sites. Metro Local Aboriginal Land Council also provided some detailed feedback on the ACHAR. Transport for NSW responses to the issues raised by the RAPs is included in Annexure A – Consultation.</p> <p>AFG 2</p> <p>A second AFG for the project was held on 3 November 2020. The agenda and minutes for this meeting are presented in Annexure A – Consultation. At this meeting a presentation was made to the RAPs which included a project overview, an overview of the Aboriginal cultural heritage assessment approach, results of the terrestrial and potential submerged sites assessment and proposed environmental management measures. Consultation with the RAPs at this meeting was recorded and is presented in the meeting minutes in Annexure A - Consultation. The two issues raised by the RAPs were support for an Aboriginal heritage interpretation strategy and concern regarding ongoing vandalism, damage and littering of AHIMS sites.</p>

3.5 Potential submerged sites assessment

RAPs were emailed regarding the potential submerged sites assessment on 5 March 2018 and a 28 day timeframe was provided for responses. The email included recent information on the assessment and a proposed methodology for further investigation for comment. No responses were provided from RAPs. However, the email detailed that a presentation on the potential submerged sites assessment would be given at AFG 2 with opportunity to comment and ask questions.

The potential submerged sites assessment is included in Annexure E and was presented at AFG 2. No specific comments or questions were provided from the RAPs in relation to the potential submerged sites assessment.

Notification requirements under section 24KA of the *Native Title Act 1993* apply where construction work is required on Crown land and where the land has not been acquired by Transport for NSW. Notification in accordance with this section would occur if and as required.

4. Background information

4.1 Environmental context

The study area is located in highly urbanised areas north of Sydney. It extends from Cammeray and Artarmon in the south and west, to Seaforth, Balgowlah and Frenchs Forest in the north and east. The northern section of the study area passes through a largely undeveloped landscape along the Wakehurst Parkway between Seaforth and Frenchs Forest near Garigal National Park (Bantry Bay) and Manly Dam Reserve. It crosses Middle Harbour between Northbridge and Seaforth.

The study area extends across a range of landforms and geological features. These can be broadly split into three main landscape regions, listed from south to north:

- Lower North Shore: around 25 per cent of the study area is located in this landscape region
- Middle Harbour and Balgowlah: around 25 per cent of the study area is located in this landscape region
- The Wakehurst Parkway: around 50 per cent of the study area is located in this landscape region.

4.1.1 Lower North Shore

The lower North Shore landscape region is a highly urbanised and developed landscape with only very small pockets of unmodified landscape remaining. The study area includes several parks and reserves, including St Leonards Park, ANZAC Park, Cammeray Golf Course, Artarmon Park and Artarmon Reserve, as well as the Flat Rock Reserve and the surrounding alluvial terraces and exposed sandstone outcrops. These parks and reserves have been subject to less disturbance and may have increased potential for Aboriginal sites.

4.1.2 Middle Harbour and Balgowlah

The Middle Harbour and Balgowlah landscape region is a highly urbanised and developed landscape with only very small pockets of unmodified landscape remaining. The landscape region is characterised by undulating to rolling low hills on Hawkesbury Sandstone with local reliefs of 20 to 80 metres, slopes of 10 to 25 per cent and rock outcrops of less than 25 per cent. A gentler gradient at Clive Park descends from Northbridge into a shallower portion of Middle Harbour, with The Spit Bridge constructed where a long, narrow sandbar once formed a natural, easier crossing. Middle Harbour is bordered by steep headlands of exposed Hawkesbury Sandstone with some low hills and rises on Permian sediments. The study area traverses the low gradient at Clive Park towards Seaforth and Balgowlah, where Burnt Bridge Creek is situated in Hawkesbury Sandstone bedrock.

4.1.3 The Wakehurst Parkway

At the Wakehurst Parkway landscape region, sections of undisturbed remnant landscapes are found in two locations within or near the study area (Garigal National Park and Manly Dam Reserve). The Wakehurst Parkway is located within an erosional landscape comprising undulating to rolling low hills on Hawkesbury Sandstone, broad ridges, gently to moderately inclined slopes, wide rock benches with low broken scarps, small hanging valleys and areas of poor drainage. The landscape region is characterised by rugged, rolling to very steep hills on Hawkesbury Sandstone with local reliefs of 40 to 200 metres with rock outcrops and shallow, stony, highly permeable soils. The Wakehurst Parkway landscape region is particularly significant because of the aforementioned Hawkesbury Sandstone and its association with known Aboriginal rock engravings.

4.2 Topography

The terrain within the study area rises from an elevation of around 65 metres Australian Height Datum at the southern extent of the project at Cammeray and gently undulates towards Middle Harbour.

Middle Harbour is a sub-catchment of Sydney Harbour. The Sydney Harbour estuary is a drowned river valley (palaeovalley), characterised by steep-sided banks carved into Hawkesbury Sandstone between 25 and 29

million years ago. Around 17,000 years ago, the sea level began to rise, eventually flooding the river valley and forming a flood tide delta (Sydney Institute of Marine Science 2014).

4.3 Geology and soils

The study area is located within the Sydney Basin, a large depositional geological feature that spans from Batemans Bay in the south to Newcastle in the north and Lithgow in the west.

The Sydney 1:100,000 Geological Series Sheet 9130 (NSW Department of Mineral Resources 1983) indicates that the majority of the study area is underlain by geological units associated with the Wianamatta Group. Hawkesbury Sandstone underlies the majority of the study area.

The Sydney 1:100,000 Soil Landscape Series Sheet 9130 (Soil Conservation Service of NSW 1966) identified many soil types underlying the study area (refer to Table 4-1). Hawkesbury Sandstone-derived soils (ie Gymea and Hawkesbury soil types) are extensive within the study area, occurring from North Sydney to the northern extents of the study area.

Table 4-1 Soil units underlying the study area

Soil unit	Description
Hawkesbury	<p>Landscape – found on rugged, rolling to very steep hills on Hawkesbury Sandstone with local reliefs of 40 to 200 metres, slopes of > 25 per cent and rock outcrops of > 50 per cent</p> <p>Soils – shallow (< 50 centimetres), discontinuous lithosols/siliceous sands associated with rock outcrops, earthy sands, yellow earths and some yellow podzolic soils on the inside of benches and along joints and fractures</p> <p>Limitations – extreme soils erosion hazard, mass movement (rockfall) steep slopes, rock outcrop, shallow, stony, highly permeable soils with low fertility.</p>
Gymea	<p>Landscape – undulating to rolling low hills on Hawkesbury Sandstone with local reliefs of 20 to 80 metres and slopes of 10 to 25 per cent and rock outcrops of < 25 per cent</p> <p>Soils – shallow to moderately deep yellow earths and earthy sands on crests and on the inside of benches</p> <p>Limitations – high soil erosion, rock outcrop, shallow highly permeable soil and very low soil fertility.</p>
Lucas Heights	<p>Landscape – gently undulating crests and ridges on plateau surfaces of the Mittagong Formation, with local relief to 30 metres and slopes <10 per cent</p> <p>Soils – moderately deep hardsetting yellow podzolic soils and yellow soloths, yellow earths of the outer edge of crests</p> <p>Limitations – stony soil, low soil fertility and low available water capacity.</p>
Lambert	<p>Landscape – erosional landscape comprising undulating to rolling low hills on Hawkesbury Sandstone, broad ridges, gently to moderately inclined slopes, wide rock benches with low broken scarps, small hanging valleys and areas of poor drainage, with local relief to 20–120 metres and slopes < 20 per cent</p> <p>Soils – shallow discontinuous earthy sands and yellow earths on crests, shallow siliceous sands and lithosols on leading edges, shallow to moderately deep leached sands, grey earths and greyed podzolic spoils in poorly drained areas, and localised yellow podzolic soils associated with shale lenses</p> <p>Limitations – stony soil, low soil fertility and low available water capacity.</p>

Soil unit	Description
Disturbed	<p>Landscape – the topography varies from level plains to undulating terrain and has been disturbed by human activity to a depth of at least 100 centimetres</p> <p>Soils – the original soil has been removed, greatly disturbed or buried. Most of these areas have been levelled to slopes of < five per cent. Landfill includes soil, rock, building and waste material. The original vegetation has been completely cleared</p> <p>Limitations – depend on the nature of fill material. Potential for subsidence resulting in a mass movement hazard, and soil impermeability leading to poor drainage and low fertility. Care must be taken when these sites are developed.</p>

4.4 Hydrology

The study area intersects the estuary of Sydney Harbour, a drowned river valley formed during sea level rise about 10,000 years ago. The estuary opens up from the entrance to form Port Jackson, and then divides into three main branches, Middle Harbour to the north and the Parramatta and Lane Cove Rivers extending south, then westward away from the heads. The estuary is about 30 kilometres long, with a total catchment of 500 square kilometres (Sydney Institute of Marine Science 2014).

The bathymetry of Sydney Harbour is complex and comprises dredged channels for shipping and several deep holes of about 28 to 45 metres, separated by shoals with depths of three to five metres (Sydney Institute of Marine Science 2016).

4.5 Climate

The Bureau of Meteorology weather station at Sydney (Observatory Hill) (site number 066062) is broadly representative of the weather conditions in the study area. The annual average daily maximum and minimum temperatures are 21.8°C and 13.8°C, respectively. On average, January is the hottest month with an average daily maximum temperature of 26.0°C. July is the coldest month, with an average daily minimum temperature of 8.1°C. The wettest month is April, with 128.5 millimetres falling over nine rain days. The average annual rainfall is 1215.7 millimetres over an average of 99 rain days per year.

4.6 Vegetation

The landscape within the study area is highly urbanised and is characterised by planted native vegetation mixed with exotic or invasive species. Fully structured native vegetation adjoining the Wakehurst Parkway is continuous with larger tracts of native vegetation contained within Garigal National Park (to the west) and Manly Dam Reserve (to the east). Vegetation within built-up areas of the study area is generally limited to planted street trees and vegetation within public parks and reserves except for at Wakehurst Parkway. The study area comprises a mix of urban exotic and native backyard trees, gardens and coastal sandstone foreshore forests which are characterised by species such as the Smooth-barked Apple and Coast Banksia as well as weeds and exotics. Coast banksias (*Banksia aemula*, *B. serrata*, *B. integrifolia*) and coast tea tree (*Leptospermum laevigatum*) are also found in the study area (OEH 2016).

The biodiversity values of the study area are discussed in detail in Appendix T (Technical working paper: Biodiversity Development Assessment Report) (Arcadis, 2020) of the environmental impact statement. Seven native vegetation communities were found within the project footprint, consistent with the following plant community types (PCTs):

- PCT 1250: Sydney Peppermint – Smooth-barked Apple -- Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion
- PCT 1292: Water Gum – Coachwood riparian scrub along sandstone streams, Sydney Basin Bioregion

- PCT 1783: Red Bloodwood – Scribbly Gum/Old-man Banksia open forest on sandstone ridges of northern Sydney and the Central Coast
- PCT 1786: Red Bloodwood – Silvertop Ash – Stringybark open forest on ironstone in the Sydney region
- PCT 1824: Mallee – Banksia – Tea-tree – Hakea heath-woodland of the coastal sandstone plateaus of the Sydney basin
- PCT 1841: Smooth-barked Apple – Turpentine – Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region
- PCT 1845: Smooth-barked Apple – Red Bloodwood – Blackbutt tall open forest on shale sandstone transition soils in eastern Sydney.

Several patches of the Duffys Forest endangered ecological community (aligned with PCT 1786) have been identified within the construction footprint of the project. This community is listed as endangered under the *Biodiversity Conservation Act 2016*.

Field surveys carried out for the project identified two threatened flora species within the construction footprint: Magenta Lilly Pilly (*Syzygium paniculatum*) and Netted Bottle Brush (*Callistemon linearifolius*). An additional 17 threatened flora species were recorded as having a moderate to high likelihood of occurrence within the project construction footprint, despite not being identified during field surveys.

4.7 Historical and current land use

Early historical sources describe much of the vegetation in the study area as open woodland. This vegetation would have been regularly burnt by Aboriginal people through firestick farming techniques for the purposes of hunting and cultivation of food bearing plants. In the early 20th century many of the mature trees were cut down exposing the sandstone and causing erosion. The lower shoreline areas were likely to have been used for fishing and hunting with rock shelters around the water's edge commonly used for shelter. Larger camping areas would have existed on the headlands overlooking the harbour (Attenbrow 2010).

The study area at Wakehurst Parkway contains a variety of extensive Aboriginal rock engravings. These rock engravings are thought to have had ceremonial associations. It is suggested that the Wakehurst Parkway rock engraving locations would not have been permanent occupation areas and that they would have been visited intermittently for initiation or educational purposes (Campbell 2015; Lambert 1989).

Current land use within the study area is varied but generally dominated by residential development. Pockets of industrial development are located around North Sydney and Artarmon with areas of commercial development scattered across parts of the study area, including several golf courses. Undisturbed remnant landscapes are found in two locations within or near the study area (Garigal National Park and Manly Dam Reserve). Historic aerial photographs from 1943 suggest this bushland area has remained relatively undisturbed over the past 70 years. Other smaller pockets of remnant landscape occur in the study area, such as Artarmon Park, Artarmon Reserve, Clive Park and areas along Burnt Bridge Creek that are currently used for recreational and conservation purposes. While there are some retained areas of undisturbed land in the vicinity of Flat Rock Creek, within the study area the creek is wholly within a culvert and the old creek surrounds are buried below waste deposits and rehabilitated land forms distributed over the last 60 years (Figure 4-1). The smaller pockets of undisturbed remnant landscape are typically located around smaller waterways, tributaries or harbour foreshore, whereas the larger undisturbed remnant landscapes are associated with large reserves and National Parks.

The archaeological implications of the land uses discussed in this section include the potential disturbance or destruction of Aboriginal sites in areas of significant residential, industrial and commercial development. Conversely, in areas of remnant landscape, Aboriginal sites, where present, may be relatively undisturbed. The foreshore areas and rugged topography within sections of the study area may also mean that Aboriginal sites such as rock shelters or middens may exist relatively intact in resident's backyards.

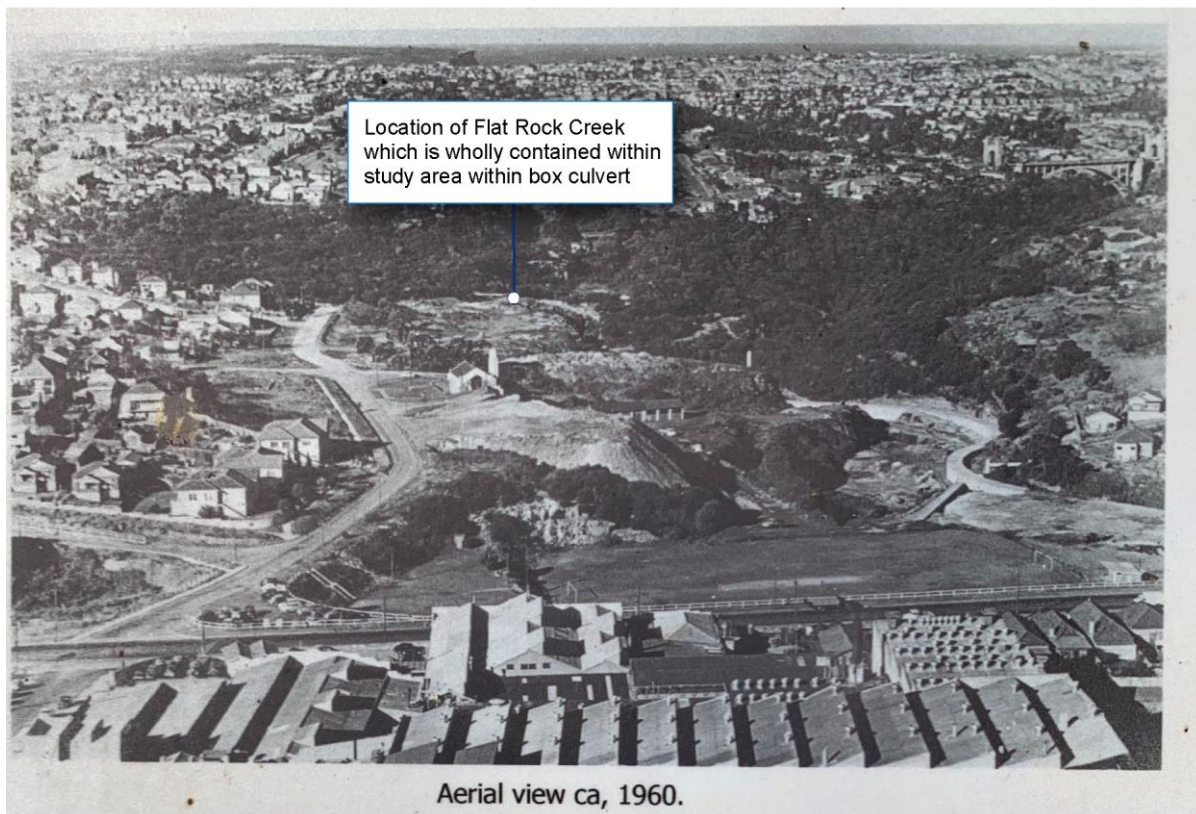


Figure 4-1: Aerial view looking east towards Flat Rock Creek – 1960

4.8 Key observations

Key observations to be drawn from a review of the existing environment and landscape context of the study area are as follows:

- Waterways within the study area would have been sources of floral and faunal resources
- There is potential for scattered midden material to occur along parts of the water margin within the study area
- Much of the study area has been subject to large scale landscape modification as a result of development. Disturbance from urban and industrial development, freeways and roads have removed most of the deposit in which Aboriginal objects would have been originally located, for example Flat Rock Creek is buried in a culvert between Willoughby Road and 150 metres east of Flat Rock Drive (Figure 4-1)
- Areas of highly disturbed terrain are unlikely to retain in situ or intact evidence of past Aboriginal occupation owing to the severity of past ground surface disturbances that have occurred. However, there is the potential for incidental survival of Aboriginal sites within private land.
- Hawkesbury Sandstone outcrops and escarpments are located in association with the Middle Harbour and Wakehurst Parkway landscape regions. These areas may contain Aboriginal rock shelter sites and engravings (Campbell 2015; Lambert 1989; McDonald 2007)
- Soils within the study area are varied according to region and landform and have varying levels of archaeological potential.

4.9 Ethnography

Ethnographic information relating to the Aboriginal occupation of the study area and surrounding region is derived from publications and other surviving forms of documents which were compiled by early European

explorers, settlers, missionaries and government officials who went to the region during the mid to late 19th century (Martinez 2010).

The following information was compiled from several written sources based on language research and ethnohistoric observations. It should be noted that the information provided here does not necessarily reflect the opinions of the Metro LALC regarding its affiliations and boundaries.

4.9.1 Social organisation

Early historical accounts described two dominant tribes occupying the Sydney region, these being the *Guringai* people and the *Dharawal* people. Historical accounts suggest the *Guringai* territory extended from Lake Macquarie to Botany Bay, while the *Dharawal* territory extended from south of Botany Bay to the Shoalhaven River. Interaction between these two groups was frequent to facilitate exchange of raw materials and other resources (Stanbury 1979).

Aboriginal people in the Sydney area were considered to have complex social organisations (Peterson 1976). Tribal groups controlled descent and land 'ownership', although there is evidence that some groups were unrestricted in their movements throughout the region (Rich 1986). Aboriginal society incorporated several hierarchical levels and groups. However, the boundaries which distinguished each of these groups have been described as fluid. The smallest group of the hierarchy, a 'family', consisted of man, his wife/wives, their children and sometimes also included their parents (Peterson 1976). The secondary social unit of Aboriginal people, termed 'band', consisted of around 30–50 people who hunted, foraged and roamed around together. Their mobility is suggested to reflect seasonal use of resources. Multiple bands that shared the same language, that were related by marriage, shared similar customs and met to perform ceremonial enactments were called a tribe (Peterson 1976; Stanbury 1979).

Aboriginal kinship extended beyond traditional European familial ties to include other members of their community. Patrilineal descent dictates clan membership and each local clan was related to specific totems, typically an animal or bird which clan members were forbidden from hunting or eating. Beyond this, social status was hierarchical within groups and between different groups. Senior men, termed 'elders', constituted the representative heads of the Aboriginal group. The *Karadji* comprised senior men involved in initiation ceremonies and also in healing ceremonies (Attenbrow 2010).

This hierarchy also extended to mediate cultural law, with those who broke the law punished accordingly. Punishments could involve ritual combats where others could throw spears at the offender with only a shield to defend himself. Conversely, there is no indication in historical accounts that women held specific rights or powers. Gender was distinguished linguistically with the use of the suffix 'leon' to the name of that person (Attenbrow 2010).

The family unit or extended family group made habitual use of the land. Food resources were largely seasonal and were more abundant in warmer months. As resources became scarcer in winter, larger units broke up into smaller units. There appears to have been a strong division of labour, with women providing vegetables, shellfish and fish caught with a hook and line, while men hunted and fished using spears (Attenbrow 2010).

Aboriginal people in the Sydney region appear to have lived primarily on fish and shellfish, supplemented with kangaroos, other marsupials and vegetable food such as fern roots and *Macrozamia* nuts. Specifically, marine subsistence included a range of fish, crabs, crayfish and some inclusion of seals and whales (Attenbrow 2010).

4.9.2 Material culture

Ethnohistoric observations suggest that Aboriginal people in the Sydney area primarily used tools made from organic materials rather than stone. Common tools included fishing spears, spear throwers, wooden clubs, parrying sticks and shields, fish hooks, canoes, net bags and wooden dishes (Kuskie 1997). Fish hooks dominate the type of shell elements recovered in the Sydney region and have been recovered from numerous sites

including Port Jackson, Royal National Park and Broken Bay. British colonial accounts describe Aboriginal fish hooks as curved but not barbed. Hooks were generally composed of shell (Kuskie 1997) but sometimes included the use of wood or bone, or even in some cases the talons of birds (Attenbrow 2010). Ranging between 13 to 50 millimetres in length, these hooks were unbarbed and crescent in shape, including small notches to attach fishing line. Fishing line consisted of two strands of bark, tree, shrub fibre or animal fur (Attenbrow 2010). Small stones (*gna'mmul*) were attached to the end of fishing lines and used as sinkers. It is suggested that bait, rather than attached to the hook itself, consisted of chewed mussels spat into the water (Attenbrow 2010).

Used for general transport and fishing, canoes are described as between 1.2 metres and 4.2 metres in length and about 1.2 metres wide (Barralier 1802 cited in Brayshaw 1986; Threlkeld cited in Gunson 1974). Depending on the size of the clan, each had six to eight canoes. Ethnographic studies indicate that women primarily used canoes with hooks and line, while men predominantly used fishing spears (Worgan 1978). Canoes comprised a single sheet of bark held together at the ends with vines. Ground-edge hatchets, wooden mallets and stone wedges were used to cut the shape of the canoe from the bark. When removed, the bark was softened through heating with fire and the ends fastened together.

To facilitate mobile subsistence strategy many of the tools and weapons used by the Aboriginal groups of Sydney were multi-functional and portable. Spears were used for both hunting and warfare and shields and clubs were used as weapons but also, in some cases, as musical instruments. The two different types of fishing spears include a *callar* and *mooting* (Attenbrow 2010). The *callar* is a large spear with four prongs and the *mooting* is a smaller version of this (Attenbrow 2010). There are few observations of land animal hunting in the Sydney region, and this may be attributed to the available coastal resources. However, fire was used to facilitate the capture of prey, and beyond direct subsistence purposes Aboriginal people used burning strategies to 'shape' the landscape for predictable subsistence, shelter and general lifestyle needs (Gammage 2012).

Other items such as stone hatchets, small sticks or 'switches' and spear throwers were used for the collection of shellfish, grub and other food plants. Shells, wooden dishes, net bags and folded bark baskets were used to store and transport these resources (Attenbrow 2010). Ethnographic studies indicate kangaroo bones were used to make combs or awls. Awls were used for sewing possum and kangaroo skin, headbands and belts (Brayshaw 1986; Kuskie 1997). Tree bark material served several purposes, including fire for torches used for nocturnal fishing parties, bedding and clothing, and in some cases to line the bottom of canoes. Cockle and oyster shells were reworked to use as tools to process plants and wood.

Sandstone rock shelters were used over much of the Sydney area as occupation sites. Exposed sandstone outcrops throughout the region would have provided a useful abrasive and platform for shaping shell, wood and other stone implements. Pigment images, stencils and engravings displayed in rock shelters depict the use of boomerangs, shields and stone hatchets. McDonald (2008) suggests that visual culture, such as rock engravings, may have communicative implications relating to group identification behaviour. During the Pleistocene epoch, social networks between Aboriginal groups would have been more extensive and widespread than during the contact period. Evidence indicates that artistic motifs such as rock engravings may have been used as a pictorial communication system within the region. McDonald (2008 p. 41) explains this correlation as:

"Rock art, and symbolic behaviour generally, is seen as an important facilitator and component of increasing and continuing social complexity across the region throughout the late Holocene".

McDonald (2008) suggests that social hierarchies and territorial boundaries may have changed and diversified as a result of sea level changes during the Holocene. This diversity is thought to have motivated the development of characteristic art motifs for particular groups and hierarchies within those groups. Some evidence of this is thought to have now disappeared under the now submerged Sydney coastal plain (McDonald 2008 p. 41). However, the orientation and additional decoration of some of the anthropomorphs and shield engravings are thought to demonstrate some of these cultural divisions.

Ethnohistorical accounts detail that clothing was not worn for the majority of the year with a few exceptions. These exceptions included the use of bark cloaks in the rain and use of skin coats in the colder hinterland areas.

Personal decoration is reported to have been full-bodied, elaborate and carried out by everyone: children and adults, both female and male. Adornment items included the use of arm, waist and headbands, pendants and necklaces and the decorative use of painted and scarred designs. Such decoration, however, was primarily for utilitarian purposes of identification rather than purely aesthetic appeal. Adornment items distinguished people based on their respective clan and status within society and recognised important occasions such as funerals and initiations (Attenbrow 2010).

4.9.3 Subsistence

Archaeological evidence from sites surrounding Middle Harbour indicate a reliance on shellfish as an important food resource. Large assemblages of animal bone have also been previously recovered from Sydney coastal middens along the ocean shoreline, in particular at Port Jackson, Balmoral Beach and Vaucluse (Attenbrow 2010).

Evidence of dugong butchery has also been recovered from St Peters in the 1880s. The cut marks and other scars on the skeletal elements were interpreted to reflect butchery of the marine mammal for subsistence purposes. Evidence of consumption of seals has also been identified at coastal shell middens. However, this inclusion is only minimal which indicates that seal was either not a primary food item or that the carcass was processed or eaten away from campsites. Shell middens at Balmoral Beach and Cammeray indicate that sea turtle was also incorporated in the early Aboriginal diet of the Sydney region (Australian Museum 2009).

Aboriginal people in the region may have also eaten different bird species. Regional archaeological deposits have been known to include remains of short-tailed Shearwaters (*Puffinus tenurostris*), Little Penguins (*Eudyptula minor*) and petrels (Australian Museum 2009).

4.9.4 Summary

The Sydney Basin has a rich Aboriginal heritage. Aboriginal occupation focused on accessing resources from diverse ecological areas, seasons and conditions. Coastal areas, smaller rivers, creeks and swamps would have been associated with occupation sites, hunting and inter-clan contact, as well as facilitating travel.

Aboriginal occupation in the Sydney area is known to have extended beyond the Last Glacial Maximum, when the environment was drier and significantly cooler and the permanent water sources even more critical to survival. Evidence of Aboriginal occupation in NSW dates back to around 50,000 to 60,000 years at Lake Mungo and up to 30,000 years at Parramatta. Archaeological excavation in the Port Jackson area has shown that Aboriginal people were living around the harbour foreshores of Port Jackson gathering shellfish at least 4500 years ago (Attenbrow 2010). The onset of the Holocene brought increasing temperatures and precipitation, changing the coastal landscape of the Sydney region substantially. Campsites in bedrock valleys were abandoned, and plateau tops and ridgelines became the new habitat for many Aboriginal people. Tools associated with Holocene assemblages in the Sydney area are characterised by backed artefacts such as Bondi points, geometric microliths and eloueras. These tools indicate multi-purpose functionality (Attenbrow 2010) and are associated with technological changes referred to as the Australian Small Tool Tradition.

Before the arrival of Europeans, Aboriginal people lived in small family or clan groups that were associated with particular territories or places. The Aboriginal language group spoken across Sydney before European settlement was known as *Darug*. Two dialects of *Darug* are suggested to have been used: the coastal dialect and the hinterland dialect. The coastal dialect of the *Darug* language is thought to have covered the area south from Port Jackson, north from Botany Bay and west from Parramatta (Attenbrow 2010). The hinterland dialect is attributed to the area west of the Cumberland Plain.

Another language, *Gringai*, is thought to have been spoken north of Port Jackson (Australian Museum 2009). The term *Kuring-gai* was originally adopted from a reference to the '*Gringai*' that was claimed to span from the Macleay river to the south of Sydney (Aboriginal Heritage Office 2015).

At the time of British arrival, the North Shore was inhabited by the *Cammeraygal* (also known as *Gamaraigal* and *Kameragal*) people with groups camped at Milsons Point, Manly and Lane Cove (Morris 1986). The first record of contact with Aboriginal people on the north shore of Sydney was on the Lane Cove River in 1788 and later in Middle Harbour. It was recorded that Aboriginal people lived in rock shelters and ate oysters and fish (Morris 1986). The Middle Harbour area was generally not settled by Europeans until the 19th century, as the land was considered of little use for agriculture. During this time, Port Jackson in particular was used as an entry point for convicts and settlers and an export point for resources such as gold, wool, timber and seals. Aboriginal archaeological records associated with the post-contact period are present throughout the Sydney Harbour region. However, the material sources are sparse. A primary example is the La Perouse rock engravings created in 1931 in commemoration of the opening of the Harbour Bridge (refer to site card for Aboriginal Heritage Information Management System (AHIMS) ID: 45-6-0873) (Irish 2011).

4.10 AHIMS sites

4.10.1 AHIMS register search

A search of AHIMS and Commonwealth and State Heritage Registers and relevant local environmental plans was carried out by Andrew Costello (Senior Archaeologist, Jacobs) on 1 May 2017, for a search area extending 300 metres from the project's construction footprint. As project refinements were made during the Stage 3 PACHCI process, this search area was refined to 50 metres. Eleven AHIMS sites were identified from the AHIMS register as being within the study area.

The location and condition of one of the sites (45-6-0662) was unable to be confirmed during field inspection and the Aboriginal Heritage Office has advised that the site was likely covered by gravel/vegetation. As such, a desktop assessment of this site was carried out, basing findings on settlement and vibration modelling. It is recommended, where possible, a further visit of this site should be carried out as part of any further detailed assessment before the start of construction works. The methodology outlined in Section 9 allows for the management of this site.

Three additional sites were initially identified within the study area, 45-5-2222 (Clive Park 4), 45-6-0994 (Chatswood) and 45-6-1587 (Seaforth) but these were later confirmed as being incorrectly mapped and were determined to sit outside the study area. These sites do not form part of the eleven sites identified within the study area and have not been considered further in this assessment.

A further search of AHIMS sites was carried out on 8 April 2020 to determine if any new AHIMS sites were apparent. No new AHIMS sites were determined in addition to those that were already identified in the 2017 search.

4.10.2 Local environmental plans

Relevant local environmental plans (LEP) were searched on 1 May 2017 and updated on 25 May 2018 by Andrew Costello (Senior Archaeologist, Jacobs). The LEP search did not list any Aboriginal sites or Places within the study area.

4.10.3 Additional AHIMS sites identified as a result of this assessment

During the archaeological survey (Stage 2 of the PACHCI), three areas of potential archaeological deposit (PAD) were identified:

- Artarmon Park PAD (45-6-3362)
- Flat Rock Creek PAD (45-6-3361)
- Burnt Bridge Creek PAD (45-6-3363).

During the test excavations, an artefact scatter (Artarmon Park artefact scatter, 45-6-3599), was identified in association with Artarmon Park PAD (45-6-3362).

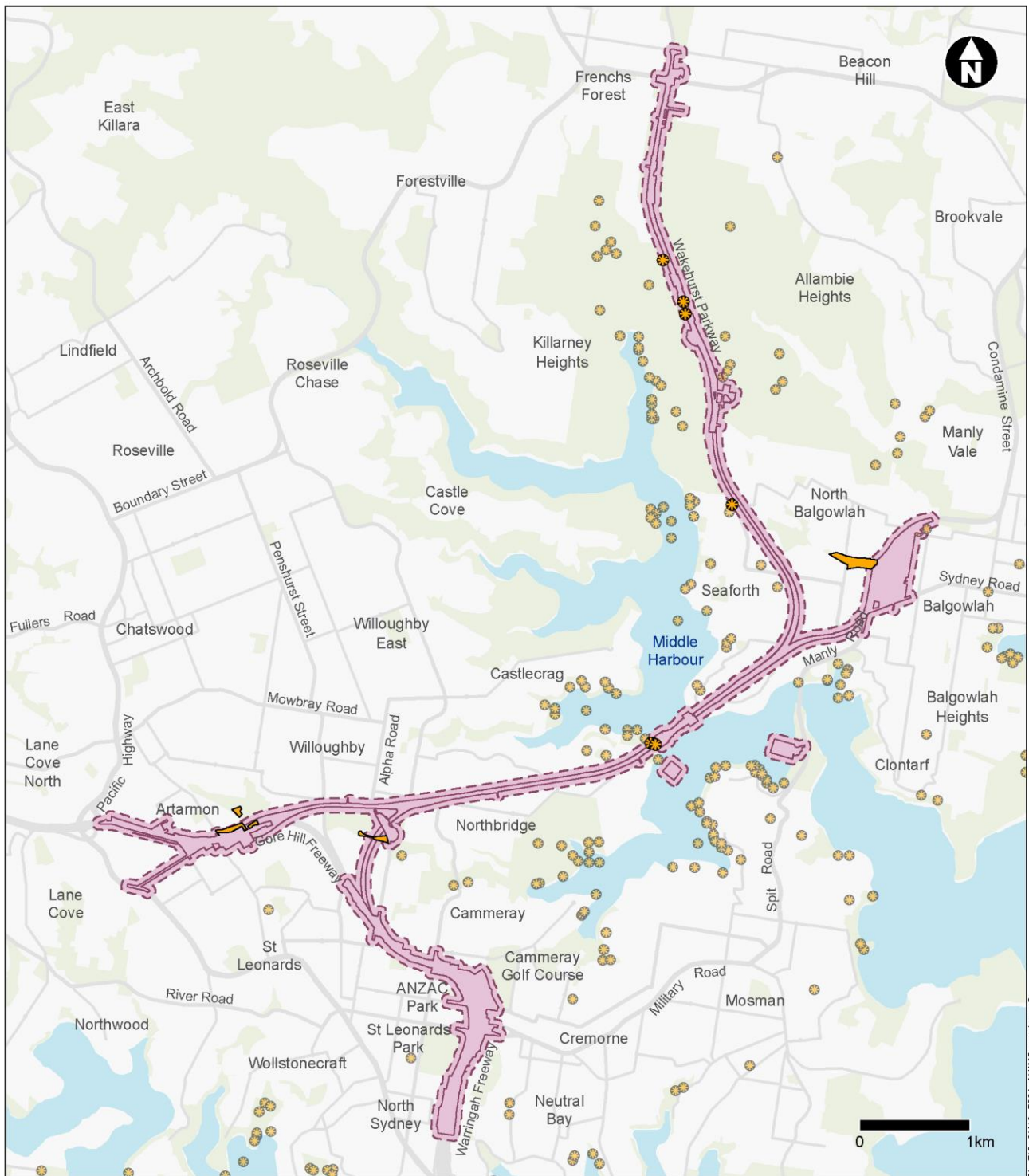
4.10.4 Summary

In summary, 11 AHIMS sites are located within the study area:

- Seven sites determined from AHIMS register search
- One site determined during test excavations undertaken as part of the archaeological survey (Stage 2 of the PACHCI)
- Three PAD sites identified as part of the archaeological survey (Stage 2 of the PACHCI).

The location of the 11 sites were verified through the archaeological survey and are referred to in this ACHAR as part of the impact assessment and management recommendations.

Aboriginal sites within the study area are mapped in Figure 4-2 to Figure 4-6. This mapping details Aboriginal sites using spatial data recorded in corresponding AHIMS site cards, or as per verified location findings. Sites that could not be inspected and verified are shown as per the coordinates provided in the AHIMS site cards.



Legend

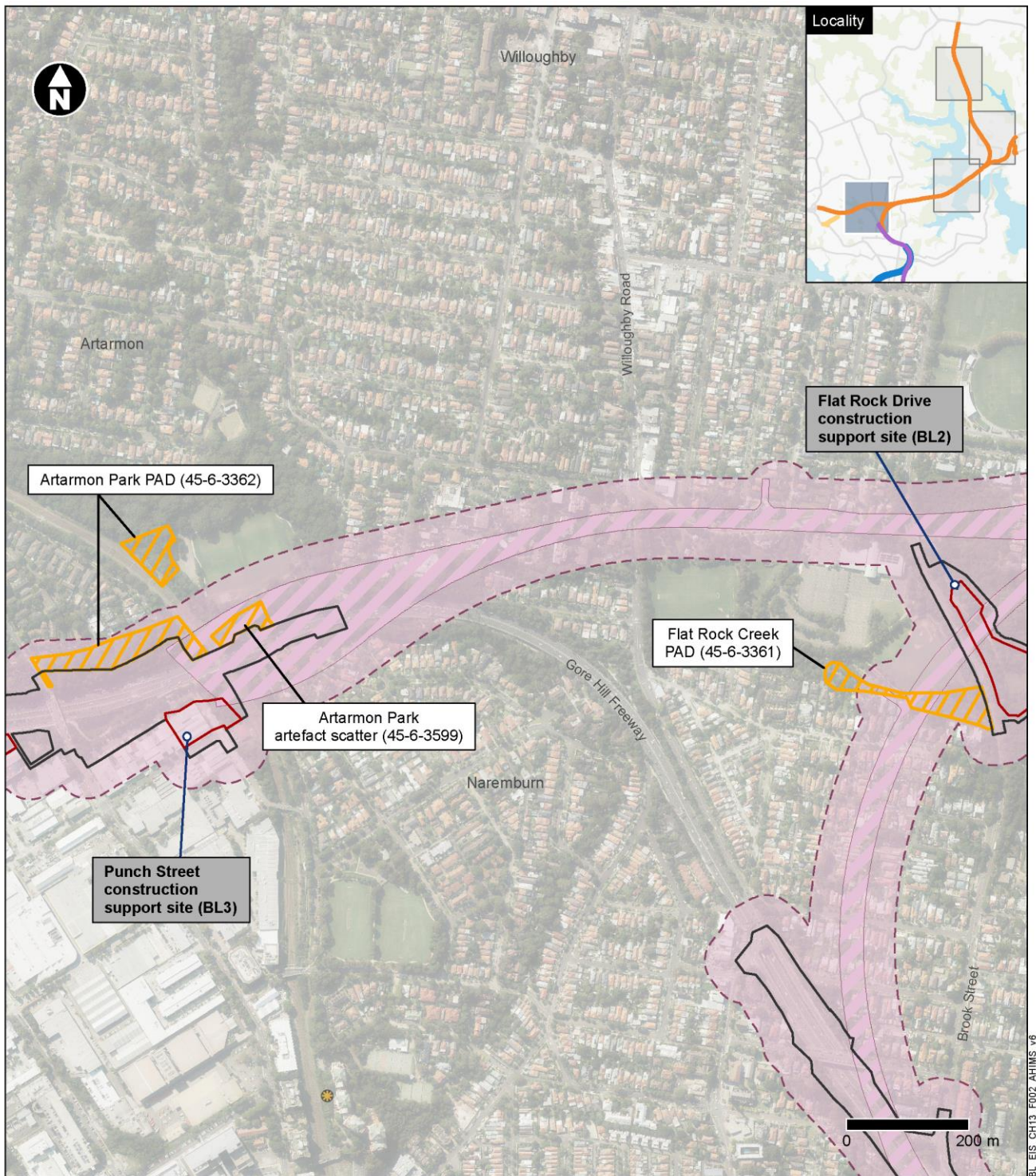
Construction features

- 50 metre area around construction footprint
- Construction footprint
- Tunnel

AHIMS sites

- AHIMS site within 50 metres of the construction footprint
- AHIMS site over 50 metres from the construction footprint
- Potential Archaeological Deposit

Figure 4-2 AHIMS sites in the region around the project



Legend

Construction features

- 50 metre area around construction footprint
- Construction footprint
- Construction support site
- Tunnel

AHIMS sites

- AHIMS site over 50 metres from the construction footprint
- Potential Archaeological Deposit

Figure 4-3 AHIMS sites within 50 metres of the project construction footprint (Gore Hill Freeway and Flat Rock Creek)

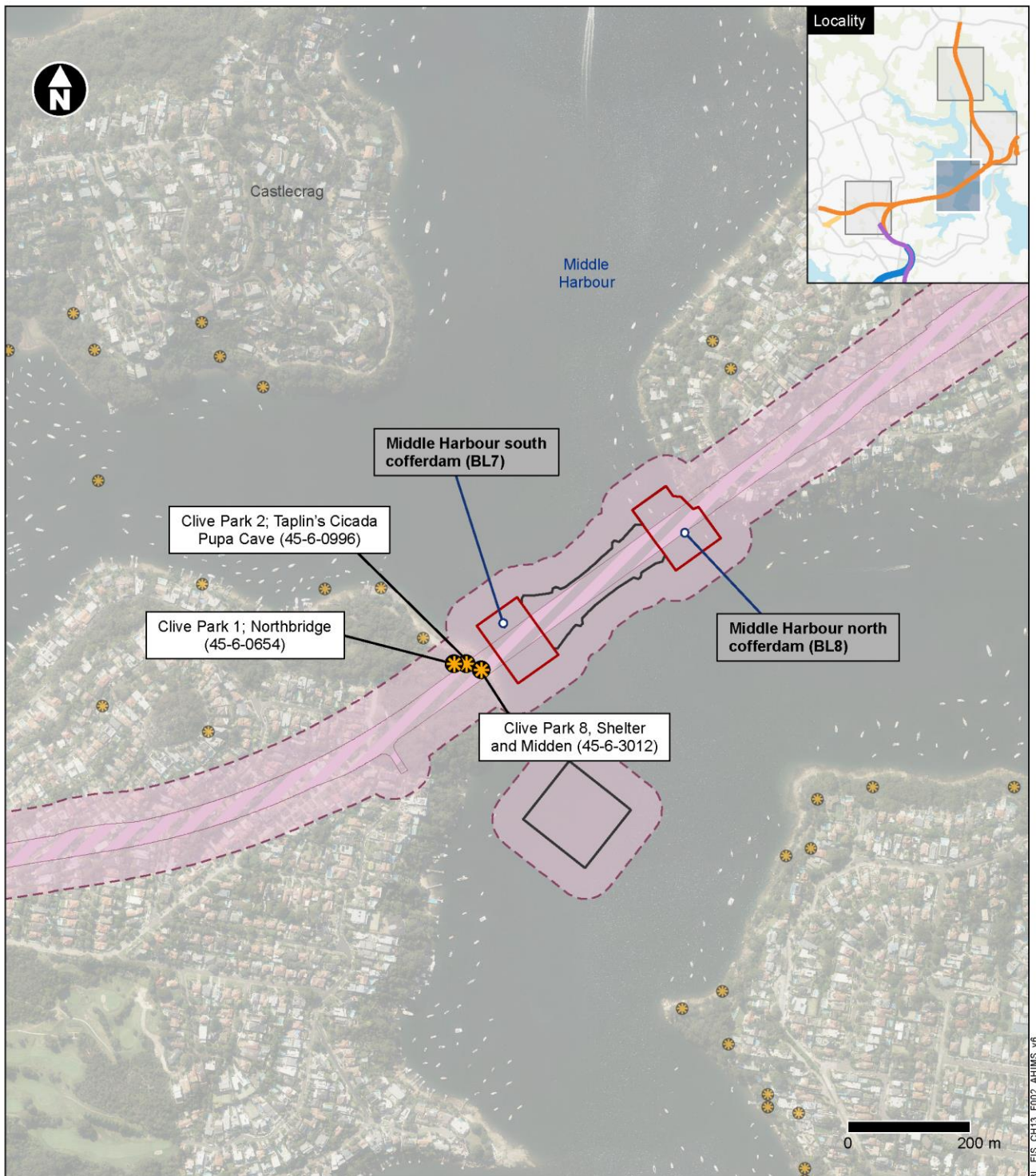
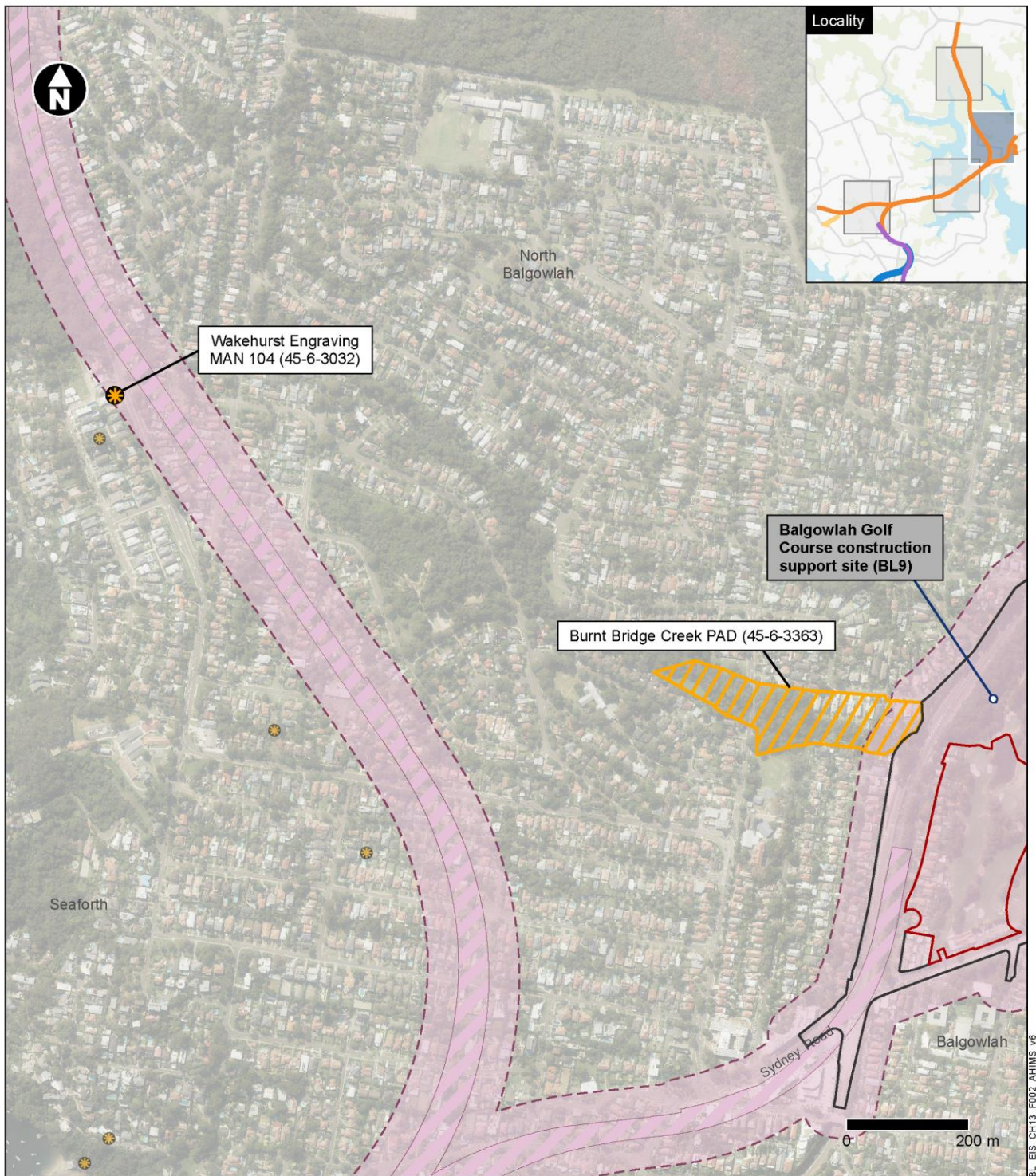


Figure 4-4 AHIMS sites within 50 metres of the project construction footprint (Middle Harbour)



Legend

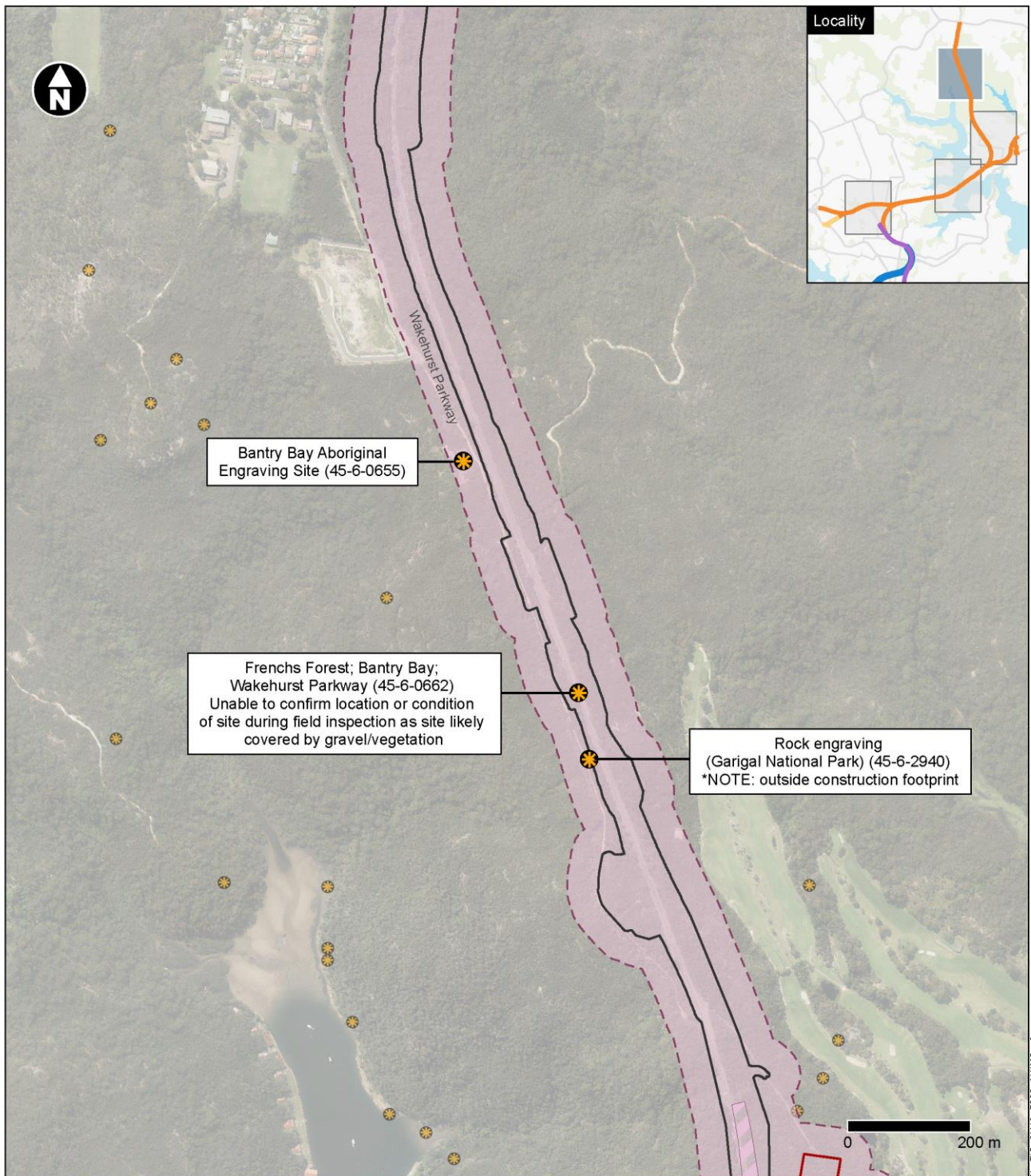
Construction features

- 50 metre area around construction footprint
- Construction footprint
- Construction support site
- Tunnel

AHIMS sites

- AHIMS site within 50 metres of the construction footprint
- AHIMS site over 50 metres from the construction footprint
- Potential Archaeological Deposit

Figure 4-5 AHIMS sites within 50 metres of the project construction footprint (Seaforth to Balgowlah)



Legend

Construction features

- 50 metre area around construction footprint
- Construction footprint
- Construction support site
- Tunnel

AHIMS sites

- AHIMS site within 50 metres of the construction footprint
- AHIMS site over 50 metres from the construction footprint

Figure 4-6 AHIMS sites within 50 metres of the project construction footprint (Wakehurst Parkway)

5. Aboriginal cultural value assessment

5.1 Introduction

The cultural values assessment in this report includes cultural information collected during consultation, field survey and the test excavation program. The Aboriginal cultural values assessment was carried out by Andrew Costello and Andy Roberts (Senior Archaeologists, Jacobs).

5.2 Methodology

The assessment involved consultation through several methods with knowledge holders as identified by the registered Aboriginal parties for the project (refer to Section 3 for further details of consultation). The cultural assessment was based on:

- Reviewing the Western Harbour Tunnel and Beaches Link program of works archaeological survey report (Costello et al. 2017) completed for the project
- Reviewing literature relevant to the study area and the surrounding landscape
- Consultation with knowledge holders for the region during AFG meetings
- Consultation with knowledge holders at arranged meetings (eg oral history recording, site visits and fieldwork with knowledge holders)
- Consulting with Aboriginal site officers during fieldwork regarding Aboriginal objects and cultural values.

The information provided has contributed to an understanding of the cultural value of the broader landscape within which the project would be located. Knowledge holders have provided information about the traditional presence of Aboriginal people in the landscape, ceremonial sites and the impact of European land management practices on their traditional land, and subsequently their culture. The cultural assessment identified locations of Aboriginal cultural value within the study area.

5.3 Cultural significance

Cultural significance can be associated with or attached to any place, places and objects by any individual, group or groups of people. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, connected places and objects. Place is a geographically defined area, and may include tangible features that embody the physically identifiable landscape; as well as intangible features such as conceptual ideas or spiritual beliefs held over places or landscapes irrespective of observable physical evidence (*The Burra Charter*, Australia ICOMOS 2013).

The Burra Charter defines cultural significance as:

- Aesthetic, historic, scientific, social or spiritual value for past, present or future generations
- Cultural significance is embodied in the *place* itself, its *fabric*, *setting*, *use*, *associations*, *meanings*, records, *related places* and *related objects*.

5.4 Identified Aboriginal cultural heritage values

The consultation process with stakeholders and on-site discussions with site officers have identified a variety of cultural heritage values within the regional landscape (refer to Table 5-1). It should be noted, however, that not all of these cultural values have been identified within the study area during the archaeological assessment.

Table 5-1 Cultural heritage values identified by registered Aboriginal parties

Cultural heritage value	Description
Resource gathering locations and techniques	The RAPs noted that fish, plants and other foods are still available throughout the region. The main resource gathering locations, and the techniques used, are vaguely known and passed down through the generations. An example of a resource gathering location would be sites associated with Clive Park.
Rock shelters	The RAPs identified rock shelters as culturally significant as they provide a link between occupation of the region, the gathering of resources, land care rejuvenation and communication between other groups. In the course of the fieldwork, the identified rock shelter site locations containing stone artefact scatters or middens were noted as having these types of cultural significance.
Middens	The RAPs identified middens as culturally significant as they provide a link between occupation of the region, the gathering of resources and land care rejuvenation and were important terrestrial, territorial markers on the landscape, facilitating communication between other groups. In the course of the fieldwork, the identified midden site locations were noted as having these types of cultural significance.
Scarred trees	Scarred trees are of great importance to the RAPs as they can be of sacred and ceremonial importance. Due to European land use and agricultural practices, scarred trees can often be the only remaining markers for ceremonial sites and burials in the landscape. None were noted during the field inspection or cultural values assessment.
Watercourses, bays, water holes or springs	Permanent water bodies are culturally significant as a central location for gathering of people, resource collection and camping. During field inspection, the RAPs indicated certain watercourses and bays within the harbour as important sources of food as well as significant for ceremonial practices. Watercourses, tides, islands and bays are often associated with spiritual beings.
Native plants and animals	<p>Native plants and animals are significant to the RAPs. During field inspection, the fauna and flora were occasionally mentioned in context with spiritual importance, particularly eels, fish, bivalves and snakes.</p> <p>During the consultation process, native plants and animals were often mentioned in discussion with resource collection. Certain names of streets and places within the study area were considered to reflect the availability or abundance of certain resources, such as the street named Burra, which translates to 'eel' in <i>Darug</i> language.</p>
Burial sites	Burial sites are of great importance and are generally of high concern to Aboriginal people as the locations of burials are rarely documented. The RAPs identified the landscape features chosen for burial sites as being areas near campsites near the shoreline of the harbour.
Engraving sites and areas of spiritual significance	<p>The RAPs referred to rock engravings as highly important areas. These sites were often connected to pathways which link spiritual and ceremonial sites, as well as travel corridors throughout the landscape between the coast and higher ground.</p> <p>Engravings of whales, fish, eels, boomerangs, and anthropomorphic figures at Wakehurst Parkway are evidence that areas of spiritual significance continue to exist within the study area.</p> <p>During the recording of the engravings, the RAPs expressed a profound sense of wonder and feeling of belonging and continuation of cultural practice. Several cultural protocols were observed while recording the rock engravings: no whistling or singing at night, observance of men's and women's sites and acknowledgment of elders and country at each site to ensure safe passage.</p>

Cultural heritage value	Description
Post-contact sites	Post-contact sites are those that have gained significance to Aboriginal people since the arrival of European settlers. No post-contact sites were identified during the archaeological assessment of the study area.
Massacre sites	These sites are of significant importance to Aboriginal people and are often difficult to discuss. No massacre sites were identified during the archaeological assessment of the study area.
Cultural knowledge	<p>The RAPs expressed concern for the loss of cultural knowledge and the meanings embedded in the landscape of the region. There are no identified knowledge holders that could be identified for the project who may possess more detailed cultural knowledge of the landscape and its spiritual meaning.</p> <p>The RAPs felt that the loss that began with early colonisation has been exacerbated by significant development in the region. The sense of loss and belonging instils a feeling of guilt that the country is not being protected for the future generations and that there is poor cultural heritage management.</p>

5.4.1 Oral testimonies and statements of cultural significance

As no knowledge holders for the project were disclosed by the site officers or registered Aboriginal parties, no direct interviews were held. The following testimonies from site officers for the project were recorded during the test excavation and survey program in January 2018.

5.4.1.1 Mr. James (Jamie) Eastwood

Mr. James (Jamie) Eastwood was interviewed after completion of the survey for the cultural values assessment on 24 January 2018. Jamie has lived and worked in Sydney for almost 20 years, mostly on cultural heritage projects. Most of his knowledge is from his family and his work. Most of the project area has been extensively disturbed by roads, rail, bridges, industrial areas and settlement to the point that there is little undisturbed land left. That which is left is therefore much more notable.

5.5 Aboriginal cultural values within the study area

As summarised in Table 5-2 this cultural assessment has identified 11 Aboriginal cultural values within the study area. These Aboriginal cultural values are associated with existing Aboriginal sites.

Table 5-2 Aboriginal cultural values within the study area

Cultural value name (AHIMS ID)	Description
Sites verified during field surveys	
Bantry Bay Aboriginal Engraving Site (45-6-0655)	Large rock engraving site with multiple engravings
Rock engraving (Garigal National Park) (45-6-2940)	Rock engraving
Clive Park 8; Shelter and Midden (45-6-3012)	Shelter and midden
Clive Park 1; Northbridge (45-6-0654)	Burial/s; shelter with art, shelter with midden, artefact scatter

Cultural value name (AHIMS ID)	Description
Clive Park 2; Taplin's Cicada Pupa Cave (45-6-0996)	Shelter with art, shelter with midden
Artarmon Park artefact scatter (45-6-3599)	Artefact scatter
Artarmon Park PAD (45-6-3362)	Potential archaeological deposit
Flat Rock Creek PAD (45-6-3361)	Potential archaeological deposit
Burnt Bridge Creek PAD (45-6-3363)	Potential archaeological deposit
Wakehurst Engraving MAN 104 (45-6-3032)	Rock engraving on outcrop
Unable to confirm location and condition during field inspection as site likely covered by gravel/vegetation	
Frenchs Forest; Bantry Bay; Wakehurst Parkway (45-6-0662)	Rock engraving

6. Summary of archaeological assessment

This section summarises the archaeological assessment carried out to inform the cultural heritage assessment. Full details of the archaeological assessment for the project can be found in the Archaeological Assessment Report which accompanies this report (refer to Annexure D - Archaeological assessment report).

6.1 Assessment methodology

The archaeological assessment was conducted in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b) and the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (DECCW 2011). The assessment broadly consisted of the following stages:

- Stage 1: Desktop assessment to develop a predictive model
- Stage 2: Archaeological survey
- Stage 3: Test excavation program.

Stage 2 and Stage 3 of the archaeological assessment included extensive consultation with and involvement by the registered Aboriginal parties (refer to Section 3).

6.1.1 Desktop assessment

Existing data was reviewed (including previous archaeological investigations specific to the study area and AHIMS searches) to identify any gaps in the assessments and to develop a predictive model to aid in identifying areas within the study area more likely to contain archaeological sites (refer to Section 2, Annexure C - Archaeological methodology).

6.1.2 Archaeological survey

During archaeological surveys, all previously recorded AHIMS sites within the study area were targeted for inspection. As outlined in Section 4.10, three AHIMS sites were not able to be located due to incorrect spatial data and were determined to sit outside the study area. Despite multiple attempts, the location and condition of one of the sites (45-6-0662) could not be confirmed during field inspection and the Aboriginal Heritage Office has advised that the site was likely covered by gravel and vegetation (refer to Table 5-2).

Survey of the study area was carried out on foot and by vehicle, during which notes regarding the ground surface visibility, integrity (land condition) and archaeological sensitivity were taken. All data were recorded on a handheld global positioning system unit and photographs were taken. All Aboriginal archaeological sites/objects identified during the survey were recorded in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b). The results of the archaeological survey are detailed in Annexure D - Archaeological assessment report.

In accordance with 'requirement 5' of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b), the archaeological survey adopted a sampling strategy which targeted each distinct landform within a given soil landscape. Where the predictive model determined landforms of high potential archaeological sensitivity, these landforms were targeted for full survey coverage with an awareness of the likelihood of certain site types potentially occurring within particular landforms. Full coverage of the study area associated with sensitive landforms was carried out with the nominated site officer from the Metro LALC where practical. The sampling strategy had the following objectives:

- Areas of higher visibility and exposures of the ground surface were targeted for particular scrutiny for the presence of midden material or stone artefacts
- All mature trees in the study area were inspected for cultural modification and scarring

- Any areas with potential rocky outcrops close to waterways were inspected for grinding grooves, waterholes and wells
- Exposed sandstone platforms with potential for engravings were targeted
- The following details were recorded for each surveyed area:
 - Landform
 - Ground surface exposure and nature of exposure
 - Visibility as a result of vegetation
 - Degree of disturbance
 - Nature of current and historical land use.

In conjunction with the PACHCI process, an assessment of potential submerged Aboriginal sites was carried out within the marine environment of the project area. A field survey, in the form of a diving investigation, took place over five days between 13 and 19 December 2017. The dive investigation focused on identifying the nature of anomalies for the maritime heritage component of the project as well as natural features which could be associated with the surviving of submerged Aboriginal archaeological sites. As such, diving took place along two locations where rock outcrops were visible on the side scan sonar and indicated the potential for the presence of rock overhangs which could have associations with past Aboriginal occupation.

6.1.3 Archaeological methodology

An archaeological methodology (Carr and Costello, 2017) was developed for the project based on the results of the archaeological survey. The methodology was designed to be generally in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b), the requirements of Stage 2 of the PACHCI and the Secretary's environmental assessment requirements for the project. The archaeological methodology can be found in Annexure C - Archaeological methodology.

6.1.4 Test excavation

The test excavation was guided by the results of the archaeological survey (Costello *et al.* 2017) and developed to be in accordance with the approved archaeological methodology for the project (Carr and Costello 2017).

During PACHCI Stage 2 fieldwork, a larger search area with a 300-metre search area around the study area was assessed. This larger study area was assessed to gain a stronger understanding of the AHIMS sites within the broader region and to inform the background information and associated key observations (Section 4.8). During PACHCI Stage 3, the study area was refined to 50 metres extending from the project footprint. This was done to more accurately assess AHIMS sites based on the known extent of potential project impacts.

During PACHCI Stage 2 fieldwork, three areas of potential archaeological deposits were identified. Refinements to the project footprint, such as relocating construction support sites resulted in the avoidance of two areas of potential archaeological deposits. Test excavation therefore only occurred at the potential archaeological deposit at Artarmon Park which would be partially impacted during construction. Testing at this location was conducted as per the archaeological methodology on 8 – 10 January 2018 (Annexure C - Archaeological methodology). Sub-surface cultural deposits were identified at Artarmon Park PAD A and a new site was registered as Artarmon Park artefact scatter (45-6-3599). In total, test excavation consisted of:

- 17 shovel test pits (500 millimetres x 500 millimetres)
- One test pit (1000 millimetres x 1000 millimetres).

Detailed results and analysis of identified Aboriginal cultural material is included in Annexure D - Archaeological assessment report.

6.2 Results

Archaeological assessment of the study area, including desktop assessment, archaeological survey, and test excavation, identified a total of 11 archaeological sites, many of which contain multiple site components (Table 6-1). The location and extent of the below sites/PADs is shown in Annexure D - Archaeological assessment report.

Table 6-1 Archaeological sites or PADs identified within the study area

Site/PAD name (AHIMS ID)	Description
Artarmon Park artefact scatter (45-6-3599)	Artefact scatter
Artarmon Park PAD (45-6-3362)	Potential archaeological deposit
Flat Rock Creek PAD (45-6-3361)	Potential archaeological deposit
Clive Park 8; Shelter and Midden (45-6-3012)	Shelter and midden
Clive Park 1; Northbridge (45-6-0654)	Burial/s; shelter with art, shelter with midden, artefact scatter
Clive Park 2; Taplin's Cicada Pupa Cave (45-6-0996)	Shelter with art, shelter with midden
Burnt Bridge Creek PAD (45-6-3363)	Potential archaeological deposit
Bantry Bay Aboriginal Engraving Site (45-6-0655)	Large rock engraving site with multiple engravings
Rock engraving (Garigal National Park) (45-6-2940)	Rock engraving
Wakehurst Engraving MAN 104 (45-6-3032)	Rock engraving on outcrop
Frenchs Forest; Bantry Bay; Wakehurst Parkway (45-6-0662)	Rock engraving

Three areas of potential archaeological deposits were identified during the archaeological survey (Artarmon Park PAD (45-6-3362), Flat Rock Creek PAD (45-6-3361), Burnt Bridge Creek PAD (45-6-3363). Several previously registered sites located within the study area were re-inspected, where access was possible. Details of all the sites re-inspected can be found in Annexure D - Archaeological assessment report.

6.2.1 Potential submerged sites assessment

Potential submerged Aboriginal sites refer to archaeological sites inundated since the rise in sea levels that occurred in Sydney Harbour during the most recent post-glacial marine transgression around 12,000 to 7000 years ago. Aboriginal sites that could occur in inundated areas of the study area include:

- Rock shelters with occupation evidence and deposit
- Art and grinding groves on sandstone ledges and faces
- Middens and/or stone artefact scatters on sandstone platforms and elevated areas
- Fish traps on shallow, wide and gently sloping sandstone platforms.

The probability of these surviving intact, or at all, depends on how the sea rose – gradually or as an encroaching active shoreline with wave and tidal action, and the subsequent pattern of tidal flow. The pronounced rock outcrops at about 20 metres depth close to Seaforth Bluff are considered to have moderate to high potential for the presence and survival of inundated rock shelters, more so than smaller rock overhangs closer to Clive Park which have been assessed as having low potential. At 30 metres below the current bed of the harbour, peat deposits present along the ancient watercourse that formed Middle Harbour are those most likely to contain well preserved Aboriginal objects. Further discussion of the potential for Aboriginal archaeological sites to survive as submerged sites is provided in Annexure E - Potential submerged sites assessment.

Table 6-2 summarises areas of submerged Aboriginal archaeological potential relevant to the project.

Table 6-2 Summary of areas of submerged Aboriginal archaeological potential

Location	Potential Aboriginal site type	Archaeological potential	Predicted potential location within study area
Between Northbridge and Seaforth	Stone artefacts, midden deposits and fish traps	Moderate to high	Formed along the ancient watercourse.
	Rock shelters	Moderate to high	Along the sloping bed of the harbour on the Seaforth side of Middle Harbour.
	Rock shelters	Low	Along the sloping bed of the harbour on the Clive Park side of Middle Harbour
	Rock shelters, art, grinding grooves, middens, stone artefact scatters, quarry sites and fish traps	Very low	Across the remainder of the study area.
Pearl Bay (west of Spit Reserve)	Rock shelters, grinding grooves, middens and/or stone artefact scatters, stone quarry sites, fish traps.	Moderate to high	In potential residual soils and/or sandstone overhangs/ledges, creek lines that may occur buried beneath Holocene marine sediments, up to 30 metres thick below the current bed of the harbour.
Pearl Bay (east of Clive Park)	Rock shelters, grinding grooves, middens and/or stone artefact scatters, stone quarry sites, fish traps.	Moderate to high	In potential residual soils and/or sandstone overhangs/ledges, creek lines that may occur buried beneath Holocene marine sediments which are assumed to comprise at least the first few metres of the current bed of the harbour.

7. Significance assessment

7.1 Methodology

7.1.1 Basis for assessment

A significance assessment is made up of several significance criteria that attempt to define why a site is important. Such assessment recognises that sites may be important for different reasons to different people, and even at different times. The assessment of Aboriginal cultural heritage in this assessment is based upon the four values of the Australia ICOMOS Burra Charter (Australia ICOMOS 2013):

- Social values
- Historical values
- Scientific values
- Aesthetic values.

Each of these values is assessed below for Aboriginal sites in the study area, and an overall significance is assigned based on an average across the values. This is inherently a reductive process and oversimplifies what is important for different reasons to a range of different stakeholders but is a necessary process in being able to create comparative values between sites. The significance of each site ultimately informs the management of sites and places.

It should be noted that only existing Aboriginal sites within the study area have been assessed for significance.

7.1.2 Social significance

The significance of a heritage item does not relate only to its scientific or research value. Aboriginal people's views on the significance of archaeological sites are usually related to traditional, cultural and educational values, although some Aboriginal people also value any scientific information a site may be able to provide.

Aboriginal cultural significance was assessed from consultation with the nominated site officers for the relevant RAPs during and following field assessments. It should be noted that Aboriginal significance assessed in this manner may not reflect the views of all members of the community.

7.1.3 Historic significance

The historic value of a site is determined through its association with historically important people, events or activities.

7.1.4 Scientific significance

Research potential or scientific significance of an Aboriginal archaeological site can be assessed by using the criteria set out below. Each criterion is rated as low, moderate or high.

- **Site integrity** – The integrity of a site refers to its state of preservation, or condition. A site can be disturbed through several factors including natural erosion processes, destructive land use practices or repeated use of a site in the past by both humans and animals
- **Site structure** – Structure refers to a site's physical dimensions, that is, size and stratigraphy. A large site or a site with stratified deposits has more research potential than small sites and/or surface scatters. Sometimes, however, specific research questions may be aimed at smaller sites, in which case they would be rated at a higher significance than normal. Site structure cannot be assessed for scarred trees or isolated artefacts
- **Site contents** – This category refers to the range and type of occupation debris found in a site. Generally, complex art sites, extensive quarries with associated debris and surface sites that contain a large and varied

amount of organic and non-organic materials are considered to have greater research potential than those sites with small, uniform artefacts, single motif art sites and small quarries with little or no debris. For scarred trees, contents may refer to the size and type of scar and/or how many scars there are on the one tree

- Representativeness and rarity** – Representativeness refers to how much variability exists between the subject site and others inside or outside the subject area. It also considers the types of sites already conserved in the area and how much connectivity between sites exists. Rarity considers how often a particular site type occurs in an area. Assessment of representativeness and rarity requires some knowledge of the background archaeology of the area or region in which a study is being carried out. Rarity also relates to whether the subject site or area is important in demonstrating a distinctive way of life, custom, process, land use, function or design which is no longer practiced (OEH 2011).

7.1.5 Aesthetic significance

This refers to the sensory value of a place, and can include aspects such as form, texture and colour, and can also include the smell and sound elements associated with use or experience of a site (Australia ICOMOS 2013). Additionally, in the context of the current investigation the aesthetic significance may also relate to a setting that allows its place in a larger and more complex landscape to be better understood and appreciated. Aesthetic significance can be closely linked to the social value of a site.

7.1.6 Scale of significance

Significance of sites and places is assigned to different geographic scales, such as local, regional, state and national, appropriate to the scale of importance. For example, K'Garri (Fraser Island) is significant at a national (and world) scale, whereas a local historic building may only be significant on a local scale. This is reflected in the variety of heritage lists held by local councils, up to State and Federal government. In scale of significance, the criteria presented above as well as educational or research potential, representativeness and rarity (Australia ICOMOS 2013) have been considered in determinations of significance.

Each site has been assessed and its scale of significance has been identified as being of importance at the State, regional or local level. Each site has also been given a grading of its significance overall based on the grading of each of the individual values. The grading of low, moderate and high has been assigned comparatively across the sites investigated in the region.

7.2 Statements of significance

Significance assessments for seven of the Aboriginal sites identified during the cultural heritage assessment of the study area are presented below. PADs do not have a statement of significance below as they have not been excavated and as such their significance is not currently known project refinements allowed PAD locations to be avoided, and hence they were not excavated. However, Artarmon Park PAD (45-6-3362) was partially excavated at two areas of potential impact and Artarmon Park artefact scatter (45-6-3599) was located at the potential archaeological deposit location. Artarmon Park artefact scatter (45-6-3599) has a statement of significance provided below. A significance assessment for the site Frenchs Forest; Bantry Bay; Wakehurst Parkway (45-6-0662) has not been provided as the location was unable to be confirmed during field inspection as the site was likely covered by gravel/vegetation.

7.2.1 Bantry Bay Aboriginal Engraving site (45-6-0655)

Table 7-1 Statement of significance – Bantry Bay Aboriginal Engraving Site (45-6-0655)

Criterion	Assessment
Social significance	Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in Sections 3 and 5). This is particularly the case for Bantry Bay Aboriginal

Criterion	Assessment
	Engraving Site (45-6-0655), which is a large site containing multiple rock engravings. It has been suggested by RAPs that the site has ceremonial significance. The site has high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The site is a widely known Aboriginal rock engraving location within Sydney. There are multiple historical accounts relating to the site and the rock engravings have been recorded on numerous occasions and referred to widely in the written archaeological record. There are also accounts of the site being visited by early European settlers and the location was one of the first major rock art sites visited by Captain Phillip after the First Fleet arrival (McDonald 2007). As such, the site has high historical significance.
Scientific significance	The site has high scientific significance at the local level as it is ranked as having high integrity, high structure and high representativeness/rarity. The integrity and structure of the site is high as the rock engravings are very well preserved and have been protected from development. The site is made up of multiple rock engravings and hence has increased scientific significance. The site has high representativeness/rarity as it is an example of a large engraving location made up of multiple engravings.
Aesthetic significance	The site has high aesthetic significance at the local level as it contains multiple rock engravings in an aesthetically pleasing bushland location. The site is also publicly accessible and a well-known rock engraving location within Sydney. It therefore helps to define what Sydney rock art looks like for the general public and encourages connection to the region's Aboriginal past.
Summary statement of significance	Overall, the Bantry Bay Aboriginal Engraving Site (45-6-0655) is of high significance at the local level. It is of high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people. It has high historical significance. It has high scientific significance due to its integrity and structure, high representativeness and rarity. The site has high research and educational potential about the way local Aboriginal populations lived in the area. Additionally, the site is of particular importance as it is a strong example of how Aboriginal people expressed artistic and creative endeavour before European arrival.

7.2.2 Rock engraving (Garigal National Park) (45-6-2940)

Table 7-2 Statement of significance – Rock engraving (Garigal National Park) (45-6-2940)

Criterion	Assessment
Social significance	Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in sections 3 and 5). This is the case for the Rock engraving (Garigal National Park) (45-6-2940), which contains an engraving of a figure of a man holding two canoes. It has been suggested by RAPs that the site has ceremonial significance. The site has high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The site is a widely known Aboriginal rock engraving location within Sydney. There are multiple historical accounts relating to the site and the rock engravings have been recorded on numerous occasions (first recorded in 1789 by Governor Phillip) (Popp <i>et al.</i> 1997). The site and nearby associated rock engravings are referred to widely in the written archaeological record. As such, the site has high historical significance.
Scientific significance	The site has moderate-high scientific significance at the local level as it is ranked as having moderate integrity, high structure, and high representativeness/rarity. The

Criterion	Assessment
	integrity of the site is moderate as the engravings, while visible, are now faint. The structure of the site is high as the rock engraving depiction and potential ceremonial meaning and interconnectedness with nearby engravings has research potential. The site has high representativeness/rarity due to the unique nature of the engraving depiction (man holding two canoes).
Aesthetic significance	The site has high aesthetic significance at the local level as it contains a rock engraving in an aesthetically pleasing bushland location.
Summary statement of significance	Overall, Rock engraving (Garigal National Park) (45-6-2940) is of high significance at the local level. It is of high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people. It has high historical significance. It has moderate-high scientific significance due to its integrity and structure, high representativeness and rarity. The site has high research and educational potential about the way local Aboriginal populations lived in the area.

7.2.3 Wakehurst Engraving MAN 104; (45-6-3032)

Table 7-3 Statement of significance –Wakehurst Engraving MAN 104; (45-6-3032)

Criterion	Assessment
Social significance	<p>Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in Sections 3 and 5). Wakehurst Engraving MAN 104; (45-6-3032) comprises an engraved sandstone outcrop. The site was last recorded in 2011 and comprised a moderate sized sandstone rock engraving which once showed a man and percussive features.</p> <p>Significant damage to the site was noted in the site inspection on 15 September 2020 as the previous site recording in 2011 showed the exposed rock to be much more extensive than was seen on site. An extensive area of bedrock appeared to have been cut back, with a significant portion missing, exceeding one square metre in extent. Discovery of significant damage to the site resulted in notification to Heritage NSW on 28 September 2020 with Transport for NSW recommending an investigation as to the cause of damage.</p> <p>Following reinspection in September 2020 it is considered that the site retains high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people. A section of the rock remains at the site with visible peck marks, as observed during the 15 September 2020 inspection.</p>
Historical significance	This site does not meet this criterion. There are no known written or oral historical references to the site.
Scientific significance	Prior to site inspection in September 2020, the site was considered to have low scientific significance at the local level as it was ranked as having low-moderate integrity, low structure and high representativeness/rarity as it is a rock engraving within the urbanised Sydney environment. Following reinspection in September 2020, the integrity and structure of the site is now low as the site has been subject to major irreversible disturbance. The representative/rarity of the site remains high. Overall, the Wakehurst Engraving MAN 104; (45-6-3032) retains a low scientific significance.
Aesthetic significance	Prior to site inspection in September 2020, the site was considered to have low aesthetic significance as it is located in an urbanised setting with all aspects obscured by residential developments. The damage to the main stone panel has removed much

Criterion	Assessment
	of the art and severely damaged its aesthetic qualities. Overall, the Wakehurst Engraving MAN 104; (45-6-3032) retains a low aesthetic significance.
Summary statement of significance	Overall, Wakehurst Engraving MAN 104; (45-6-3032) is of low significance at the local level. It is of high social significance as it provides tangible evidence of the use of the area by Aboriginal people. It has low historical significance. It has low scientific significance due to its state of preservation and recent disturbance/damage, high representativeness and rarity and existence in the urbanised Sydney environment. The site has low research and educational potential about the way local Aboriginal populations lived in the area.

7.2.4 Clive Park 8; Shelter and Midden (45-6-3012)

Table 7-4 Statement of significance – Clive Park 8; Shelter and Midden (45-6-3012)

Criterion	Assessment
Social significance	Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in sections 3 and 5). Clive Park 8; Shelter and Midden (45-6-3012) comprises a shell midden and rock shelter. The site has high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The site does not meet this criterion. There are no known written or oral historical references to the site.
Scientific significance	The site has high scientific significance at the local level as it is ranked as having moderate integrity, moderate structure, and high representativeness/rarity. The midden material is up to 200 millimetres in depth and predominantly rock oyster and cockle. The shelter has a soot blackened ceiling and is heavily eroded. No deposit with potential for archaeological material is present. The integrity and structure of the site is low-moderate as the site has been subject to disturbance. The rock shelter does not have a potential archaeological deposit or engraving/pigment art associated with it. Clive Park 8; Shelter and Midden (45-6-3012) is therefore ranked as having high scientific significance.
Aesthetic significance	The site has high aesthetic significance as it is located in a bushland setting with a pleasing easterly aspect towards Middle Harbour.
Summary statement of significance	Overall, Clive Park 8; Shelter and Midden (45-6-3012) is of high significance at the local level. It is of high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people. It has high scientific significance due to its high representativeness and rarity although it is likely the site is disturbed. The site has moderate-high research and educational potential about the way local Aboriginal populations lived in the area.

7.2.5 Clive Park 1; Northbridge (45-6-0654)

Table 7-5 Statement of significance – Clive Park 1; Northbridge (45-6-0654)

Criterion	Assessment
Social significance	Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in Sections 3 and 5). Clive Park 1; Northbridge (45-6-0654) comprises a shell midden, rock shelter, art site (engraving and pigment), artefact scatter and burial. The site is a very large rock shelter with a very deep rich shell midden. Rock

Criterion	Assessment
	engravings and pigment art have previously been recorded in the shelter. A large fish engraving is also located at this site. Previous excavations at Clive Park 1; Northbridge (45-6-0654) located flakes from axes, a bi-polar blade and fragments of a human skeleton. The site has high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	This site does not meet this criterion. There are no known written or oral historical references to the site.
Scientific significance	The site has moderate-high scientific significance at the local level as it is ranked as having moderate integrity, high structure and high representativeness/rarity. The integrity and structure of the site is moderate-high as the site has been subject to disturbance. However, the site has high representativeness/rarity as it is a multi-component site displaying a rich archaeological history within the urbanised Sydney environment. Clive Park 1; Northbridge (45-6-0654) is therefore ranked as having high scientific significance.
Aesthetic significance	The site has high aesthetic significance as it is located in a bushland setting with a pleasing easterly aspect towards Middle Harbour.
Summary statement of significance	Overall, Clive Park 1; Northbridge (45-6-0654) is of high significance at the local level. It is of high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people. It has high historical significance. It has high scientific significance due to its high representativeness and rarity and existence as a multi-component site in the urbanised Sydney environment. The site has high research and educational potential about the way local Aboriginal populations lived in the area.

7.2.6 Clive Park 2; Taplin’s Cicada Pupa Cave (45-6-0996)

Table 7-6 Statement of significance – Clive Park 2, Taplin’s Cicada Pupa Cave (45-6-0996)

Criterion	Assessment
Social significance	Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in sections 3 and 5). Clive Park 2 is a rock shelter and shell midden. The rock shelter also contains a hand stencil. The site has high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	This site does not meet this criterion. There are no known written or oral historical references to the site.
Scientific significance	The site has moderate-high scientific significance at a local level as it is ranked as having low-moderate integrity, moderate structure, and potential sub-surface deposit. The integrity and structure of the site is low-moderate as the site may have been subject to disturbance as a result of being located within an urban environment. The rock art recorded originally is no longer visible as a result of the combined effect of weathering and graffiti disturbance. The site is highly disturbed as evidenced by the concrete path built to access the beach which also leads to a small memorial bench located under the rock shelter. The site is made up of more than one component (midden and rock shelter and potentially also burial and art) and hence increases the scientific significance to moderate-high.
Aesthetic significance	The site has moderate aesthetic significance at the local level as it is a rock shelter with a pleasant east-facing perspective towards Middle Harbour.

Criterion	Assessment
Summary statement of significance	Overall, Clive Park 2 is of moderate-high significance at a local level as it provides tangible evidence of the use of the area by Aboriginal people. It has moderate-high scientific significance due to its moderate representativeness and rarity but also low-moderate integrity owing to pathway and bench construction at the site. The site has high research and educational potential about the way local Aboriginal populations lived in the area.

7.2.7 Artarmon Park artefact scatter (45-6-3599)

Table 7-7 Statement of significance – Artarmon Park artefact scatter (45-6-3599)

Criterion	Assessment
Social significance	Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in sections 3 and 5). Artarmon Park artefact scatter (45-6-3599) is a sub-surface artefact scatter located at the confluence of Flat Rock Creek and a tributary. The site has high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	This site does not meet this criterion. There are no known written or oral historical references to the site.
Scientific significance	The site has moderate scientific significance at a local level as it is ranked as having low-moderate integrity, low structure, and further potential for sub-surface deposit. The integrity and structure of the site is low-moderate as the site has been subject to disturbance as a result of being located within an urban environment. The site has moderate representativeness/rarity as it is an artefact scatter, which are common site types in the broader Sydney region. However, due to increased development and urbanisation, sub-surface artefact scatters are becoming increasingly rarer. Artarmon Park artefact scatter (45-6-3599) is therefore ranked as having moderate scientific significance.
Aesthetic significance	The site has low aesthetic significance at the local level as it is a sub-surface artefact scatter located in a disturbed area beneath the Gore Hill Freeway.
Summary statement of significance	Overall, Artarmon Park artefact scatter (45-6-3599) is of low-moderate significance at a local level as it provides tangible evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate as the site is likely to have been subject to disturbance as a result of being located within an urban environment. However, the site has moderate representativeness/rarity due to its location within a developed, urban environment. The site has low-moderate research and educational potential about the way local Aboriginal populations lived in the area.

7.3 Summary of significance

The summary of the significance assessment of Aboriginal sites located within the study area is presented below in Table 7-8. All ratings in this table are at the local level of significance. Mapping of all Aboriginal sites identified within the study area is presented in Figure 4-2 to Figure 4-6.

Table 7-8 Summary of the significance assessment for identified Aboriginal sites located within the study area

Name (AHIMS ID)	Social significance	Historical significance	Scientific significance	Aesthetic significance	Overall significance
Bantry Bay Aboriginal Engraving Site (45-6-0655)	High	High	High	High	High
Rock engraving (Garigal National Park) (45-6-2940)	High	High	Moderate-high	High	High
Wakehurst Engraving MAN 104; (45-6-3032)	High	N/A	Low	Low	Low
Clive Park 8; Shelter and Midden (45-6-3012)	High	N/A	High	High	High
Clive Park 1; Northbridge (45-6-0654)	High	N/A	Moderate-high	High	High
Clive Park 2; Taplin's Cicada Pupa Cave (45-6-0996)	High	N/A	Moderate-high	Moderate	Moderate-high
Artarmon Park artefact scatter (45-6-3599)	High	N/A	Moderate	Low	Low-moderate
Unable to confirm location or condition during field inspection as likely covered by gravel/vegetation					
Frenchs Forest; Bantry Bay; Wakehurst Parkway (45-6-0662)	The site area has been identified to likely be within 50 m of the construction footprint. Presumed to be in poor condition and located in a degraded roadside verge underneath gravel/vegetation adjacent to Wakehurst Parkway. The condition of the site has not been verified during this assessment and an independent inspection and verification is required by a representative of the Aboriginal Heritage Office, the last agency to have conducted a condition assessment of the site.				

7.3.1 Potential submerged sites significance assessment

The potential submerged sites assessment is included in Annexure E - Potential submerged sites assessment.

The assessment examines the proposed tunnel alignment on the bed of Middle Harbour. Using modelling based on remote sensing information, it identifies the sensitivity of different zones based on the likelihood that they retain archaeological deposits pre-dating sea-level rise. Any Aboriginal archaeological sites or objects that pre-date sea level rise are likely to hold high archaeological and cultural significance.

Any potential submerged Aboriginal archaeological sites are likely to have very high scientific significance due to the potential to yield information that would contribute to an understanding of the NSW natural and cultural

history. Submerged Aboriginal archaeological sites and Pleistocene Aboriginal archaeological sites are both, on their own, rare site types within a NSW context. The identification of submerged Pleistocene landscapes and associated Aboriginal archaeological resources would be an extremely rare discovery within Australia.

8. Impact assessment

The potential impacts to Aboriginal cultural places and archaeological sites recorded within the study area have been considered. The study area has been developed to also consider potential impacts related to vibration and settlement risk identified for the project (Renzo Tonin & Associates, 2018).

This section looks specifically at those areas where a site or place may be directly or indirectly impacted due to its location within the study area.

8.1 Impact avoidance

All recorded Aboriginal sites within the study area have been considered in relation to the proposed road construction, operation and associated activities, and wherever possible, Transport for NSW has sought to avoid and reduce impacts to Aboriginal sites.

Throughout design development and refinement, the project's alignment and associated required infrastructure has been modified where possible, to avoid or reduce the impact to identified Aboriginal sites, particularly those of high significance.

The project has subsequently avoided the following potential archaeological deposits identified in the archaeological survey (refer to Table 6-1):

- Artarmon Park PAD (45-6-3362)
- Flat Rock Creek PAD (45-6-3361)
- Burnt Bridge Creek PAD (45-6-3363).

Despite these refinements, some indirect impacts may still occur at several identified Aboriginal sites without appropriate harm minimisation and mitigation measures being in place.

8.2 Potential impacts

The majority of potential impacts to Aboriginal sites within and adjacent to the study area may occur during the construction phase of the project. Potential impacts may include:

- Direct impacts such as the removal, modification or destruction of an Aboriginal site
- Indirect impacts associated with construction vibration generated by tunnelling or surface works and the settlement of land due to tunnelling below or near Aboriginal sites.

Potential impacts during operation are expected to be limited and may include indirect impacts associated with Aboriginal site setting (visual impacts, changes to vistas/landscapes), changes to ongoing use or environmental association.

Based on the results of this assessment and in consultation with the RAPs:

- The location and condition of one Aboriginal site (45-6-0662) could not be confirmed but is considered likely to be within the construction footprint
- Five Aboriginal sites (45-6-0655, 45-6-2940, 45-6-3362, 45-6-3361 and 45-6-3363) are located within 50 metres of surface works including two sites that may be subject to indirect impacts associated with vibration and settlement (45-6-0655 and 45-6-2940)
- Five Aboriginal sites (45-6-3032, 45-6-3012, 45-6-0654, 45-6-0996 and 45-6-3599) are located above or within 50 metres of the tunnel alignment and may be subject to indirect impacts associated with vibration and settlement

- The location of the Aboriginal site at Wakehurst Parkway (45-6-0662) was unable to be confirmed during PACHCI Stage 3 fieldwork as the site was likely covered by gravel/vegetation. However, its presence in the study area is acknowledged and included
- Operational impacts are considered to be negligible.

Maps showing the project construction footprint in relation to Aboriginal sites identified through this assessment are presented in Section 4. The potential impact to Aboriginal sites recorded within and adjacent to the study area is summarised in Table 8-3.

8.2.1 Types of potential indirect impact

8.2.1.1 Vibration from tunnelling and at-surface activities

Vibration from construction activities has the potential to result in physical damage to Aboriginal sites. Depending on the outcomes of vibration modelling, the vibration levels may exceed the minimum working distance to achieve a screening level of 2.5 mm/s for Aboriginal sites. The vibration screening level of 2.5 mm/s for avoiding damage to Aboriginal sites is a conservative figure based on modelling provided by the Australian Government Department of Industry, Innovation and Science (Deutsches Institut für Normung 1999). It assumes that all Aboriginal sites are structurally unsound and that the most sensitive items are located at the closest point to the tunnel. A large rock hammer could be used during bench clearing tunnelling activities, which typically has a minimum working distance during tunnelling of 20 metres for unsound structures (Renzo Tonin & Associates 2020).

If vibration levels are expected to exceed this goal, mitigation and management measures would be implemented as outlined in Section 9. This would include carrying out Aboriginal site condition surveys before and after construction and conducting continuous vibration monitoring during vibration intensive construction works.

Further details in regard to the potential vibration impacts during construction of the project are discussed in detail in Appendix G (Technical working paper: Noise and vibration) (Renzo Tonin and Associates, 2020).

8.2.1.2 Settlement from tunnel excavation

Tunnel excavation, combined with the subsequent impacts on groundwater levels, is expected to result in settlement at the ground surface. To assess the impact on Aboriginal sites (particularly rock shelters and engravings), it is important to estimate potential levels of settlement.

The project tunnels would be constructed almost entirely in Hawkesbury Sandstone. Predicted surface settlement contours due to stress redistribution induced by tunnel excavation involve a maximum predicted surface settlement range of between 10 millimetres and 85 millimetres directly above the mainline tunnels (Jacobs 2020). However, calculated surface settlement at Aboriginal archaeological sites within the study area is predicted to range between 10 millimetres and 30 millimetres. A damage classification model (CIRIA 1996) used for the project describes this settlement range as having a 'slight' degree of sensitivity due to the potential for cracks to form in buildings.

For the greater Sydney region, Sefton's (Sefton 1996) investigation of the effects of mining-related subsidence on Aboriginal rock shelter sites remains the most useful study into the effects of subsidence on rock shelters specifically (note, rock engravings are not covered in this study). The results of Sefton's analysis showed that the determining probability of subsidence related impacts to a rock shelter was overhang size, with larger shelters (greater than 50 cubic metres) at greater risk of impact. No rock shelter site less than 50 cubic metres was found to have been impacted by subsidence, and impacts to larger shelters were also rare (Sefton 1996). All rock shelters within the study area are significantly smaller than 50 cubic metres, suggesting that harm from subsidence related impacts would be unlikely to these Aboriginal site types.

8.2.1.3 Shore wash and coastal erosion impact

Shore wash from on-water construction activities has the potential to impact coastal Aboriginal sites, particularly shell middens which may be disturbed through shore wash and coastal erosion impact.

The likely shore wash deriving from on-water construction activity for the project has been assessed (Royal Haskoning DHV 2020). The effects of the shore wash on Aboriginal sites has been determined to be negligible. However, to ensure that maritime construction traffic does not create wash that could impact on the wave climate, a speed limit has been recommended to ensure that vessels do not operate at or near the critical threshold speed that could cause shore wash impact (Royal Haskoning DHV, 2020).

8.2.1.4 Environmental setting

The environmental setting of Aboriginal sites has the potential to be impacted through construction activity. This can be caused through vegetation removal or other changes to an Aboriginal site's aesthetic and environmental setting due to impacts from construction activity. For example, engraving locations near Wakehurst Parkway are surrounded by bushland that add to the aesthetic character of the site.

The environmental setting of Aboriginal sites would be protected through maintaining an appropriate level of nearby vegetation to protect the existing environmental aesthetic conditions. Vegetation would also be replanted after construction to re-establish pre-existing conditions (WSP Arup, 2020).

8.2.1.5 Potential submerged sites impact assessment

An impact assessment for potential submerged sites is contained in Annexure E.

Potential rock overhangs are submerged and concealed by marine sediments and they cannot be readily accessed and assessed. The assessment of impacts on potential submerged Aboriginal sites is therefore based on the potential for such sites to exist, using available geophysical information and an understanding of site formation processes.

The predictive model provides a basis for assessing potential impacts and identified that there is documented physical evidence of Aboriginal occupation and land use patterns along the Middle Harbour shoreline and the broader Sydney Basin.

The extent to which sites may have survived inundation is dependent on the length and intensity of exposure to water movement and wave action. While the study area considered for the project focused on areas of potential direct and indirect impacts, in the relatively enclosed water of Middle Harbour, the rate of survival can be expected to be greater than at sites situated in what would have been more open country, eastwards of the current coastline.

Construction activities associated with cofferdam construction, dredging and installation of immersed tube tunnel units may have direct and indirect impacts on potential submerged Aboriginal archaeological sites. The majority of potential impacts to submerged Aboriginal terrestrial sites would likely occur during construction, rather than operation, and may include:

- Direct impacts, ie the removal or destruction of an Aboriginal site from construction activities such as dredging, piling and cofferdam construction
- Indirect impacts associated with construction vibration generated by construction activities near to Aboriginal sites.

Further investigations, where reasonable and feasible, would be required to confirm the presence of submerged sites and their condition. If confirmed, the identification and documentation of such Aboriginal archaeological sites would demonstrate that such sites could be present across Middle Harbour, and the information obtained in this project would be invaluable in managing this resource on both State and National levels, into the future.

A summary of potential impacts to submerged Aboriginal heritage is provided in Table 8-1.

Table 8-1 Summary of potential impacts to submerged Aboriginal terrestrial sites

Location	Potential Aboriginal site type	Archaeological potential	Significance of direct impacts	Significance of indirect impacts
Between Northbridge and Seaforth	Stone artefacts, midden deposits and fish traps	Moderate to high	Moderate to major	Negligible
	Rock shelters – Seaforth side of Middle Harbour	Moderate to high	Moderate to major	Negligible
	Rock shelters – Clive Park side of Middle Harbour	Low	N/A	Negligible
	Rock shelters, art, grinding grooves, middens, stone artefact scatters, quarry sites and fish traps (across the remainder of the study areas)	Very low	Negligible to moderate	Negligible
Pearl Bay (west of Spit Reserve)	All forms identified – rock shelters, grinding grooves, middens and/or stone artefact scatters, stone quarry sites, fish traps.	Moderate to high	Potential impacts to submerged Aboriginal archaeological sites unlikely in this location as the depth of piling for the temporary wharf would not reach below bed of the harbour strata containing potential Aboriginal archaeological sites.	
Pearl Bay (east of Clive Park)	All forms identified – rock shelters, grinding grooves, middens and/or stone artefact scatters, stone quarry sites, fish traps.	Moderate to high	Potential impacts to submerged Aboriginal archaeological sites unlikely in this location as the depth of piling for the temporary wharf would not reach below bed of the harbour strata containing potential Aboriginal archaeological sites.	

8.2.2 Significance of impact

Table 8-2 has been developed to assess the level of potential impact and associated significance for Aboriginal archaeological sites within the study area. The significance of impact ratings corresponds with the damage classification model used for the project (CIRIA 1996). Impacts to potential archaeological deposit cannot be assessed as their composition and significance has not been established.

Table 8-2 Impact assessment matrix

Impact rating	Scale	Intensity	Duration/frequency
Major	Medium – large	Moderate – high	Permanent/irreversible
Moderate	Small – medium	Moderate	Medium – long-term
Minor	Small/localised	Low	Short-term/reversible
Negligible	Little or no potential physical impact to an Aboriginal site. Includes rock shelters that are less than 50 cubic metres in size.		

Table 8-3 Impact assessment for Aboriginal archaeological sites within the study area

Heritage item name (AHIMS ID)	Heritage item type	Overall significance	Location relative to study area	Type of potential impact	Description	Significance of potential impact
Bantry Bay Aboriginal Engraving Site (45-6-0655)	Rock engravings	High	Within 50 metres of Killarney Heights surface works (Wakehurst Parkway)	Indirect – environmental setting and access	Potential for changed visual setting and surrounding landscape due to mature native tree removal during construction. Potential for changed access to site during construction works.	Negligible
				Indirect – vibration	Vibration impact to the Aboriginal site has been identified as being outside the minimum working distance for unsound structures.	Negligible
Rock engraving (Garigal National Park) (45-6-2940)	Rock engraving	High	Within 50 metres of Killarney Heights surface works (Wakehurst Parkway)	Indirect – environmental setting and access	Potential for changed visual setting and surrounding landscape due to mature native tree removal during construction. Potential for changed access to site during construction works.	Negligible
				Indirect – vibration	Vibration impact to the Aboriginal site has been identified as being outside the minimum working distance for unsound structures.	Negligible
Wakehurst Engraving MAN 104 (45-6-3032)	Rock engravings	Low	Within 50 metres of the ramp tunnels at Seaforth	Indirect – vibration	Vibration impact to the Aboriginal site has been identified as being outside the minimum working distance for unsound structures.	Negligible
				Indirect – settlement	Settlement at this location is predicted to be 14 millimetres, which poses a minor risk, but site is already severely impacted / damaged and risk is therefore considered negligible.	Negligible
Clive Park 8; Shelter and	Shelter with midden	High	Located above the mainline tunnels at Clive Park and	Indirect – vibration	Vibration impact to the Aboriginal site has been identified as being outside the minimum working distance for unsound structures.	Negligible

Heritage item name (AHIMS ID)	Heritage item type	Overall significance	Location relative to study area	Type of potential impact	Description	Significance of potential impact
Midden (45-6-3012)			within 50 metres of the Northbridge cofferdam (BL7)	Indirect – settlement	Settlement at this location is predicted to be 25-30 millimetres. Rock shelter is less than 50 cubic metres in size.	Negligible
Clive Park 1; Northbridge (45-6-0654)	Burial/s; shelter with art, shelter with midden	High	Located above the mainline tunnels at Clive Park and within 50 metres of the Northbridge cofferdam (BL7)	Indirect – vibration	Vibration impact to the Aboriginal site has been identified as being outside the minimum working distance for unsound structures.	Negligible
				Indirect – settlement	Settlement at this location is predicted to be 20-25 millimetres. Rock shelter is less than 50 cubic metres in size. Large overhang and high significance of this site increased significance outcome of potential impact.	Minor
Clive Park 2; Taplin's Cicada Pupa Cave (45-6-0996)	Shelter with art, shelter with midden	Moderate-high	Located above the mainline tunnels at Clive Park and within 50 metres of the Northbridge cofferdam (BL7)	Indirect – vibration	Vibration impact to the Aboriginal site has been identified as being outside the minimum working distance for unsound structures.	Negligible
				Indirect – settlement	Settlement at this location is predicted to be 10-15 millimetres. Rock shelter is less than 50 cubic metres in size.	Negligible
Artarmon Park artefact scatter (45-6-3599)	Sub-surface artefact scatter	Low-moderate	Within 50 metres of surface works at Gore Hill Freeway Connection	No impact	Site is a sub-surface artefact scatter and would not be impacted by the project.	No impact
Artarmon Park PAD (45-6-3362)	Potential archaeological deposit	N/A	Within 50 metres of surface works and the ramp tunnels at Gore Hill Freeway Connection and	No impact	Site is a potential archaeological deposit and would not be impacted by the project.	No impact

Heritage item name (AHIMS ID)	Heritage item type	Overall significance	Location relative to study area	Type of potential impact	Description	Significance of potential impact
			Beaches Link on ramp (portal)			
Flat Rock Creek PAD (45-6-3361)	Potential archaeological deposit	N/A		No impact	Site is a potential archaeological deposit and would not be impacted by the project.	No impact
Burnt Bridge Creek PAD (45-6-3363)	Potential archaeological deposit	N/A		No impact	Site is a potential archaeological deposit and would not be impacted by the project.	No impact
Frenchs Forest; Bantry Bay; Wakehurst Parkway (45-6-0662)	Rock engravings	Not assessed	Potentially within the study area. Potentially within 50 metres of Killarney Heights surface works (Wakehurst Parkway)	Direct (partial / potential)	Location and condition not confirmed during site inspection as site was likely covered by gravel/vegetation.	Minor

8.3 Cumulative impacts

Cumulative impacts can be defined as the combined effects of environmental or social impacts that occur because of multiple activities and developments with similar impacts within a particular local area and region.

There is currently no defined or endorsed process for the assessment of cumulative impacts on Aboriginal cultural heritage in NSW. However, the assessment of cumulative impacts on cultural heritage values must take into account the fact that many cultural values are non-renewable, associated with a finite and limited number of surviving places and objects.

Ideally, an assessment of cumulative impacts should be measured against a baseline of data which characterises the existing cultural resources to be impacted and the cumulative loss already realised. In the case of the local and regional contexts of the project, effective datasets of such cultural heritage information do not exist. The AHIMS database provides a register of known Aboriginal sites in NSW but is limited in its application due to the selective factors which affect the registration of recordings. Gaps in archaeological survey across the Sydney region mean that the AHIMS register does not provide a complete baseline for a comprehensive cumulative impact assessment. However, as the only baseline data available it does help inform qualitative observations and discussion on the cumulative impact.

The study area contains a total of 11 Aboriginal sites, of which the location and condition of one site was not confirmed during field inspections as the site was likely covered by gravel/vegetation. Of the 11 Aboriginal sites, potential indirect impact would occur to seven sites and no impact would occur to four sites. For 45-6-0662 it is likely that partial direct impact may occur to that site (Table 8-3). The overall significance of the Aboriginal sites falls within a range of low to moderate to high. Therefore, the regional Aboriginal cultural heritage values across the project would be reduced significantly by the cumulative impacts from the project if serious harm such as complete loss of a site was to occur.

The significance of these potential impacts would be negligible for nine sites and minor at two sites (Table 8-3). Potential minor, negligible or indirect impacts to a site are not considered to result in any cumulative impacts to the region's archaeology. If mitigation and harm minimisation measures to avoid impacts to the Aboriginal sites assessed can be followed, the increasing rarity of intact Aboriginal sites within the urbanised Sydney region would not be impacted. Therefore, the project would not result in a cumulative impact on the region's archaeology

Furthermore, the project physically overlaps with the Western Harbour Tunnel and Warringah Freeway Upgrade project at Warringah Freeway, where Beaches Link tunnel portals are located at the Warringah Freeway, and at the motorway control centre at Waltham Street, Artarmon. In this location no existing AHIMS sites nor impacts to Aboriginal cultural heritage were identified. As such, it is considered that the project would not contribute to cumulative impacts in this location. No further cumulative impact assessment has been carried out.

9. Management recommendations

To manage impacts to Aboriginal sites and cultural heritage values, the broad objectives for the project are to:

- Avoid or minimise impacts on significant cultural heritage
- Preserve as much cultural heritage in its original environment as possible
- Maintain cultural heritage through preservation and increased knowledge.

9.1 Terrestrial sites

The first principle of cultural heritage management is impact avoidance and minimisation before mitigation. If it is not possible to completely avoid sites, then mitigation is required for parts of sites that are not going to be impacted. Where complete avoidance is not possible, management recommendations must be implemented for impacted areas of each of the archaeological sites.

The recommendations in this Section have been developed to avoid significant impacts, and where impacts are unavoidable, to effectively mitigate impacts. Management recommendations have been drafted in accordance with the type of impact to the site and the significance of the site. All management recommendations have been presented to relevant registered Aboriginal parties. A summary of the management recommendations for Aboriginal sites is provided in Table 9-1.

All accessible Aboriginal sites located within the study area have been visited during PACHCI Stage 3 fieldwork and new, in-depth site cards have been prepared for each site. Updated recording has involved preparing extensive photographic records, stratigraphic drawings, site plans, landform descriptions, updated condition assessments, flora and faunal surveys, and community consultation. This activity has provided accurate baseline data for measuring any potential disturbance to sites during construction.

Cultural heritage has little intrinsic value as material fabric. Most of its importance is created in the connections it draws to stories and places and events that we value, and the insights it gives on our changing past and present. As such, interpretation is an essential element of heritage conservation, identifying and communicating those values and connections to the broader public. It applies to sites that are to be impacted as a mitigation, and to projects and areas to ensure that new work fits into its context and environment, and improves established community, social, heritage and urban design values, as set out in the *Burra Charter* (Australia ICOMOS 2013).

Heritage impacts for the project occur at a low level and are generally moderate impacts to places of local heritage significance. Much of the impact is dispersed and out of the public gaze. Traditional heritage interpretation such as place-based signage may not be appropriate.

9.2 Potential submerged terrestrial sites

The underlying principle in safeguarding the cultural heritage significance of maritime heritage is to avoid or minimise any direct, indirect and long-term impacts on a site. This approach is refined and adjusted depending on the level of cultural heritage significance of an item or site, the risk of impact and the scale of impact. The scale or consequence of impact relates to the degree of loss of cultural heritage significance.

The proposed works that could most likely impact potential submerged Aboriginal archaeological sites is the excavation within the cofferdams. Without mitigation, the potential impacts could range from negligible to moderate. Other activities such as piling are assessed to have a negligible to minor impact on the potential submerged Aboriginal sites.

Two forms of mitigation measures have been recommended.

The first is further pre-construction investigation at Seaforth of potential rock shelter(s) outside of the cofferdam footprint. This measure involves investigation into whether a high resolution geophysical survey may be of assistance in identifying rock overhangs concealed by marine sediments should be assessed. If it is determined that a high resolution geophysical survey could produce the desired results, then the survey should be carried out. If the geophysical survey conclusively shows that there are no rock overhangs measuring at least 1.5 metres in height (from the rock base to the rock ceiling), there would be no further work carried out and any residual risk should be managed through an unexpected finds procedure. However, if the geophysical survey is inconclusive or distinct rock overhangs are identified, then an archaeological dive investigation should be implemented. This would be a progressive sequence of probing through the sediments underneath the overhang with a thin rod to determine the size of any voids. A 1.5 m probe would be used as this is seen as the minimum feasible size for a rock shelter and is of a size that a diver can comfortably handle. Much of this diving work at this stage would be done in near zero visibility and should therefore be limited to what a diver can feasibly and safely do.

Where suitably large voids are identified underneath rock overhangs, the overlying Holocene marine sediments should be carefully excavated and removed using a diver-operated airlift (dredging device). At a pre-determined depth or an identified change in sediment type, divers would cease excavating and use a corer to take a controlled series of underlying sediment/rock samples; preferably where possible as continuous cores. These core samples would subsequently be examined for evidence of pre-inundation soil deposits.

If evidence of pre-inundation soils is identified in the core samples, then the feasibility of carrying out a controlled archaeological dive excavation should be assessed. Excavation methodologies would be directed towards achieving the highest amount of spatial and stratigraphic control possible – ie. excavating in grids and spits. However, physical environmental factors such as operating space within an overhang and water visibility would undoubtedly have an influence on how the excavation is carried out especially with respect to diver safety.

The above described geophysical survey, dive and possible archaeological dive investigation should all be carried out during the detailed design and construction planning phase.

The second management measure recommends investigation at the Middle Harbour south and north cofferdams (BL7 and BL8) to see whether a high resolution geophysical survey may be of assistance in identifying rock overhangs concealed by marine sediments. If it is determined that a high resolution geophysical survey could produce the desired results, then the survey should be carried out. If the geophysical survey conclusively shows that there are no rock overhangs measuring at least 1.5 metres in height (from the rock base to the rock ceiling), there would be no further work carried out and any residual risk should be managed through an unexpected finds procedure. However, if the geophysical survey is inconclusive or distinct rock overhangs are identified, then onsite visual monitoring within the cofferdam should be carried out during the construction period, after the cofferdam has been de-watered. The aim of the monitoring would be to identify voids within the bedrock close to the interface with marine sediments.

In the event that a void in the bedrock appears that displays the characteristics of a potential rock shelter, then the marine sediments should be removed by pump. Should the marine sediments bottom out onto the rock no further action would be taken. If the characteristics of the marine sediments change or if fissures are evident, then samples of the sediments should be taken, preferably as an intact core sample.

In consultation with a suitably experienced geomorphologist a set of criteria should be established for the identification of pre-inundation soil deposits (peat, charcoal, roots, etc). If pre-inundation soil deposits are evident within samples, a controlled archaeological investigation to recover any artefacts should take place. However, the extent of the archaeological investigation would need to be determined by the constraints of the bed rock conditions and safety constraints within the cofferdams, including workplace health and safety protocols for handling of potentially contaminated sediment. Environmental, engineering and workplace health and safety factors such as operating space within an overhang, viscosity of the pre-inundation soil and elevated contamination levels would have an influence on the method of archaeological investigation, which should nonetheless aim to retain spatial and stratigraphic control if at all feasible.

Table 9-1 Management and mitigation measures for Aboriginal sites within the study area

Ref	Phase	Impact	Management and mitigation measures	Application
AH1	Pre-construction and construction	Aboriginal heritage – vibration, and settlement impacts	<p>Before the start of construction, further consultation with Heritage NSW, the Metro Local Aboriginal Land Council, the Aboriginal Heritage Office and the Registered Aboriginal Parties should be carried out to decide an appropriate course of action for the Aboriginal site 45-6-0662 on Wakehurst Parkway, as the location and condition of this site could not be confirmed during field inspection as the site is likely covered by gravel/vegetation.</p> <p>If considered appropriate, an archaeological investigation may be carried out at the possible site location to carefully remove the gravel/vegetation, to confirm its presence and record the underlying site condition.</p> <p>If new information regarding site condition is identified during consultation suggesting the sites may be subject to impacts due to vibration and settlement, then mitigation measures AH2, AH3 and AH4 should apply.</p> <p>In the absence of confirming the site, if during construction works a site is located, the unexpected finds protocol prescribed in AH5 would apply. Further, Heritage NSW, an appropriately qualified archaeologist and the Metro Local Aboriginal Land Council should be contacted and the site should be re-recorded in situ.</p>	Frenchs Forest; Bantry Bay; Wakehurst Parkway (45-6-0662)
AH2	Pre-construction and construction	Aboriginal heritage – vibration impacts	<p>The following process should be carried out to confirm where vibration monitoring at those terrestrial sites within 50 metres of the project corridor will be required:</p> <ol style="list-style-type: none"> Terrestrial Aboriginal site condition surveys of sites should be completed by an appropriately qualified person using those techniques appropriate in determining which sites are considered to be structurally unsound Where this determination cannot be made, as a precaution the site should be considered to be structurally unsound A screening of vibration intensive activities within 50 metres of structurally unsound sites should be carried out to identify activities that have the potential to exceed vibration levels of 2.5 millimetres per second Sites identified as being both structurally unsound and having potential for exceedance in vibration levels of 2.5 millimetres per second should be identified as requiring vibration monitoring, where this cannot be reduced at source. 	All registered AHIMS sites subject to vibration intensive activities determined to be structurally unsound (see AH2).

Ref	Phase	Impact	Management and mitigation measures	Application
AH3	Construction	Aboriginal heritage – vibration impacts	<p>Vibration monitoring should be carried out at sites that have been identified as requiring monitoring in accordance with the process outlined in management measure AH2. The monitoring program should:</p> <ul style="list-style-type: none"> • Be developed by a suitably qualified person • Be risk-based • Include appropriate frequency and duration of monitoring including adequate benchmark recording before works commence • Include appropriate management protocols for any exceedances. <p>Where possible, project works should be conducted in a manner to minimise vibration levels, to less than 2.5 millimetres per second at all structurally unsound AHIMS sites.</p>	All registered AHIMS sites subject to vibration intensive activities determined to be structurally unsound (see AH2).
AH4	Construction	Aboriginal heritage – vibration impacts	<p>Where monitoring identifies that vibration levels exceed 2.5 millimetres per second, or following vibration intensive activities, subsequent condition survey of sites that are subject to monitoring in AH3 should be carried out.</p> <p>The subsequent condition surveys should record any changes to the integrity of the site that may have resulted from construction vibration. Additional surveys must be carried out by a suitably qualified person and include a Metro Local Aboriginal Land Council representative. AHIMS site cards should be updated accordingly where any changes are observed. Condition surveys may include further photogrammetry and 3D-capture techniques, in which case comparison against the baseline should be carried out.</p>	All registered AHIMS sites subject to vibration monitoring (see AH3).
AH5	Construction	Unexpected discovery of historical heritage materials features or deposits	If at any time during the construction of the project, any items of potential Aboriginal archaeological or cultural heritage conservation significance or Ancestral remains are discovered, they should be managed in accordance with the <i>Standard Management Procedure: Unexpected Heritage Items</i> (Road and Maritime, 2015a)	BL/GHFC
AH6	Construction	Aboriginal heritage - impacts	Cultural and historic heritage awareness training should be carried out for personnel engaged in work that may impact heritage items before commencing works for the project.	BL/GHFC

Ref	Phase	Impact	Management and mitigation measures	Application
AH7	Pre-construction and construction	Aboriginal heritage - impacts	As part of the project urban design and landscape plan, an Aboriginal heritage interpretation strategy will be developed for the project in consultation with Registered Aboriginal Parties and other relevant Stakeholders. Appropriate Aboriginal heritage interpretation will be incorporated into the project urban design and landscape plan in accordance with the interpretation strategy.	BL/GHFC
AH8	Pre-construction	Potential Aboriginal submerged sites heritage impacts	<p>The effectiveness of using high resolution geophysical survey to identify rock overhangs concealed by marine sediments should be assessed. If it is determined that a high resolution geophysical survey could produce the desired results, then the survey should be carried out.</p> <p>If the geophysical survey conclusively shows that there are no rock overhangs measuring at least 1.5 metres in height (from the rock base to the rock ceiling), there would be no further archaeological work carried out and any residual risk should be managed through an unexpected finds procedure. However, if the geophysical survey is inconclusive or distinct rock overhangs are identified, then an archaeological dive investigation should be implemented. Much of the diving would be done in near zero visibility and should therefore be limited to what a diver can feasibly and safely do.</p>	Potential rock shelter(s) at Seaforth outside of Middle Harbour north construction support site (BL8) cofferdam footprint
AH9	Pre-construction and construction	Potential Aboriginal submerged sites heritage impacts	<p>The effectiveness of using high resolution geophysical survey to identify rock overhangs concealed by marine sediments should be assessed. If it is determined that a high resolution geophysical survey could produce the desired results, then the survey should be carried out.</p> <p>If the geophysical survey conclusively shows that there are no rock overhangs measuring at least 1.5 metres in height (from the rock base to the rock ceiling), there would be no further archaeological work carried out and any residual risk should be managed through an unexpected finds procedure. However, if the geophysical survey is inconclusive or distinct rock overhangs are identified, then onsite visual monitoring within the cofferdam should be carried out during the construction period, after the cofferdam has been de-watered. The aim of the monitoring would be to identify voids within the bedrock close to the interface with marine sediments.</p> <p>In the event that a void in the bedrock appears that displays the characteristics of a potential rock shelter, then the marine sediments should be removed by pump. Should the marine sediments bottom out onto the rock no further action would be taken. If the characteristics of the marine sediments change or if fissures are evident, then samples of the sediments should be taken, preferably as an intact core sample.</p>	Middle Harbour south and north cofferdams construction support sites (BL7 and BL8)

Ref	Phase	Impact	Management and mitigation measures	Application
			<p>In consultation with a suitably experienced geomorphologist a set of criteria should be established for the identification of pre-inundation soil deposits (peat, charcoal, roots, etc). If pre-inundation soil deposits are evident within samples, a controlled archaeological investigation to recover any artefacts should take place. However, the extent of the archaeological investigation and method of recovery should be determined by the constraints of the bed rock conditions and workplace health and safety protocols and constraints within the cofferdams, including safety protocols for handling of potentially contaminated sediment. Environmental, engineering and workplace health and safety factors such as operating space within an overhang, viscosity of the pre-inundation soil and elevated contamination levels would have an influence on the method of archaeological investigation, which should nonetheless aim to retain spatial and stratigraphic control if at all feasible.</p>	

10. References

- Aboriginal Heritage Office (2015), *Filling a Void: A review of the historical context for the use of the word 'Guringai'*. Retrieved 12 December 2017 from <http://www.aboriginalheritage.org/news/2015/filling-a-void/>.
- Arcadis (2020), *Beaches Link and Gore Hill Freeway Connection Environmental Impact Statement - Technical working paper: Biodiversity Development Assessment Report*.
- Attenbrow, V (1991), *Port Jackson archaeological project: a study of the prehistory of the Port Jackson catchment, New South Wales. Stage I-site recording and site assessment*. Australian Aboriginal Studies(2):40-55.
- Attenbrow, V (2010), *Sydney's Aboriginal past: Investigating the archaeological and historical records*. Sydney: University of New South Wales Press Ltd.
- Australia ICOMOS (2013), *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance 2013*. Burwood, Vic: Australia ICOMOS Incorporated.
- Australian Government (2011), *Native Title Act 1993*.
- Australian Museum (2009), *CLANS AND LANGUAGE GROUPS*. Retrieved 29 January 2018 from <https://australianmuseum.net.au/clans-and-language-groups>.
- Brayshaw, H (1986), *Aborigines of the Hunter Valley: A Study of Colonial Records: Scone, Scone & Upper Hunter Historical Society Bicentennial Publication No4*.
- Campbell, L.M (2015), *Geological Mapping in the southern Barmedan 1:100 000 map sheet area in 2014*.
- Carr, A. and A. Costello (2017), *Western Harbour Tunnel and Beaches Link archaeological methodology*.
- CIRIA (1996), *Environmental assessment: good practice. Proceedings of Construction Industry Environmental Forum Conference Volume 126*.
- Cosmos Archaeology (2020), *Beaches Link and Gore Hill Freeway Connection Project: Potential Submerged Aboriginal Sites Assessment*.
- Costello, A., A. Carr and C. Jones (2017), *Western Harbour Tunnel and Beaches Link Archaeological Survey Report*.
- Department of Environment, Climate Change and Water (2010a), *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*. Retrieved 12 December 2017 from: <http://www.alc.org.au/media/43239/1004%20deccw%20community%20consultation%20requirements.pdf>.
- Department of Environment, Climate Change and Water (2010b), *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*, Sydney.
- Department of Environment, Climate Change and Water (2011), *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*.
- Deutsches Institut für Normung (1999), *DIN 4150-3: Structural vibrations - Part 3: Effects of vibration on structures*.
- Gammage, B (2012), *The Biggest Estate on Earth: How Aborigines Made Australia*. Allen & Unwin

Gunson, N (ed) (1974), *Australian Reminiscences & Papers of L.E. Threlkeld missionary to the Aborigines 1824-1859*. Australian Aboriginal Studies No. 40. Canberra: Australian Institute of Aboriginal Studies.

Irish, P (2011), *Changing perspectives in Australian archaeology, part III. Hidden in plain view—the Sydney Aboriginal Historical Places Project*. Technical Reports of the Australian Museum, Online 23(3):31-44.

Jacobs (2020), *Beaches Link and Gore Hill Freeway Connection Environmental Impact Statement - Technical working paper: Groundwater*.

Kuskie, P (1997), *An Aboriginal Archaeological Assessment of a Newcastle City Council Property at the Corner of Ilenaghans Drive and Jogn Renshaw Drive, Beresfield, Lower Hunter Valley, NSW*, Report to Newcastle City Council.

Lambert, D (1989), *Conserving Australian rock art: a manual for site managers*. Aboriginal Studies Press

Martinez, C.K (2010), *Bias and Ethnocentrism in Anthropology*. Retrieved 26 January 2018 from: http://www.associatedcontent.com/article/2632281/bias_and_ethnocentrism_in_anthropology.html.

McDonald, J (2008), *Dreamtime superhighway : Sydney Basin rock art and prehistoric information exchange*: ANU E Press, Canberra.

Morris, A (1986), *An Archaeological Survey of North Port Jackson*. Australian Archaeology No5. (14-17)

Office of Environment and Heritage (2011), *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*. Sydney: NSW Government.

Office of Environment and Heritage (2012), *National Parks and Wildlife Act 1974*. <http://www.legislation.nsw.gov.au/>.

Office of Environment and Heritage (2016), *Sydney Basin Bioregion*. Retrieved 24 January 2018 from <http://www.environment.nsw.gov.au/bioregions/SydneyBasin-RegionalHistory.htm>.

Peterson, A (1976), *Tribes and Boundaries in Australia*. Canberra: Australian Institute of Aboriginal Studies.

Popp, T., N. Popp and B. Walker (1997), *Footprints on Rock. Aboriginal Art of the Sydney Region*. Sydney: Metropolitan Local Aboriginal Land Council.

Renzo Tonin & Associates (2020), *Beaches Link and Gore Hill Freeway Connection Environmental Impact Statement - Technical working paper: Noise and vibration*.

Renzo Tonin & Associates (2018), *Western Harbour Tunnel and Beaches Link Mainline tunnelling vibration information*.

Rich, E (1986), *Heritage Study of the Municipality of Manly; Aboriginal Sites Report*, Kate Blackmore and Associates.

Roads and Maritime Services (2011), *Procedure for Aboriginal and Cultural Heritage Consultation and Investigation*. Sydney.

Roads and Maritime Services (2015), *Standard Management Procedure: Unexpected Heritage Items*

Royal Haskoning DHV (2020), *Beaches Link and Gore Hill Freeway Upgrade Environmental Impact Statement - Technical working paper: Navigation Impact Assessment*.

Sefton, C (1996), *Sandstone overhangs and subsidence : monitoring rock art for effects of mining activities*.

SKM (2012), *Upgrading the Pacific Highway: Woolgoolga to Ballina Upgrade - Woodburn to Ballina Section - Aboriginal Cultural Heritage Assessment Report*, NSW Roads and Maritime Services, Aurecon, Sinclair Knight Merz, Sydney.

Soil Conservation Service of NSW (1966), *Soil Conservation Service of NSW*.

Stanbury, P (1979), *10,000 years of Sydney life: a guide to archaeological discovery*. Macleay Museum University of Sydney

Sydney Institute of Marine Science (2014), *Sydney Harbour: A systematic review of the science 2014*. Sydney Institute of Marine Science Technical Report

Transport for NSW (2019), *Western Harbour Tunnel and Warringah Freeway Upgrade Environmental Impact Statement*.

Worgan, G.B (1978), *Journal of a First Fleet surgeon*. Sydney, NSW: Library Council of New south Wales in association with Library of Australian History.

WSP Arup (2020), *Beaches Link and Gore Hill Freeway Connection Environmental Impact Statement – Technical working paper: Landscape Character and Visual Impact Assessment Report*.

Annexure A. Consultation



Transport
Roads & Maritime
Services

Invitation to Register

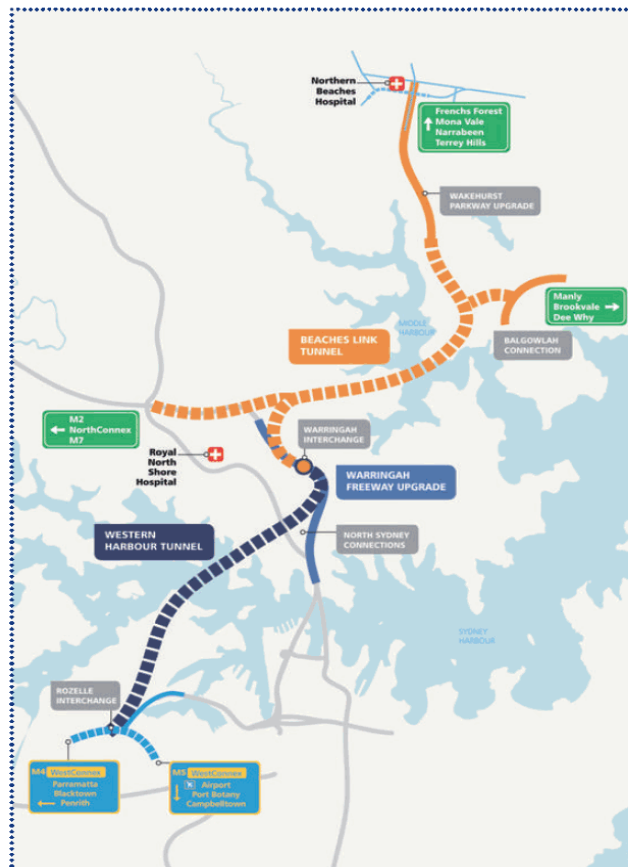
The NSW Government has announced the next stage of planning and the preferred route for the proposed Western Harbour Tunnel and Beaches Link. Western Harbour Tunnel would run from WestConnex at Rozelle Interchange, cross beneath Sydney Harbour and link with the Warringah Freeway at North Sydney. The Beaches Link would run from the Balgowlah area, cross under Middle Harbour and connect with the Warringah Freeway. Beaches Link includes east-west links to the Gore Hill Freeway, providing much need connectivity between economic zones such as Macquarie Park and the Northern Beaches.

Roads and Maritime Services invites Aboriginal people and Aboriginal groups that hold cultural knowledge relevant to determining the significance of Aboriginal objects and places for the Western Harbour Tunnel and Beaches Link Project to register to be consulted.

The proposal is likely to be subject to assessment and approval under Part 5.1 of the *Environmental Planning and Assessment Act 1979*. The purpose of this consultation is to inform the preparation of an Environmental Impact Statement for the proposal. Further information is provided on the following website www.rms.nsw.gov.au/projects/sydney-north/western-harbour-tunnel-beaches-link/index.html.

The proposal may result in Roads and Maritime Services:

- Applying for an Aboriginal Heritage Impact permit (AHIP) under Part 6 of the *National Parks and Wildlife Act 1974* and/or
- Undertaking investigations in accordance with the *Code of Practice for Archaeological Investigations* of Aboriginal Objects in New South Wales
- Undertaking an environmental impact assessment under the *Environmental Planning and Assessment Act 1979*.



To register your interest, please contact:
Andrew Costello
Jacobs Group Australia
Level 7, 177 Pacific Highway
NORTH SYDNEY NSW 2060
Email: andrew.costello@jacobs.com
Registrations must be received by phone or in writing by **Wednesday 28 June 2017**.

For more information please contact us on 1800 789 297, motorwaydevelopment@rms.nsw.gov.au or visit rms.nsw.gov.au.

A07322



Meeting Minutes

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Subject	Western Harbour Tunnel and Beaches Link Aboriginal Focus Group Meeting 1		
Project	WHTBL		
Project No.	IA146500	File	Document1
Prepared by	Chelsea Jones	Phone No.	[REDACTED]
Location	Old Northbridge Bowling Club, Warners Park, The Outpost	Date/Time	September 28, 2017
Participants	<p><u>RMS</u> - Lee Davison, Mike Reed, James Hay, Gemma Poppett <u>Jacobs</u> – Damian Williams, Alistair Carr, Andy Roberts, Andrew Costello and Chelsea Jones <u>RAP Groups</u>: Darleen Hoskins McKenzie (Bilinga, Gunyuu, Munyungu, Murrumbul and Wingikara), Ryan Johnson (Murrabidgee), Anthony Johnson (Murigael), Ricky Fields (Kamilaroi-Yakuntjara), Paul Boyd (Didge Ngunawal Clan).</p>		
Copies to	<p><u>RMS</u> - Lee Davison, Mike Reed, James Hay, Gemma Poppett <u>Jacobs</u> – Damian Williams, Alistair Carr, Andy Roberts, Andrew Costello and Chelsea Jones <u>RAP Groups</u>: Walbunja, Murramarang, Biamanga, Kamilaroi- Yankuntjatjara Working Group, Muragadi Heritage Indigenous Corporation. Murrabidgee Mullangari aboriginal Corporation Cultural Heitafe, Goobah Developments, Didge Ngunawal Clan, Darug Land Observations and Joanna Berte Davis.</p>	Apologies	<p>Jamie and Uncle Gordon from Darug Land Observations Pty Ltd Joanne Berte Davis</p>

Notes	Action
1 Acknowledgement to Country: Lee Davison, Roads and Maritime Aboriginal Cultural Heritage Officer	
2 Introduction & Apologies: Lee Davison, Roads and Maritime Aboriginal Cultural Heritage Officer	

Please select a legal entity from the Change Document Details option on the Jacobs ribbon
 1



Meeting Minutes

Western Harbour Tunnel and Beaches Link
 Aboriginal Focus Group Meeting 1
 September 28, 2017

Notes	Action
<p>3 Objectives of meeting: Lee Davison, Roads and Maritime Aboriginal Cultural Heritage Officer</p> <ul style="list-style-type: none"> • Objectives - Present an introduction and overview of the project, including a map and plan of the proposed project/study area. • Provide an opportunity for RMS, Jacobs and the Aboriginal parties to clearly define their roles, functions and responsibilities (This is also an opportunity for participants to discuss how they want future meetings held, such as preferred times, venues, terms of reference, etc) • Outline the impact assessment process - explain the EIS process and the relevant legislation. The investigations are being done in accordance with the <i>Code of practice for archaeological investigation of Aboriginal objects in NSW 2010</i>. SEARS may be defined later. • Discuss the draft methodology for the preparation of the cultural heritage assessment report and present the results of the preliminary site survey and the draft archaeological methodology. That is, the proposed method for undertaking further archaeological investigations and/or mitigation management as sent out with the letter of invitation. • Provide an opportunity for the Aboriginal parties to provide the names of knowledge holders in the community identify (including self-nomination), and raise and discuss any cultural concerns, perspectives and assessment requirements. Aboriginal parties may not wish to share information with other registered parties. RMS and Jacobs will respect the sensitive nature of the information provided, and will use this information in a manner agreeable to the provider. Contact details are provided at the end of the presentation should people wish to share or express information in a more private manner. • Discuss the need for a site visit to familiarise the Aboriginal parties with the scope of the project and the potential impacts on the study area. 	



Meeting Minutes

Western Harbour Tunnel and Beaches Link
 Aboriginal Focus Group Meeting 1
 September 28, 2017

Notes	Action
<ul style="list-style-type: none"> • Invite the Aboriginal parties to nominate people (including self-nomination) to be considered for engagement in the following archaeological roles: <ul style="list-style-type: none"> ○ Site officer. ○ Trainee site officer. • Advise the Aboriginal parties that participation as a registered party in the consultation process is separate to any engagement as a site officer. Payments will only be made to people who are engaged by RMS as Aboriginal site officers, or engaged by a consultant as a knowledge holder. Payment will not be made to Aboriginal parties as part of the general consultation process. Details regarding payments for the provision of services can be found in Appendix A. 	
<p>4 The Project – Design overview: Mike Reed, Roads and Maritime, Western Harbour Tunnel and Beaches Link design lead</p> <ul style="list-style-type: none"> • Looking at construction and environmental aspects. Discussing why we are implementing the project, when and where. Project design includes three main components: The Beaches link, the Western Harbour Tunnel and the Warringah Highway upgrade. • The Beaches Link connection extends from northern beaches to existing motorway network. The northern beaches are currently not strongly serviced by public transport. This Motorway connection which facilitate rapid transit buses. The approximate beaches travel time to the city center is 86 minutes. The construction of the Beaches link component of WHTBL will condenser this down to roughly 30 minutes. The Beaches hospital construction will most likely see the Beaches area become an urban centre and this will allow easier access to this as well as the wider French’s Forest area. The construction will facilitate quicker and more efficient transport from north to south routes and east to west routes to and from the northern beaches area. • Western Harbour tunnel links the westconnex and existing Harbour network. It will extend from North 	

1

3

Meeting Minutes



Western Harbour Tunnel and Beaches Link
 Aboriginal Focus Group Meeting 1
 September 28, 2017

Notes	Action
<p>Sydney corridor to connect to what will be the M4 M5 connection. Therefore, essentially creating an inaugural bypass of the city center. This is arranged to systemize same traffic flow so only people heading to the same area are going the same way.</p> <ul style="list-style-type: none"> • Significant upgrade to the Warringah freeway. Extends from the Sydney Harbour bridge to Harbour tunnel and up to Artarmon hill. Without upgrade to this area the WHTand BL connections would not be feasible. • Impacts of <i>transition from surface to tunnel</i> will be most severely impacted so close attention to environmental and cultural aspects of these areas are being focused on particularly. • Paleo valleys for the WHTBL necessitate a revised construction strategy compared to previous Sydney tunneling endeavors. Sediment levels are about 15m so not very deep but will allow some bulk fuel vessels. Sediment is not the sort of rock we can tunnel through. Appropriate sediment at 40-50m and we are not digging that low because this is the crossover area between rock and sediment. Still developing concept but essentially looking at using same technology as Sydney tunnel which was an immersed road connection. Investigating a range of technologies to use for this but the immersed road connection will facilitate the highest road alignment. Rock interfaces would be offshore at about 20metres. Birchgrove, Roselle and Waverton areas in particular will use the immersed tech. • Steel immersed tube unit will be fitted out on the inside and on the Harbour floor up to Balgowlah and Wakehurst parkway. • Depths for Northbridge area approximately 90m . • Burnt bridge creek 65m approximately • Harbour crossing 25m • Essentially the project will provide a separate orbital bypass so that traffic destination are diverted to the same way. • Scott Jefferies – enviro and Planning approvals: NSW government came out in March and said they were going to undertake preliminary investigation of 	



Meeting Minutes

Western Harbour Tunnel and Beaches Link
 Aboriginal Focus Group Meeting 1
 September 28, 2017

Notes	Action
<p>WHTBL. This involved: carrying out geotechnical investigations, going to market to talk to construction workers and finally community and stakeholder engagement.</p> <ul style="list-style-type: none"> Requirements for RMS and Jacobs were to compile an EIS. Currently in early days of the EIS process. Currently in process of preparing state significant structure applications. Looking at going back to government early next year and if we get the go ahead we will finish compiling EIS. 	
<p>5 Project planning and program: James Hay, Roads and Maritime, Western Harbour Tunnel and Beaches Link Project Director</p> <ul style="list-style-type: none"> Introduction of himself as the program director. 1980s there was talk about overlay for a surface motorway but delayed because tunneling was proposed as a more appropriate production avenue. Bus journeys and travel times are erratic for the beaches link area and this will facilitate efficacy of this. First tunnel added in 1990. Currently, if you want to go west or south you have to go over the bridge and this causes extensive congestion. The project will move most of this traffic from the CBD and will facilitate optimized connection of all the connecting areas. Public transport has limited availability so this will also facilitate more efficient private transport avenues. 	
<p>6 Field Survey report results and proposed Archaeological sub-surface methodology discussion: Andrew Costello, Jacobs Senior Archaeologist</p> <ul style="list-style-type: none"> 55 previously registered AHIMS sites within 300m of the study corridor. Most are rock art sites so because the project development is proposed underground tunneling these are unlikely to be impacted. Most will not be impacted at all but assessment of where exactly they were located was still necessary. The AHIMS site types include: middens, rock shelters and engravings. Being such a highly urbanized area there was once a lot of aboriginal heritage but a lot of this has since been destroyed. Therefore, the importance of these remaining sites is acknowledged. A lot of these sites were located on private property so not 	

Meeting Minutes



Western Harbour Tunnel and Beaches Link
 Aboriginal Focus Group Meeting 1
 September 28, 2017

Notes	Action
<p>all sites could be accessed but most/all sites in public area sites were re-identified. Some sites recorded have since been destroyed so could no longer be relocated. Stage 2 PACHI survey undertaken by qualified archaeologists from Jacobs and a representative Metro LALC. Assessment identified only 3 PADS that were still intact. Historical photography will be used to examine landscape and reformation processes of these PAD areas. Prior to development, the Artarmon PAD most likely was one entire pad but has been divided up owing to this development.</p> <ul style="list-style-type: none"> • Flat Rock Creek has the potential to maintain some sub-surface deposits. Also there is historical site associated with Henry Lawson in this area. • Burnt Bridge Creek retains some potential but is very modified by previous construction and now includes very dense scrub. Possible potential for grinding grooves but visibility for the area is quite low. Areas along creek bed and terracing also have the potential to hold deposits. • Wakehurst Parkway widening. Rock engravings present near here and the national park and manly dam. Walking and bush bike trails are fairly disturbed and thickly vegetated but we were able to view most engravings, however there are potential obscured ones also. In particular, horizontal sandstone bedrock potential for engraving. The methodology looks at how we might identify potential new engraving sites despite this low visibility. Any knowledge pertaining to sites within this area would be great. Tunnels may be indirectly impacted through vibration. Therefore, sites and rock shelters and deposits will be closely monitored. • Updating of site cards based on our investigation will also be undertaken. The methodology also recommends further investigation: looking into historic photographs, re-record these sites, monitor sites to ensure indirect impacts will be managed and avoid sites where possible. • The methodology also suggests shovel test probes will be inserted at intervals to see if there is an intact deposit and if any Aboriginal artefacts still remain. 	

Aboriginal cultural heritage assessment report

[EXTERNAL] WHTBL sub-surface testing - Message (HTML)

File Message Tell me what you want to do

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Tue 17/10/2017 2:40 PM

Phil Hunt <[REDACTED]> on behalf of AHO <[REDACTED]>

[EXTERNAL] WHTBL sub-surface testing

To: Jones, Chelsea (AU)

You forwarded this message on 18/10/2017 7:46 AM.


Hi

Just an informal email re the testing, the Aboriginal Heritage Office doesn't usually have involvement at this level for projects unless requested by a partnering Council.

From a quick look at the archaeological report, it did seem unusual to be doing excavations at the proposed locations, given the levels of past disturbance and the context (sandstone coastal country where open artefact scatters are uncommon). If you find anything, we'd be very interested in the results.

Regards

Phil



Kind Regards

Aboriginal Heritage Office

[REDACTED]

[REDACTED]

PH# [REDACTED]

[REDACTED]

Northern Beaches Council

Engravings Trail location of carvings close to Wakehurst Parkway - Message (HTML)

File Message Tell me what you want to do

Ignore Delete Reply Forward Meeting IM - More - Move Actions - Mark Unread Categorize Follow Up - Translate Related - Select - Zoom

Tue 10/10/2017 2:36 PM

joanne berte-davis <[REDACTED]>

Engravings Trail location of carvings close to Wakehurst Parkway

To: Jones, Chelsea (AU); Costello, Andrew

Hi Chelsea and Andrew,

When I looked through the the proposal my only concern was that I did not notice any reference to the Engravings Trail carvings.

I have dropped a pin on its location close to Wakehurst Parkway in Google maps.

I am concerned that it is preserved.

It is accessible at the end of Bantay Bay Rd French's Forest. About 100m down the trail on the right hand side there is a fence. Enter through the fence to get to it. It's on a large rockplatform. They are amazing. There are many carvings depicting fish, whale, sheldis, and other symbol's there was also a kangaroo but I couldn't find it this time. There has been some recent back burning in the area. Some of the carvings may have been damaged. There are also tyre tracks in the area.

I was made known of this area by one of my primary school teachers in the 1970's who took us there for a school excursion. About 5 years ago an aboriginal guide took us through and explained some of the significance of the site. He said it was a teaching place. Teaching about hunting and counting were some of the things he mentioned. I have also seen a picture outlining all of the carvings. I am unable to locate this as yet. It found a survey ? mark and a national parks and wildlife aboriginal carvings plaque. I have photographed these and will send you photos separately.

Is there any reason why they are not acknowledged in the proposal?

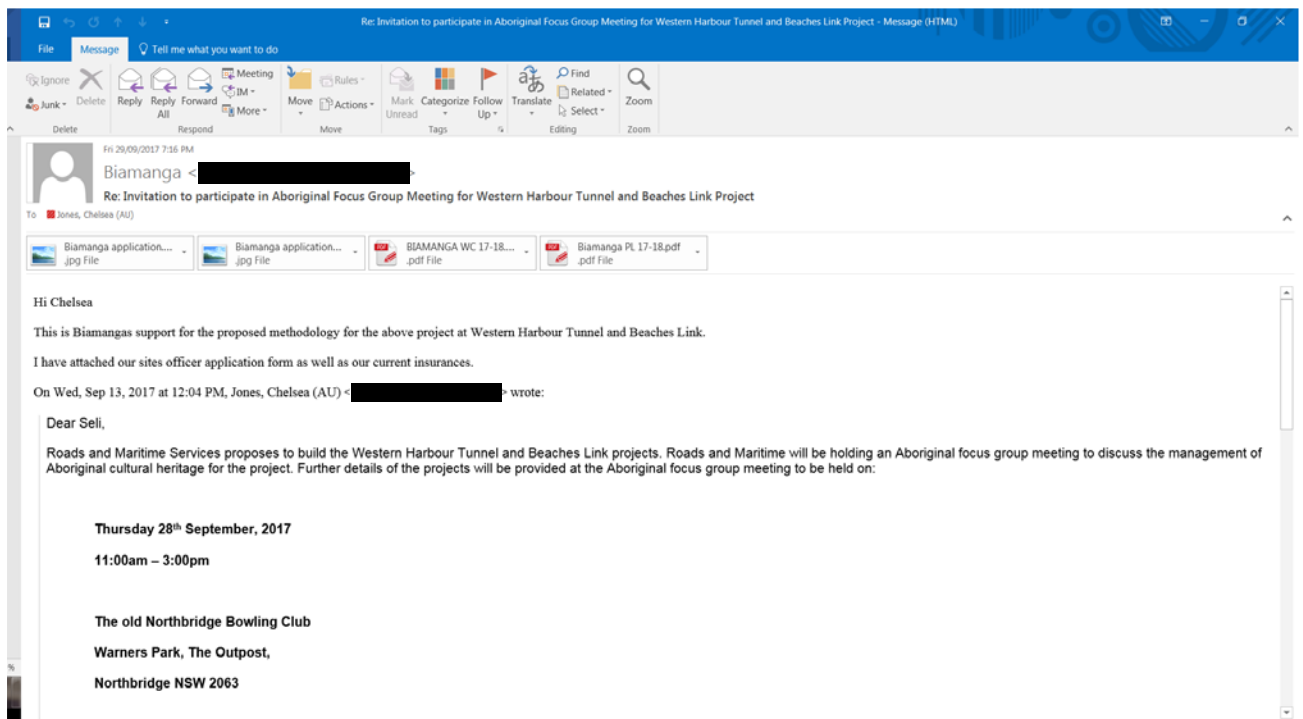
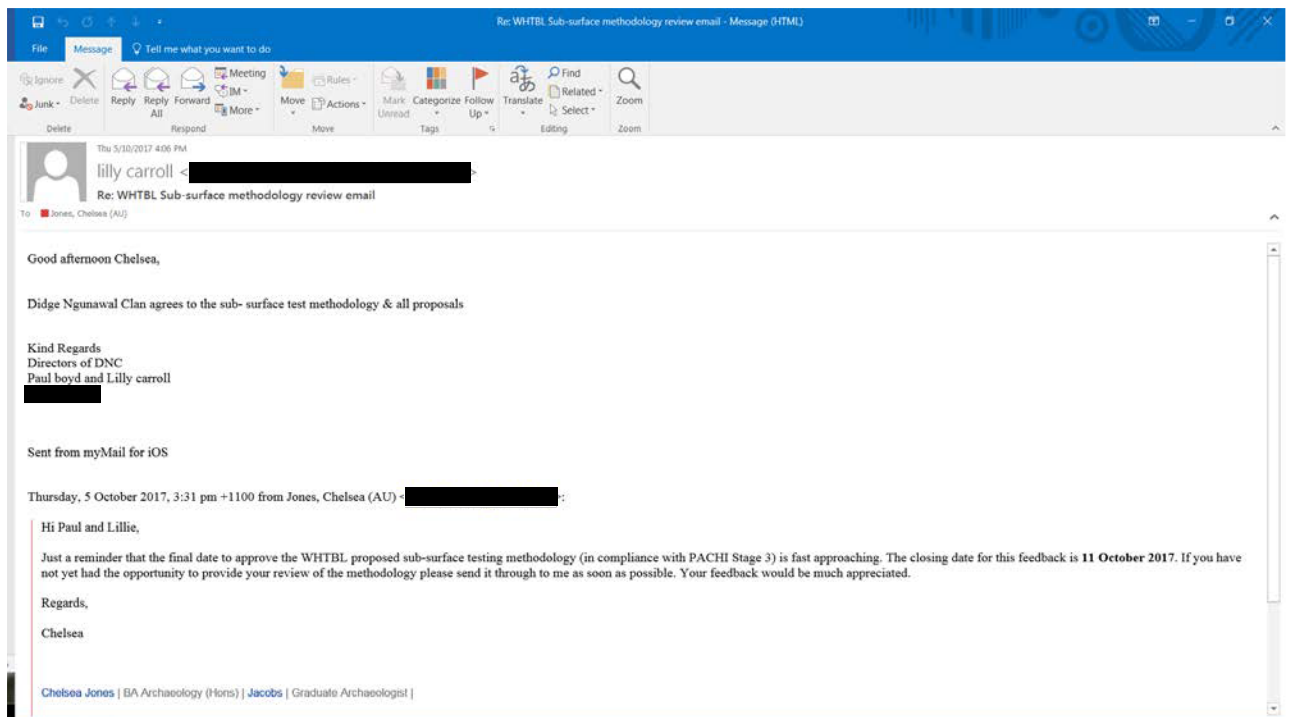
Yours sincerely

Joanne Berte-Davis

[REDACTED]

Engravings Trail, Frenchs Forest NSW 2086

<https://goo.gl/maps/ZJy2xmfvuWD2>





Murra Bidgee Mullangari

Aboriginal Corporation Cultural Heritage
ICN: 8112

Date: 9/10/2017

Attention: Chelsea Jones

Jacobs Australia Pty Ltd
Level 7, 177 Pacific Highway
North Sydney NSW2060

Dear Chelsea,

Re: Archaeological Methodology – Western Harbour Tunnel and Beaches Link

I have read the Archaeological methodology for the Western Harbour Tunnel and Beaches link and endorse the recommendations made by Jacobs Australia Pty Ltd.

If you require further details please feel free to contact me either by mobile or email. I look forward to hearing from you.

Kind regards

Darleen Carroll – Johnson | Administration – Site Officer

M: [REDACTED]

Ryan Carroll - Johnson | Site Officer

M: [REDACTED]

Murra Bidgee Mullangari

[REDACTED]

A: [REDACTED]

E: [REDACTED]



Department of Industry



Murra Bidgee Mullangari Aboriginal Corporation support their community in financial hardship with Energy Assistance packages. We are a NSW Government approved EAPA voucher distributor

Page 1 of 1

Ryan – [REDACTED] | Darleen – [REDACTED] | Email: [REDACTED]



**DARUG LAND
OBSERVATIONS PTY LTD
ABN 27 602 765 453**

EMAIL: [REDACTED]

MOBILE: [REDACTED]

26th September 2017

Chelsea Jones
[REDACTED]

Dear Chelsea,

RE: WESTERN HARBOUR TUNNEL & BEACHES LINK PROJECT

Archaeological Methodology

Darug Land Observations Pty Ltd has reviewed the archaeological methodology, and supports the methodology for the proposed Western Harbour Tunnel and Beaches Link Project.

In relation to the long-term storage of recovered artefacts, if any, Darug Land Observations Pty Ltd strongly believes recovered artefacts should be reburied on country (the study area).

Furthermore, Darug Land Observations Pty Ltd would be involved in the monitoring of the topsoil removal, test excavations and all other form of works to be carried out on the site.

Yours sincerely,

Jamie Workman
Darug Land Observations Pty Ltd

Uncle Gordon Workman
Darug Elder



Metropolitan Local Aboriginal Land Council

[Redacted]
Telephone: [Redacted] Fax: [Redacted]
[Redacted] Email: [Redacted]

Site Visit

Northern Beaches Links, Seaforth Oval and Wakehurst Parkway Project

Aboriginal Sites Officer MLALC: Kevin Telford

RMS: Lee Davison

On Friday 20th March 2020, I Kevin Telford as representative of Metropolitan Local Aboriginal Land Council participated in a site inspection survey at the above property to determine the purpose of identifying any Aboriginal sites of cultural and heritage values.

Aboriginal Heritage

There are no Aboriginal archaeological constraints to the proposed development on the residential premises of Northern Beaches Links, Seaforth Oval and Wakehurst Parkway Project, however works should proceed with caution as identified by MLALC representative.

In the unexpected circumstances that Aboriginal significant objects are exposed in the future activities should temporarily cease and OEH be contacted to advise on appropriate course of action and to allow MLALC representatives to record and collect the identified items.

Sites Inspections and discussion.

Aboriginal Site Officer of MLALC Kevin Telford



Transport
for NSW

AGENDA

Meeting title	Aboriginal focus group #2 – Beaches Link & Gore Hill Freeway Connection
Date and time	10am to 12pm, Tuesday 3 rd November
Venue	MS Teams
Facilitator	Mark Lester (TfNSW)

Item no.	Topic	Lead	Duration
	Acknowledgement to of Country	Mark Lester (TfNSW Aboriginal Cultural Heritage Officer)	5 min
1	Introduction & apologies	Mark Lester	5 min
2	Objectives of meeting	Mark Lester	5 min
3	The project – design overview	Beaches Link design lead	10 min
4	Project planning and program	Beaches Link planning lead	10 min
5	Aboriginal cultural heritage assessment report and proposed management strategy discussion	Andrew Costello, Jacobs Aboriginal heritage lead	10 mins
6	Community comments / cultural values	Aboriginal focus group stakeholders, Registered Aboriginal Party representatives	15 mins
7	General business and review of outcomes and actions	All	15 mins

AGENDA – BL AFG#2

To be held on 03 November 2020

1



Meeting Minutes

177 Pacific Highway
 North Sydney, NSW 2060
 Australia
www.jacobs.com

Subject Beaches Link Aboriginal Focus Group 2 (AFG2) Meeting, 3 November 2020
Project Beaches Link and Gore Hill Freeway Connection
Chair Deborah Swan
Location Microsoft Teams **Date:** 3 November 2020, 11am
Description Findings of the project’s draft ACHAR

Participants	Apologies
<p>[AC] Andrew Costello – EA Specialist [JC] Jamie Crawford – EA Specialist Coordinator [JE] Jamie Eastwood - Darug Aboriginal Cultural Heritage Assessments [JK] Jedda Khan - Kamilaroi - Yankuntjatjara Working Group [SF] Scott Franks - Tocomwall Pty Ltd [DS] Deborah Swan – TfNSW Aboriginal Cultural Heritage Officer [AN] Adam Noonan – TfNSW Planning Manager [KR] Kerry Radford – TfNSW Planning and Env. Officer [LS] Lucy Smith – TfNSW Planning and Env. Advisor [LG] Lisa Granqvist - TfNSW Planning and Env. Advisor [DG] Denis Gojak – TfNSW Senior Heritage Specialist [JS] Jodie Sale – TfNSW A/Senior Aboriginal Engagement Specialist [TK] Timothy Kwok – TfNSW Senior Community and Stakeholder Engagement Manager [JF] Jacinta Fuller – TfNSW Planning and Environment Coordinator</p>	<p>[CCT] Cherie Carroll Turrise - Gunjeewong Cultural Heritage [PB] Paul Boyd - Didge Ngunawal Clan [OK] Philip Khan - Kamilaroi - Yankuntjatjara Working Group [CS] Corey Smith – Callendulla [HTK] Hika Te Kowhai - Walburja [RS] Roxanne Smith – Murramarang [SS] Seli Storer – Biamanga [JW] Jamie Workman - Darug Land Observations Pty Ltd [GW] Gordon Workman - Darug Land Observations Pty Ltd [PPK] Philip Khan - Kamilaroi - Yankuntjatjara Working Group [RF] Ricky Fields - Kamilaroi - Yankuntjatjara Working Group [JJ] Jesse Johnson - Muragadi Heritage Indigenous Corporation [AJ] Anthony Johnson - Muragadi Heritage Indigenous Corporation [BS] Basil Smith - Goobah Developments [PB] Paul Boyd - Didge Ngunawal Clan [LC] Lillie Carroll - Didge Ngunawal Clan [DJ] Darleen Johnson - Aboriginal Corporation Cultural Heritage [RJ] Ryan Johnson - Aboriginal Corporation Cultural Heritage [DHM] Darlene Hoskins-McKenzie - Bilinga, Gunyuu, Munyungu, Murrumbul and Wingikara [ST] Selina Timothy - Metro Local Aboriginal Land Council</p>

Item	Description	Action	Date
1	Acknowledgement of Country		
1.1	Acknowledgement of Country provided by DS.	Note	-
2	Introduction and apologies		
2.1	DS offered apologies from Paul Boyd and Philip Khan (noting that Jedda Khan is attending).	Note	-
3	Objectives of meeting		
3.1	DS outlined that the objective of the meeting is to go through Aboriginal cultural heritage impacts and discuss any questions and concerns associated with the project.	Note	-
4	The project – design overview		
4.1	AN offered an apology on behalf of Transport for NSW regarding a misunderstanding in relation to accessing the draft ACHAR. This issue has now been rectified.	Note	-
4.2	AN provided a description of project, including the separation of the WHT and BL projects, design refinements including changes around Balgowlah Golf Course and design changes associated with the tunnel alignment.	Note	-



Meeting Minutes

Item	Description	Action	Date
5	Project planning and program		
5.1	AN provided an overview of design and project status, SEARs, including the requirements to consult and assess impacts, and outlined that the target date for exhibition is late 2020.	Note	-
6	Aboriginal cultural heritage assessment approach		
6.1	AC provided an overview of the approach to assessment. AC outlined an overview of the SEARs, PACHCI process, consultation requirements and assessment process undertaken. Focus has been on the avoidance of sites. AC provided an overview of the survey works carried out, in particular around Wakehurst Parkway.	Note	-
6.2	AC provided a description of AHIMS sites in relation to the project footprint. Approach has been to assess within 50 metres of the project area.	Note	-
6.3	AC outlined that PADs were identified at Artarmon Park and Flat Rock Creek.	Note	-
6.4	AC identified where the tunnel crosses under Middle Harbour and proximity to local AHIMS sites. AC provided a description of damage to AHIMS sites from third parties.	Note	-
6.5	AC identified that a PAD was identified at Burnt Bridge Creek and highlighted that damage to site 45-6-3032 was identified during site survey.	Note	-
6.6	Location of tunnel described. Overview of sites associated with Wakehurst Parkway. Description of survey work carried out by RAPs, including wet recording. Value of sites described. Description of difficulty accessing and locating site 45-6-0662 provided.	Note	-
7	Terrestrial Aboriginal cultural heritage assessment		
7.1	Overview of number of sites identified in study area provided.	Note	-
7.2	AC described the work undertaken by the survey team, particularly at night.	Note	-
7.3	AC described the excavation works undertaken at Artarmon Park PAD and provided a summary of the findings. 17 shovel test pits identified 15 stone artefacts.	Note	-
7.4	AC provided a description of the impact assessment approach adopted, including the approach to defining major, moderate, minor, negligible impacts.	Note	-
7.5	Summary of impact findings provided. Minor impact at site 45-6-0662 identified as a worst-case scenario.	Note	-
7.6	AC described the potential for a minor settlement impact at Clive Park (45-6-0654). Settlement impact of 20-25 millimetres identified. Description of potential impact at Wakehurst Parkway (45-6-0662), although site condition and location was unable to be confirmed as site was likely covered by gravel/vegetation.	Note	-
7.7	SF said he has decided to leave the meeting as Tocomwall has not been involved in any field surveys or testing and cannot comment. SF said he had only received access to the draft ACHAR today and as such he will require the 28-day consultation period. He intends on taking this point up with Heritage NSW. AN advised that correspondence accompanying release of the ACHAR had requested the RAPs to notify TfNSW if they had any issues accessing the draft ACHAR when the document was issued on 9 October, however TfNSW were not notified of this issue until last Friday when they reached out to SF.	Note	-

Item	Description	Action	Date
	AN offered to extend the consultation process by one week from 6 Nov to 13 November 2020 for all RAPs.		
7.8	AC presented findings from recent site inspection in September 2020 on site 45-6-3032 and detailed the significant damage observed.	Note	-
8	Potential submerged Aboriginal heritage sites assessment		
8.1	Overview of submerged sites assessment carried out by Cosmos Archaeology provided by AC.	Note	-
8.2	AC described the finding of the submerged sites assessment and proposed management measures.	Note	-
9	Environmental management		
9.1	AC highlighted that early assessment has assisted in avoiding sensitive areas. AC outlined that proposed updates to the Environmental Management Measures (EMMs) have been made since the draft ACHAR was issued with a view to strengthening these. AC offered to talk through the proposed changes with the RAPs. No participants requested to review the proposed changes to the EMMs. AC outlined that further consultation will be carried out in relation to site 45-6-0662 to determine an appropriate course of action for assessment and management.	Note	-
9.2	AC asked for any ideas from the RAPs with regard to heritage interpretation initiatives. No participants offered an opinion at this stage in the meeting (refer below for contribution by JE).	Note	-
10	Summary of key points and next steps		
10.1	Summary of issues raised and key points provided by AC.	Note	-
10.2	AC confirmed the draft ACHAR consultation will now be extended from 6 November 2020 to 13 November 2020, further to earlier comments and confirmation from TfNSW.	Note	-
11	Community comments / cultural values		
11.1	The opportunity for questions from participants was offered by AC. A discussion on the importance of heritage interpretation initiatives took place and led by AC. JE outlined that interpretation is an important part of the project and provides an opportunity to build acknowledgement, awareness, and reconciliation. JE mentioned that Songlines describe the cultural values in this area and the Clive Park suite of sites is of very high cultural significance. DS and AN also emphasised importance of interpretation as a means of educating and informing the wider community of Aboriginal cultural heritage. AC suggested that the Whale engravings are a significant feature of the project area and could be included in the interpretation strategy.	Note	-
11.2	JE raised concerns with regard to ongoing vandalism, damage and littering of AHIMS sites. JE felt strongly that these sites were being disrespected by the public and at each visit with his sons to share his culture, JE has had to clean up bottles and litter and is offended by vandalism. AC outlined that he intends to contact Council with regard to the littering and damage of sites, especially at Clive Park, and that Andy Roberts (Jacobs Archaeologist) has been closely monitoring the site and has notified council. AC offered to call JE following the call as the line was distorted so as to get further feedback on his issues raised.	Note	-
11.3	AC asked for any final comments, questions or inputs. None were offered. JE thanked those involved for a good presentation today.	Note	-



Meeting Minutes

Item	Description	Action	Date
11.4	Meeting concluded.	Note	-

Aboriginal cultural heritage assessment report

Aboriginal Focus Group Beaches Link and Gore Hill Freeway Connection project - Meeting

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Aboriginal Focus Group Beaches Link and Gore Hill Freeway Connection project

Kerry Radford <[redacted]> [Accept] [Tentative] [Decline] [Propose New Time] [More]

Required [redacted] Mon 19/10/2020 4:54 PM

Optional [redacted]

As the meeting organizer, you do not need to respond to the meeting.

20201103 Beaches Link AFG2 Agenda.pdf .pdf File

Tuesday, 3 November 2020 11:00 AM-1:00 PM Microsoft Teams Meeting

Good afternoon,

Transport for NSW is currently in the process of finalising the Beaches Link and Gore Hill Freeway Connection environmental impact statement and as part of this process, completed the draft Aboriginal cultural heritage assessment report, provided separately to this group via a link to nominated email addresses, as part of project consultation. This forms an integral component of the environmental impact statement and is required as part of our approvals under the *Environmental Planning & Assessment Act 1979*. This assessment considers the potential impact of the project on Aboriginal cultural heritage and outlines our proposed management strategies.

As part of this process we would like to invite you to attend the Aboriginal focus group to present findings from the document, seek feedback and any further cultural information and values relevant to the draft Aboriginal cultural heritage assessment report you think should be considered.

The Aboriginal focus group will be held on Tuesday 3 November 2020 from 10am – 12pm via Microsoft Teams. Please see details below. An agenda for this meeting is attached for your consideration.

Kind regards,
The Beaches Link Project team

Beaches Link draft Aboriginal Cultural Heritage Assessment Report - Message (HTML)

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Beaches Link draft Aboriginal Cultural Heritage Assessment Report

Kerry Radford <[redacted]> [Reply] [Reply All] [Forward] [More]

To [redacted] Fri 9/10/2020 5:49 PM

Cc whtbl

Electronic Data Room Use - October 2020 - Cultural Heritage Assessment R....pdf .pdf File

BL CHAR Review - comments.xlsx .xlsx File

Hi Basil,

With regards to your review of the Beaches Link Aboriginal Cultural Heritage Assessment Report, you should have received an email from Ansarada inviting you to access the data room. Note the subject heading is ***'Your access details to the Beaches Link and Gore Hill Freeway Connection – Draft Aboriginal Cultural Heritage Assessment Report dataroom'***.



You may need to check your junk folder. Please see attached electronic data room use document which may assist you.

Please use the attached comments sheet if you wish to provide comments on the draft Aboriginal Cultural Heritage Assessment Report. Comments are to be forwarded to whtbl@transport.nsw.gov.au by no later than Thursday 6th November 2020.

Can you please let the project know that you gained access to the room, or if you are having any trouble accessing this room or the report.

Kind regards,

The Beaches Link Project team
Motorways
Infrastructure and Place
Transport for NSW

Aboriginal cultural heritage assessment report

Wed 25/11/2020 12:16 PM
 Kerry Radford
 Beaches Link Aboriginal Cultural Heritage Assessment Report

To: whtbl

Good afternoon,

Further to the email below, please note that the consultation period for the Beaches Link Aboriginal Cultural Heritage Assessment Report closes on Monday. If you have not already provided comments, could you please do so by Monday 30 November.

Please let us know if you have any questions.

Regards,
 The Beaches Link project team

Transport for NSW



From: Kerry Radford
 Sent: Thursday, 12 November 2020 9:30 AM
 To: whtbl@transport.nsw.gov.au
 Subject: Beaches Link Aboriginal Cultural Heritage Assessment Report

Good morning,

Thank you to those who attended the Beaches Link Aboriginal Focus Group (AFG) meeting on Tuesday 3 November for the presentation of its Aboriginal Cultural Heritage Assessment Report (ACHAR) as part of the project's environment impact statement. We hope it was valuable and that you got a better appreciation of the ACHAR's assessment and its approach, outcomes and proposed mitigation measures. Please find attached for the meeting minutes and proposed amendments to mitigation measures in track changes for your consideration. The mitigation measures were discussed in the meeting and are proposed to be amended to strengthen project requirements. The meeting minutes and proposed mitigation measures will be incorporated into the final ACHAR.

For those not able to attend, it was advised at the AFG that the consultation period for reviewing the ACHAR was extended to Friday 13 November 2020 due to a misunderstanding in relation to accessing the ACHAR, which has now been rectified. The project team at Transport for NSW would like to apologise to all parties for any inconvenience.

Subsequent to this, Transport for NSW has now further extended the consultation period to Monday 30 November.

Could you please forward any comments to whtbl@transport.nsw.gov.au by Monday 30 November.

Again, please let us know if you have any issues, or any issues accessing the report and we look forward to your feedback.

Regards,

The Beaches Link project team

Transport for NSW



Sun 11/10/2020 4:21 PM
 James Eastwood
 Re: Beaches Link draft Aboriginal Cultural Heritage Assessment Report

To: Kerry Radford

You replied to this message on 11/10/2020 4:28 PM.

Message: Electronic Data Room Use - October 2020 - Cultural Heritage Assessment R...pdf (453 KB) | BL CHAR Review - comments.xlsx (11 KB)



Dear Kerry
 I have successfully gain access to the Beaches Link and Gore Hill freeway connection Draft Aboriginal Cultural Heritage Report . Thank you for providing this report to ARAGUNG Aboriginal Cultural Heritage site Assessments .
 kind regards
 ARAGUNG
 Jamie Eastwood

Tue 20/10/2020 10:00 AM
 Cullendulla
 Re: Aboriginal Focus Group Beaches Link and Gore Hill Freeway Connection project

To: Kerry Radford

You replied to this message on 25/10/2020 9:04 AM.

Please keep me informed of any further developments

On Mon, Oct 19, 2020 at 4:54 PM Kerry Radford <[redacted]> wrote:

Good afternoon,

Transport for NSW is currently in the process of finalising the Beaches Link and Gore Hill Freeway Connection environmental impact statement and as part of this process, completed the draft Aboriginal cultural heritage assessment report, provided separately to this group via a link to nominated email addresses, as part of project consultation. This forms an integral component of the environmental impact statement and is required as part of our approvals under the *Environmental Planning & Assessment Act 1979*. This assessment considers the potential impact of the project on Aboriginal cultural heritage and outlines our proposed management strategies.

As part of this process we would like to invite you to attend the Aboriginal focus group to present findings from the document, seek feedback and any further cultural information and values relevant to the draft Aboriginal cultural heritage assessment report you think should be considered.

The Aboriginal focus group will be held on Tuesday 3 November 2020 from 10am – 12pm via Microsoft Teams. Please see details below. An agenda for this meeting is attached for your consideration.

Kind regards,
 The Beaches Link Project team

Aboriginal cultural heritage assessment report

 Tue 20/10/2020 10:26 AM
Murrumbidgee <[redacted]>
Re: Aboriginal Focus Group Beaches Link and Gore Hill Freeway Connection project
To: Kerry Radford
You replied to this message on 21/10/2020 9:03 AM

Please keep us informed of any further developments

On Mon, Oct 19, 2020 at 4:54 PM Kerry Radford <[redacted]> wrote:

Good afternoon,

Transport for NSW is currently in the process of finalising the Beaches Link and Gore Hill Freeway Connection environmental impact statement and as part of this process, completed the draft Aboriginal cultural heritage assessment report, provided separately to this group via a link to nominated email addresses, as part of project consultation. This forms an integral component of the environmental impact statement and is required as part of our approvals under the *Environmental Planning & Assessment Act 1979*. This assessment considers the potential impact of the project on Aboriginal cultural heritage and outlines our proposed management strategies.

As part of this process we would like to invite you to attend the Aboriginal focus group to present findings from the document, seek feedback and any further cultural information and values relevant to the draft Aboriginal cultural heritage assessment report you think should be considered.

The Aboriginal focus group will be held on Tuesday 3 November 2020 from 10am – 12pm via Microsoft Teams. Please see details below. An agenda for this meeting is attached for your consideration.

Kind regards,
The Beaches Link Project team

 Fri 20/11/2020 2:53 PM
Cullendulla <[redacted]>
Re: Beaches Link Aboriginal Cultural Heritage Assessment Report
To: Kerry Radford
You forwarded this message on 20/11/2020 2:54 PM.

This is to confirm that we support the environment management measures and wish to be kept informed of any further developments

On Thu, Nov 12, 2020 at 9:30 AM Kerry Radford <[redacted]> wrote:

Good morning,

Thank you to those who attended the Beaches Link Aboriginal Focus Group (AFG) meeting on Tuesday 3 November for the presentation of its Aboriginal Cultural Heritage Assessment Report (ACHAR) as part of the project's environment impact statement. We hope it was valuable and that you got a better appreciation of the ACHAR's assessment and its approach, outcomes and proposed mitigation measures. Please find attached for the meeting minutes and proposed amendments to mitigation measures in track changes for your consideration. The mitigation measures were discussed in the meeting and are proposed to be amended to strengthen project requirements. The meeting minutes and proposed mitigation measures will be incorporated into the final ACHAR.

For those not able to attend, it was advised at the AFG that the consultation period for reviewing the ACHAR was extended to Friday 13 November 2020 due to a misunderstanding in relation to accessing the ACHAR, which has now been rectified. The project team at Transport for NSW would like to apologise to all parties for any inconvenience.

Subsequent to this, Transport for NSW has now further extended the consultation period to Monday 30 November.

Could you please forward any comments to whtbl@transport.nsw.gov.au by Monday 30 November.

Again, please let us know if you have any issues, or any issues accessing the report and we look forward to your feedback.

Regards,

The Beaches Link project team

Transport for NSW

Aboriginal cultural heritage assessment report

Thu 3/11/2020 2:18 PM
Darleen Johnson <[REDACTED]>
Re: Beaches Link draft Aboriginal Cultural Heritage Assessment Report

whbl

You forwarded this message on 1/12/2020 9:33 AM.

Message: Electronic Data Room Use - October 2020 - Cultural Heritage Assessment R..pdf (453 KB) | EL CHAR Review - comments.xlsx (11 KB)

Hi Kerry
I have read the project information and draft ACHAR for the above project, I endorse the recommendations made.
Kind regards
Darleen Johnson
[REDACTED]

On Friday, 9 October 2020, 05:48:13 pm AEDT, Kerry Radford <[REDACTED]> wrote:

Hi Ryan,


With regards to your review of the Beaches Link Aboriginal Cultural Heritage Assessment Report, you should have received an email from Anarada inviting you to access the data room. Note the subject heading is "Your access details to the Beaches Link and Gore Hill Freeway Connection – Draft Aboriginal Cultural Heritage Assessment Report dataroom".

You may need to check your junk folder. Please see attached electronic data room use document which may assist you.

Please use the attached comments sheet if you wish to provide comments on the draft Aboriginal Cultural Heritage Assessment Report. Comments are to be forwarded to whbl@transport.nsw.gov.au by no later than Thursday 6th November 2020.

Can you please let the project know that you gained access to the room, or if you are having any trouble accessing this room or the report.

Kind regards,
The Beaches Link Project team
Motorways
Infrastructure and Place
Transport for NSW



Thu 20/11/2020 4:49 PM
Murramarang <[REDACTED]>
Re: Beaches Link Aboriginal Cultural Heritage Assessment Report

Kerry Radford

You forwarded this message on 20/11/2020 5:01 PM.

I support the environmental management measurements of this proposal

On Thu, Nov 12, 2020 at 9:30 AM Kerry Radford <[REDACTED]> wrote:

Good morning,

Thank you to those who attended the Beaches Link Aboriginal Focus Group (AFG) meeting on Tuesday 3 November for the presentation of its Aboriginal Cultural Heritage Assessment Report (ACHAR) as part of the project's environment impact statement. We hope it was valuable and that you got a better appreciation of the ACHAR's assessment and its approach, outcomes and proposed mitigation measures. Please find attached for the meeting minutes and proposed amendments to mitigation measures in track changes for your consideration. The mitigation measures were discussed in the meeting and are proposed to be amended to strengthen project requirements. The meeting minutes and proposed mitigation measures will be incorporated into the final ACHAR.


For those not able to attend, it was advised at the AFG that the consultation period for reviewing the ACHAR was extended to Friday 13 November 2020 due to a misunderstanding in relation to accessing the ACHAR, which has now been rectified. The project team at Transport for NSW would like to apologise to all parties for any inconvenience.

Subsequent to this, Transport for NSW has now further extended the consultation period to Monday 30 November.

Could you please forward any comments to whbl@transport.nsw.gov.au by Monday 30 November.

Again, please let us know if you have any issues, or any issues accessing the report and we look forward to your feedback.

Regards,
The Beaches Link project team
Transport for NSW



Aboriginal cultural heritage assessment report

From: James Eastwood [mailto:]
Sent: Monday, 30 November 2020 7:56 AM
To: whtbl <whtbl@rms.nsw.gov.au>
Subject: Beaches Link



To Whom it may concern

Thank you for sharing information RE: Beaches Link Project to Aragung Aboriginal cultural heritage Site Assessment, our Organisation has reviewed this information and supports and agrees with the methodology and mitigation measures put in place.

As the project is associated closely to known Aboriginal sites, our organisation would like to recommend that a form of interpretation also be included into works, to not only acknowledge and highlight the importance of these sites - but to also make the wider community aware of its local Aboriginal history.

We would also like to recommend a maintenance plan for the upkeep and particularly the removal of rubbish around these sites. It has become particularly culturally upsetting and offensive when I have visited these sites and seen them trashed with beer cans, graffiti and other forms of rubbish.

In the past I have personally removed rubbish and cleaned up around the area of these sites, as they hold a great spiritual cultural connection and provide a direct link to my First Nation Heritage. Just as these sites are immensely significantly important to First Nation People they should also be considered to be just as important as part of all of Australia's history and heritage, and deserve to be treated with the cultural respect in which they were held by Aboriginal peoples of the present and past.

Kind Regards
ARAGUNG
Jamie Eastwood



Wed 27/12/2020 11:45 AM
Kerry Radford
RE: Beaches Link
To: James Eastwood
Cc: whtbl

Hi Jamie,

Thank you for your feedback on the ACHAR.

We are pleased ARAGUNG agrees with the methodology and mitigation measures proposed in the ACHAR.

In terms of your suggestion for an Aboriginal heritage interpretation to be included as part of the project, Transport for NSW agrees this is an important way of acknowledging Aboriginal heritage and raising awareness in the community. We have recently added a new environmental management measure to the final ACHAR which commits to an Aboriginal heritage interpretation strategy as follows:

AH7 - As part of the project urban design and landscape plan, an Aboriginal heritage interpretation strategy will be developed for the project in consultation with Registered Aboriginal Parties and other relevant Stakeholders. Appropriate Aboriginal heritage interpretation will be incorporated into the project urban design and landscape plan in accordance with the interpretation strategy.

As for the recommendation to implement a maintenance plan, Transport for NSW acknowledges the presence of rubbish and graffiti at Aboriginal sites is offensive and disrespectful to Aboriginal people and their cultural connection to the sites. These sites are an immensely important part of Australia's history and heritage and deserve to be culturally respected. Whilst Transport for NSW will consider the recommendation, as well as other strategies like it with a similar objective, there are unfortunately limitations with a maintenance plan as the majority of sites are located on land not owned or managed by Transport for NSW. As a minimum, the commitment to an Aboriginal heritage interpretation strategy, as well as the urban design and landscape plan will consider maintenance options and appropriate measures to mitigate the concerns raised.

Thank you again for your feedback on the ACHAR and your participation in the project consultation to date.

Regards,

The Beaches Link Project Team



Metropolitan Local Aboriginal Land Council

[Redacted]

Telephone: [Redacted]

Email: [Redacted]

Kerry Radford
Planning and Environment Officer
Motorways
Transport for NSW
NSW Government

Dear Kerry

Beaches Link and Gore Hill Freeway Connection Project

On-site Archaeological Monitoring (during upgrade works): MLALC would highly recommend one of our Aboriginal Sites Officer or myself as the Cultural Heritage Officer to be present if and when works commence with an archaeologist in the case any future monitoring is required once works commence on this project.

Regarding questions raised below we provide the following:

If the sites have Aboriginal cultural values, and if there are any important stories or cultural knowledge associated with the sites that requires consideration.

Each sites is of extreme high cultural value for the Gadigal and its neighbours given it is part of the locality where the Gadigal's collective neighbours an surrounding neighbours gathered together in the past on different sites.

MLALC respectfully requests to be engaged for any on-site archaeological monitoring during the upgrade works that occur.

The Importance of Preserving and Restoring, Engraving Sites, Rock Shelters, Middens, Grinding grooves and Burial sites. Cultural Significant Sites. Consultation Process

- Providing relevant information about Cultural significance and values of Aboriginal objects and/or places.
- Influencing the design of the method to assess cultural and scientific significance of Aboriginal objects and/or places.
- Actively contributing to the development of Cultural Heritage management options and recommendations for any Aboriginal objects and/or places within the proposed subject area.
- Commenting on draft assessment reports before they are submitted by the proponent to the DPIE Aboriginal people have used the area in the past as important place of camping, hunting, trading, ceremonies and gatherings. The indication of Aboriginal occupations within the vicinity is obvious with the surrounding landscape usage such as the important significance sites around the harbour and coves.

The significance for Aboriginal people past and presents remains in Custodianship in our caring and monitoring of Sites. All parts of Sydney hold cultural ties especially the Harbor area and its coves and waterways and so it is our Cultural and Heritage obligations for the preservation and conservation of cultural significance Sites as we are affiliated to our connection to country both on Land and at Sea. Culture and Heritage aims to encourage and empower Aboriginal communities to protect, conserve and restore cultural landscapes and waterways that are of

importance to local Aboriginal communities. Ensuring secure traditional connections to country both on Land and at Sea. The Consultation and support in strengthening of Connection to Country and Management of Country is vital. Development and enrichment of working partnerships together with Metropolitan Local Aboriginal Land Council, Office of Environment and Heritage and Transport NSW as well as with Heritage consultants, Archaeologists and RAPS.

Aboriginal Cultural Heritage Management Recommendations:

- Bring together various stakeholders and groups to work collectively towards the goal and aims of Aboriginal Cultural Heritage management.
- Use cultural awareness training to reinforce contractors, businesses and community understanding of Aboriginal sites.
- Ensure Aboriginal sites are regularly monitored and maintained. The maintenance and monitoring of sites should be done by Cultural Heritage officers in collaboration with the local Aboriginal community.

Assessment of Identified Values Summary of Cultural Value- The MLALC have provided the following information on social and/or Cultural Values Historic Value- The MLALC have provided the following information on historic values.

As a general recommendation from MLALC if Human burials or remains and or cultural materials are unearthed during any stages and are exposed standard stop-work procedures and protocols should be followed and to be advised to contact appropriate authorities and if suspected to be of Aboriginal origin the Heritage Community Engagement Department of Premier and Cabinet and MLALC to be contacted and need to be notified of the discovery immediately. Cultural significance objects found during works carried out should be Cared, respected, and recorded in a correct manner in accordance with guidelines. After proposed development is finalized MLALC suggests that the landscapes of native vegetation to be planted and suggestions of known clan name an Aboriginal language names be used for places, animals and plants. MLALC encourages that Aboriginal language be utilized in any naming conventions or outputs that may occur and stem from the project and MLALC to be notified and made aware of wordings on interpretive signage. Also suggestions of any forms of Art works that may highlight and be used in some areas.

If you require further information, please do not hesitate in contacting the MLALC Office for assistance.

Regards

Selina Timothy Cultural Heritage Officer at MLALC
Metropolitan Local Aboriginal Land Council



Aboriginal cultural heritage assessment report



Thu 3/12/2020 9:35 AM

Kerry Radford

RE: Beaches Link Aboriginal Cultural Heritage Assessment Report

To Cultural Heritage

Cc whtbl@transport.nsw.gov.au

Message ACHAR Issue raised by Metro LALC - TfNSW response 02122020.pdf (173 KB)

Hi Selina,

Thank you for your email.

Please find attached a response to your issues raised.

Regards,

The Beaches Link project team



Issue raised by Metro LALC	Transport for NSW response
<p>Site inspections</p> <ul style="list-style-type: none"> On-site Archaeological Monitoring (during upgrade works): MLALC would highly recommend one of our Aboriginal Sites Officer or myself as the Cultural Heritage Officer to be present if and when works commence with an archaeologist in the case any future monitoring is required once works commence on this project. MLALC respectfully requests to be engaged for any on-site archaeological monitoring during the upgrade works that occur. 	<p>The ACHAR has a number of environmental management measures to address the issue raised by Metro LALC as follows:</p> <ul style="list-style-type: none"> Environmental management measure AH1 requires that before the start of construction, further consultation with Heritage NSW, the Metro Local Aboriginal Land Council, the Aboriginal Heritage Office and the Registered Aboriginal Parties should be carried out to decide an appropriate course of action for the Aboriginal site 45-6-0662 on Wakehurst Parkway, as the location and condition of this site could not be confirmed during field inspection as the site is likely covered by gravel/vegetation. In the absence of confirming the site, if during construction works a site is located, the unexpected finds protocol prescribed in AH5 would apply. Further, Heritage NSW, an appropriately qualified archaeologist and the Metro Local Aboriginal Land Council will be contacted and the site will be re-recorded in situ. Environmental management measure AH4 requires that where vibration monitoring identifies that vibration levels exceed 2.5 millimetres per second, or following vibration intensive activities, subsequent condition survey of AHIMS sites that are subject to monitoring in AH3 will be carried out. The surveys will be carried out by a suitably qualified person and include a Metro Local Aboriginal Land Council representative. Environmental management measure AH5 requires that if at any time during the construction of the project, any items of potential Aboriginal archaeological or cultural heritage conservation significance or Ancestral remains are discovered, they should be managed in accordance with the <i>Standard Management Procedure: Unexpected Heritage Items</i> (Road and Maritime, 2015a). The unexpected finds procedure requires that Heritage NSW be notified if an unexpected find is discovered during construction.
<p>Consultation Process</p> <ul style="list-style-type: none"> Bring together various stakeholders and groups to work collectively towards the goal and aims of Aboriginal Cultural Heritage management. Providing relevant information about Cultural significance and values of Aboriginal objects and/or places. Influencing the design of the method to assess cultural and scientific significance of Aboriginal objects and/or places. Actively contributing to the development of Cultural Heritage management options and recommendations for any Aboriginal objects and/or places within the proposed subject area. Commenting on draft assessment reports before they are submitted by the proponent to the DPIE 	<p>Transport for NSW's agrees that consultation should bring together various stakeholders and groups to work collectively towards the goal and aims of Aboriginal Cultural Heritage management.</p> <p>Transport for NSW's approach to consultation is set out in the Procedure for Aboriginal and Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime Services, 2011). The PACHCI been used to form the ACHAR and project consultation. Registered Aboriginal Parties have been given the opportunity to comment on the ACHAR and attend Aboriginal Focus Groups, and Metro MLALC has been invited to attend field inspections. This process has provided relevant information about Aboriginal cultural significance and allowed RAPs input into the design on the assessment methodology. The ACHAR and environmental management measures have received support from numerous RAPs. The consultation period for the ACHAR has resulted in consultation prior to the environmental impact statement going on exhibition and prior to assessment by DPIE.</p>
<p>Cultural Awareness</p> <ul style="list-style-type: none"> Use cultural awareness training to reinforce contractors, businesses and community understanding of Aboriginal sites. 	<p>Cultural awareness is important to Transport for NSW and has been addressed as follows:</p> <ul style="list-style-type: none"> Environmental management measure AH6 requires that cultural and historic heritage awareness training will be carried out for personnel engaged in work that may impact heritage items before commencing works for the project. Environmental management measure AH7 has been added to the final ACHAR and requires that as part of the project urban design and landscape plan, an Aboriginal heritage interpretation strategy will be developed for the project in consultation with Registered Aboriginal Parties and other relevant Stakeholders. Appropriate Aboriginal heritage

Issue raised by Metro LALC	Transport for NSW response
	<p>interpretation will be incorporated into the project urban design and landscape plan in accordance with the interpretation strategy. Businesses and the community will have the opportunity to comment on the urban design and landscape plan. The Aboriginal heritage interpretation for the project will inform and educate the community on Aboriginal cultural heritage issues.</p>
<p><i>Site Maintenance</i></p> <ul style="list-style-type: none"> Ensure Aboriginal sites are regularly monitored and maintained. The maintenance and monitoring of sites should be done by Cultural Heritage officers in collaboration with the local Aboriginal community. 	<p>Whilst Transport for NSW will consider the recommendation, as well as other strategies like it with a similar objective, there is unfortunately limitations with implementing maintenance measures as the majority of AHIMs sites are located on land not owned or managed by Transport for NSW. As a minimum, the commitment to an Aboriginal heritage interpretation strategy, as well as the urban design and landscape plan will consider maintenance options and appropriate measures to mitigate the issue raised.</p>
<p><i>Unidentified Finds</i></p> <ul style="list-style-type: none"> As a general recommendation from MLALC, if Human burials or remains and or cultural materials are unearthed during any stages and are exposed standard stop-work procedures and protocols should be followed and to be advised to contact appropriate authorities and if suspected to be of Aboriginal origin the Heritage Community Engagement Department of Premier and Cabinet and MLALC to be contacted and need to be notified of the discovery immediately. Cultural significance objects found during works carried out should be Cared, respected, and recorded in a correct manner in accordance with guidelines. 	<p>Environmental management measure AH5 requires that if at any time during the construction of the project, any items of potential Aboriginal archaeological or cultural heritage conservation significance or Ancestral remains are discovered, they should be managed in accordance with the <i>Standard Management Procedure: Unexpected Heritage Items</i> (Road and Maritime, 2015a). The unexpected finds procedure requires that Heritage NSW be notified.</p> <p>The requirements of <i>Standard Management Procedure: Unexpected Heritage Items</i> (Road and Maritime, 2015a) will ensure that due care and respect is taken and any cultural significant objects found are recorded in accordance with relevant guidelines.</p>
<p><i>Interpretation Strategy</i></p> <ul style="list-style-type: none"> After proposed development is finalized MLALC suggests that the landscapes of native vegetation to be planted and suggestions of known clan name an Aboriginal language names be used for places, animals and plants. MLALC encourages that Aboriginal language be utilized in any naming conventions or outputs that may occur and stem from the project and MLALC to be notified and made aware of wordings on interpretive signage. Also suggestions of any forms of Art works that may highlight and be used in some areas. 	<p>Transport for NSW supports the inclusion of an Aboriginal heritage interpretation strategy for the project. Environmental management measure AH7 has been added to the final ACHAR and requires that as part of the project urban design and landscape plan, an Aboriginal heritage interpretation strategy will be developed for the project in consultation with Registered Aboriginal Parties and other relevant Stakeholders. Appropriate Aboriginal heritage interpretation will be incorporated into the project urban design and landscape plan in accordance with the interpretation strategy. As required by the AH7, as a registered Aboriginal party, MLALC will be consulted during this process, and Transport for NSW encourages MLALC to participate in discussion at that time around appropriate naming conventions and signage for the project as detailed plans for Aboriginal heritage interpretation are formed.</p>

Application Name: Eora People
 Application (NNTT) No: NC98/10
 Application (Fed Crt) No: NG6099/98
 State: NSW
 Region: NSW/ACT
 Date Application Made: 01/05/98
 Date Registration Test: 02/05/99
 Decision made:
 Decision: Not Accepted
 Decision Type: Abbreviated Decision

Information relevant to the Decision

The delegate has considered all information and documents in the working/registration test files for NC 95/9; NC96/11; NC 98/9; NC 98/10; NC 98/11 and NC98/12.

In relation to each application:

The Tribunal wrote to the applicants on 1 October 1998 regarding the requirements of the registration test and advising that the further information or amendments were required by 1 January 1999.

The applicants wrote to the Tribunal on 20 January 1999 requesting an extension for 6 weeks. The Tribunal wrote to the applicants on 25 January 1999 granting an extension to 12 March 1999.

In relation to NC 98/11 only the Tribunal also wrote to the applicants on 3 March 1999 providing a preliminary assessment of the application against the conditions of the registration test and sought further information or amendments from the applicants by 19 March 1999.

The applicants wrote to the Tribunal on 8 March 1999, seeking a further extension until 1 April 1999, which was granted.

The applicants wrote to the Tribunal on 30 March 1999 seeking a further extension until 14 April 1999, which was granted on 31 March 1999 with the condition that any further extensions would only be granted upon the Registrar or his delegate seeing proof of the applicants' ability to engage with the registration process, which could be evidenced by a draft of the proposed amended application.

The Tribunal wrote to the applicants on 20 April 1999, noting that no further information or amendments had been received, and advising that unless further information or amendments were received by 27 April 1999 the Registrar's delegate would proceed to consider the applications for registration.

The applicants wrote to the Federal Court, cc the Tribunal, on 14 April 1999 seeking a further extension until 15 June 1999. That request for an extension was not approved and the Registrar's delegate proceeded to apply the conditions of the registration test.

Reasons for Decision

1. The applications have not been amended, nor has additional information been provided, nor things done, in order that it might satisfy the provisions of the amended Native Title Act 1993 relating to registration.
2. There has been generally no attempt to satisfy the formal and procedural conditions as set out in 190C(2), 190C(4) and 190C(5).

3. In particular, the applicants have not provided affidavits (as specified in 62(1)(a)) and as required for the satisfaction of 190C(2). I do not accept that the affidavits lodged with the original applications satisfy the full substantive requirements of s62(1)(a)(i) to s62(1)(a)(v).

4. Further, the applicants have not provided evidence that the applications have been certified by each representative Aboriginal /Torres Strait Islander body that could certify the applications (as set out in 190C(4)(a)). In the alternative, the applicants have not provided evidence that the applicant(s) is a member of the native title claim group and is authorised to make the applications and to deal with matters arising in relation to them, by all the other persons in the native title claim group (that is, to satisfy the requirements as set out in 190C(4)(a) and 190C(4)(b)).

5. Finally, the applicants have not supplied a statement to the effect that the requirement set out in paragraph 190C(4)(b) has been met, and that sets the grounds on which the Delegate should consider that it has been met. For this reason I am not satisfied that the conditions in subsection 190C(4) is met.

6. Given the failure in respect to 190C(2) and 190C(4) I have not considered it necessary to apply the test in respect to the merits questions in 190B.

DECISION

The applications ARE NOT ACCEPTED for registration pursuant to s190A of the *Native Title Act 1993*

Written notice of the decision and the reasons for the decision, are to be provided to the applicant and to the Federal Court, in accordance with s190D of the *Native Title Act*.



Extract from the National Native Title Register

Determination Information:

Determination Reference: Federal Court Number(s): NSD6003/2000
NNTT Number: NND2001/001

Determination Name: Metropolitan Local Aboriginal Land Council

Date(s) of Effect: 23/05/2001

Determination Outcome: Native title does not exist

Register Extract (pursuant to s. 193 of the *Native Title Act 1993*)

Determination Date: 23/05/2001

Determining Body: Federal Court of Australia

ADDITIONAL INFORMATION:

Not Applicable

MATTERS DETERMINED:

Native title does not exist in relation to land situated at Forestville known as Lots 8,9,10 and 11 Bantry Bay Road Forestville.

Note: The National Native Title Register may, in accordance with s. 195 of the Native Title Act 1993, contain confidential information that will not appear on the Extract.



Extract from Schedule of Native Title Applications

Application Reference: Federal Court number: NSD6061/1998
NNTT number: NC1997/008

Application Name: Darug Tribal Aboriginal Corporation

Application Type: Claimant

Application filed with: National Native Title Tribunal

Date application filed: 12/05/1997

Current status: Discontinued - 08/03/2011

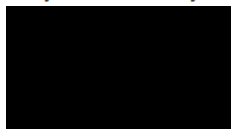
Registration information: Please refer to the Register of Native Title Claims/National Native Title Register (as appropriate) for registered details of this application.

Registration decision status: Accepted for registration

Registration history: Registered from 12/05/1997 to 29/09/1999 Registered from 13/12/2000 to 08/03/2011

Applicants: Colin Gale, Gordon William Morton, Angela Martin

Address(es) for Service: Eddy Neumann
Eddy Neumann Lawyers



Additional Information

Not applicable

Persons claiming to hold native title:

The native title claim group comprises all the members of the Darug Tribal Aboriginal Corporation

National Native Title Tribunal

Extract from Schedule of Native Title Applications

NSD6061/1998

Page 1 of 0

Extract Created: 05/08/2015 15:53 (WST)

Further information: National Native Title Tribunal 1800 640 501

and their descendants.

Native title rights and interests claimed:

1. Subject to paragraphs 2 - 5 below the applicants claim the full and free enjoyment of the following native title rights in relation to area subject to application.

- (a) a right to possess, occupy, use and enjoy the claimed area
- (b) a right to make decisions about the use and enjoyment of the claimed area
- (c) a right of access to the claimed area
- (d) a right to control the access of others to the claimed area
- (e) a right to use and enjoy the resources of the claimed area
- (f) a right to control the use and enjoyment of others of resources of the claimed area
- (g) a right to trade in resources of the claimed area
- (h) a right to receive a portion of any resources taken by others from the claimed area
- (i) a right to maintain and protect places or importance under traditional laws, customs and practices in the claimed area
- (i) a right to maintain, protect and prevent the misuse of cultural knowledge of the common law holders associated with the claim area.

2. With respect to those parts of the area the subject of the application which are, or have been the subject of a previous non-exclusive possession act within the meaning of s23F of the NTA, the applicants claim the native title rights and interests set out in 1 above subject to the rights and interests created in the "non exclusive possession act" which are not inconsistent with the rights and interests claimed and, in the case of rights granted which are inconsistent with the rights and interests claimed, subject to any suspension of the native title rights and interests which those inconsistent rights and interests cause.

3. With respect to those parts of the area the subject of the application which are, or have been, the subject of

- (a) a Category B intermediate period act within the meaning of s232C
- (b) a Category C intermediate period act within the meaning of s232D or
- (c) a Category D intermediate period act within the meaning of s232E

the applicants claim the native title rights and interests set out in 1 above subject to the rights and interests created in the "non exclusive possession act" which are not inconsistent with the rights and interests claimed and, in the case of rights granted which are inconsistent with the rights and interests claimed, subject to any suspension of the native title rights and interests which those inconsistent rights and interests cause.

4. With respect to those parts of the area the subject of the application which are, or have been the subject of

- (a) a Category B past act within the meaning of s230
- (b) a Category C past act within the meaning of s231 or
- (c) a Category D past act within the meaning of s232

the applicants claim the native title rights and interests set out in 1 above subject to the rights and interests created in the "non exclusive possession act" which are not inconsistent with the rights and interests claimed and, in the case of the rights granted which are inconsistent with the rights and interests claimed, subject to any suspension of native title rights and interests which those inconsistent rights and interests cause.

5. The native title rights and interests identified above do not extend to ownership of any minerals, petroleum or gas which are wholly owned by the Crown.

6. The native title rights and interests identified above do not include a claim for exclusive occupation and use of off shore areas as defined by s253.

Application Area: **State/Territory:** New South Wales
Brief Location: Sydney
Primary RATSIB Area: New South Wales
Approximate size: 174.9010 sq km
 (Note: There may be areas within the external boundary of the application that are not claimed.)
Does Area Include Sea: No

Area covered by the claim (as detailed in the application):

Information identifying the boundaries of:

a) the area covered by the application; and

b) any areas within those boundaries that are not covered by the application.

(a) 18 x AO size colour maps (1 x locality & 17 x enlargements), 1 x A3 locality map and a 21 page tenure/parcel identifier produced by the Surveyor General's Department have been filed with the National Native Title Tribunal. The 21 page tenure/parcel identifier is "Attachment C".

(b) Subject to clauses (d) and (e) the area covered by the application excludes any land or waters covered by:

(i) a schedule interest;

(ii) a freehold estate;

(iii) a commercial lease that is neither an agricultural lease nor a pastoral lease;

(iv) an exclusive agricultural lease or an exclusive pastoral lease;

(v) a residential lease;

(vi) a community purpose lease;

(vii) a lease dissected from a mining lease as referred to in s23B(2)(vii);

(viii) any lease (other than a mining lease) that confers a right of exclusive use over particular land or waters;

which was validly vested or granted on or before 23 December 1996.

(c) subject to clauses (d) and (e) the area covered by the application excludes any area covered by the valid construction or establishment of any public work, where the construction or establishment of the public work commenced on or before 23 December 1996.

(d) Where the act specified in (b) and (c) falls within the provision of

(i) s23B(9) - Exclusion of acts benefiting Aboriginal peoples or Torres Straight Islanders;

(ii) s23B(9A) - Establishment of a national or state park;

(iii) s23B(9B) - Acts where legislation provides for non-extinguishment;

(iv) s23B(9C) - Exclusion of Crown to Crown grants; and

(v) s23B(10) - Exclusion by regulation,

the area covered by the act is not excluded from this application.

(e) Where an act referred to in clauses 2 and 3 covers land or waters referred to in:

s47 - Pastoral leases held by native title claimants;

s47A - Reserves etc covered by claimant applications; and

s47B - Vacant crown land covered by claimant applications,
the area covered by the act is not excluded from the application.

(f) Where an area is covered by a previous non-exclusive possession act (s 23F) the native title claim group does not claim the native title rights and interests set out in clause 1 of Attachment E to the exclusion of all others.

(g) The area covered by the application excludes land where native title has been extinguished at common law.

Attachments: 1. Map & Tenure/Parcel Identifier , 21 pages - A4, 24/05/2000

NNTT Contact Details

Address:	National Native Title Tribunal Sydney Office Level 16, Law Courts Building Queens Square SYDNEY NSW 2000 GPO Box 9973 SYDNEY NSW 2001
Telephone:	(02) 9227 4000
Freecall:	1800 640 501
Fax:	(02) 9227 4030
Web Page:	www.nntt.gov.au

End of Extract



Extract from Schedule of Native Title Applications

Application Reference: Federal Court number: NSD6175/1998
NNTT number: NP1998/001

Application Name: [REDACTED]

Application Type: Compensation

Application filed with: National Native Title Tribunal

Date application filed: 08/07/1998

Current status: Discontinued - 23/03/1999

Applicants: [REDACTED]

Address(es) for Service: [REDACTED]

Additional Information

Not applicable

Persons claiming compensation:

Native title rights and interests for which compensation is claimed:

None

Details of acts claimed to have extinguished or affected native title:

None

Gunjewong Cultural Heritage — Cherie Carroll Turrise, Elder		
Date	Form of Contact	Summary
24/06/2017	Email	Invitation to participate in Aboriginal consultation response. Worked on numerous projects in Western Sydney area.
27/06/2017	Email	Attachment included in response. Copy of email saved.
13/09/2017	Email	Invitation mail out
26/09/2017	Email	Agenda mail out
11/10/2017	Email	Sent reminder to respond to sub-surface methodology
19/10/2020	Email	Invitation to AFG #2
12/11/2020	Email	Consultation period for commenting on the ACHAR has been extended to 30/11.
25/11/2020	Email	Reminder that comments close on 30/11.
Tocomwall Pty Ltd – Scott Franks and Jennifer Norfolk		
Date	Form of Contact	Summary
01/08/2017	Letter	Invitation to participate in Aboriginal consultation response.
09/08/2017	Email	ROI and asking for confirmation of registration of interest to participate in WTBL
13/09/2017	Email	Invitation mail out
26/09/2017	Email	Agenda mail out
28/09/2017	In person	Scott was called to see if he was going to attend workshop as he is down as a RAP. He explained that he had advice from his insurer that he should think twice about attending such workshops. This was because there was no remuneration for him or his staff and they would not be covered by their insurer in the event of an accident (when travelling to the meeting for example). He stated that even if they were to receive \$1.00 or travel reimbursement then they would be covered but without it, it was just too risky for his business. He suggested other RAPs (especially those connected to corporations) were also becoming risk averse as well. He also pointed out that as the meeting was being held in the middle of a business day it impacted their work commitments. He will not travel to such meetings until this issue is resolved
11/10/2017	Email	Sent reminder to respond to sub-surface methodology
02/10/2020	Phone call	Checked contact details ahead of sending ACHAR for review
07/10/2020	Phone call	Advised that the ACHAR was not yet publicly available but a link would be provided
19/10/2020	Email	Invitation to AFG #2
30/10/2020	Phone call	Queried whether they were attending the AFG and whether they had been able to access the ACHAR
12/11/2020	Email	Consultation period for commenting on the ACHAR has been extended to 30/11.
25/11/2020	Email	Reminder that comments close on 30/11.
Callendulla – Corey Smith		
Date	Form of Contact	Summary
01/08/2017	Email	Invitation to participate in Aboriginal consultation

Gunjewong Cultural Heritage — Cherie Carroll Turrise, Elder		
21/08/2017	Email	Registration of interest received
13/09/2017	Email	Invitation mail out
26/09/2017	Email	Agenda mail out
28/09/2017	Email	Email stating that Callendulla supports the proposed methodology. Site officer forms and insurances attached, and email saved to project folder.
11/10/2017	Email	Sent reminder to respond to sub-surface methodology
19/10/2020	Email	Invitation to AFG #2
21/10/2020	Email from Corey	'Please keep me informed of any further developments'
12/11/2020	Email	Consultation period for commenting on the ACHAR has been extended to 30/11.
20/11/20	Email from Corey	'Confirm that we support the environmental management measures and wish to be kept informed of any further developments'
25/11/20	Email	Reminder that comments close on 30/11.
Walbunja – Hika Te Kowhai		
Date	Form of Contact	Summary
01/08/2017	Email	Invitation to participate in Aboriginal consultation
05/08/2017	Email	Registration of interest received
13/09/2017	Email	Invitation mail out
26/09/2017	Email	Agenda mail out
26/09/2017	Email	Email to inform that Walbunja will be attending AFG
6/10/2017	Email	Email requesting another copy of the sub-surface methodology to peruse
11/10/2017	Email	Sent reminder to respond to sub-surface methodology
19/10/2020	Email	Invitation to AFG #2
30/10/2020	Phone call	Left a message and asked them to call back
12/11/2020	Email	Consultation period for commenting on the ACHAR has been extended to 30/11.
25/11/2020	Email	Reminder that comments close on 30/11.
Murramarang – Roxanne Smith		
Date	Form of Contact	Summary
01/08/2017	Email	Invitation to participate in Aboriginal consultation
21/08/2017	Email	Registration of interest received
13/09/2017	Email	Invitation mail out
26/09/2017	Email	Agenda mail out
26/09/2017	Email	Email confirmation attendance of AFG
28/09/2017	Email	Email stating that Murramarang supports the proposed sub-surface methodology. Site officer forms and insurances attached and saved
11/10/2017	Email	Sent reminder to respond to sub-surface methodology
19/10/2020	Email	Invitation to AFG #2
20/10/2020	Email from Roxanne	"Please keep us informed of any further developments"

Gunjewong Cultural Heritage — Cherie Carroll Turrise, Elder

12/11/2020	Email	Consultation period for commenting on the ACHAR has been extended to 30/11.
25/11/2020	Email	Reminder that comments close on 30/11.

Biamanga – Seli Storer

Date	Form of Contact	Summary
01/08/2017	Email	Invitation to participate in Aboriginal consultation
21/08/2017	Email	Registration of interest received
13/09/2017	Email	Invitation mail out
26/09/2017	Email	Agenda mail out
26/09/2017	Email	Email confirmation of attendance at AFG
29/09/2017	Email	Email stating that Biamanga support the proposed methodology. Site officer forms and current insurances attached and saved
11/10/2017	Email	Sent reminder to respond to sub-surface methodology
19/10/2020	Email	Invitation to AFG #2
12/11/2020	Email	Consultation period for commenting on the ACHAR has been extended to 30/11.
25/11/2020	Email	Reminder that comments close on 30/11.

Darug Land Observations Pty Ltd – Jamie Workman and Uncle Gordon Workman

Date	Form of Contact	Summary
01/08/2017	Email	Invitation to participate in Aboriginal consultation
17/08/2017	Email	Registration of interest received. Invitation to participate in Aboriginal consultation response. Office specialises in community consultations and has members that comprise traditional owners. Do not accept or support persons not from Darug nation that comment on area. Will not volunteer. Payment for discriminated exclusion DLO specified.
13/09/2017	Email	Invitation mail out
26/09/2017	Email	Agenda mail out
26/09/2017	Email	Cannot personally attend but wishes to be included. Site officer forms included in email and letter in reply to archaeological methodology attached (approval).
11/10/2017	Email	Sent reminder to respond to sub-surface methodology
19/10/2020	Email	Invitation to AFG #2
12/11/2020	Email	Consultation period for commenting on the ACHAR has been extended to 30/11.
25/11/2020	Email	Reminder that comments close on 30/11.

Kamilaroi Yankuntjatjara Working Group – Pollowan Phillip Khan and Ricky Fields

Date	Form of Contact	Summary
01/08/2017	Email	Invitation to participate in Aboriginal consultation
17/08/2017	Email	Registration of interest received. Senior Aboriginal person who actively participates in the protection of Aboriginal Cultural Heritage in Sydney Basin.
13/09/2017	Email	Invitation mail out

Gunjewong Cultural Heritage — Cherie Carroll Turrise, Elder		
26/09/2017	Email	Agenda mail out
13/09/2017	Phone	Called to confirm completion of site officer form and attendance at the AFG by himself or a representative of Kamilaroi. Also enquired if trainees were able to participate in the site work and was informed that logistics of this have not yet been confirmed.
14/09/2017	Phone	Called to confer he has a conflicting family engagement so will send a representative to the AFG instead.
28/09/2017	In person	Owing to health problems Ricky is unable to participate in field work at the moment, but wants to be included in the project.
6/10/2017	Email/Phone	Forgot to send through his site officer forms to the AFG and wishes for me to email him a copy of the company's address so that he may mail them. Also commented on sub-surface methodology saying it is brilliant and very comprehensive.
11/10/2017	Email	Sent reminder to respond to sub-surface methodology
12/10/2017	Mail	Site officer forms
02/10/2020	Phone call	Checked contact details ahead of sending ACHAR for review
19/10/2020	Email	Invitation to AFG #2
12/11/2020	Email	Consultation period for commenting on the ACHAR has been extended to 30/11.
25/11/2020	Email	Reminder that comments close on 30/11.
Muragadi Heritage Indigenous Corporation – Jesse, Vickylee and Anthony Johnson		
Date	Form of Contact	Summary
01/08/2017	Email	Invitation to participate in Aboriginal consultation
24/08/2017	Email	Registration of interest received. Family lived in area for many years and has worked as a site officer for many companies over the years.
13/09/2017	Email	Invitation mail out
26/09/2017	Email	Agenda mail out
26/09/2017	Email	Confirmation of attendance at AFG
28/09/2018	Email	Anthony wishes to be included as a RAP
11/10/2017	Email	Sent reminder to respond to sub-surface methodology
19/10/2020	Email	Invitation to AFG #2
30/10/2020	Phone call	Left a message
12/11/2020	Email	Consultation period for commenting on the ACHAR has been extended to 30/11.
25/11/2020	Email	Reminder that comments close on 30/11.
Aboriginal Corporation Cultural Heritage Murra Bidgee Mullangari – Darleen and Ryan Johnson		
Date	Form of Contact	Summary
01/08/2017	Email	Invitation to participate in Aboriginal consultation
27/08/2017	Email	Registration of interest received.
13/09/2017	Email	Invitation mail out
26/09/2017	Email	Agenda mail out

Gunjewong Cultural Heritage — Cherie Carroll Turrise, Elder

26/09/2017	Email	Confirmation that representative will be attending the AFG.
11/10/2017	Email	Sent reminder to respond to sub-surface methodology
02/10/2020	Phone call	Checked contact details ahead of sending ACHAR for review
19/10/2020	Email	Invitation to AFG #2
30/10/2020	Phone call	Queried whether they were attending the AFG and whether they had been able to access the ACHAR
5/11/2020	Email from Darleen	"I have read the project information and draft ACHAR for the above project, I endorse the recommendations made"
12/11/2020	Email	Consultation period for commenting on the ACHAR has been extended to 30/11.
25/11/2020	Email	Reminder that comments close on 30/11.

Goobah Developments – Basil Smith

Date	Form of Contact	Summary
01/08/2017	Email	Invitation to participate in Aboriginal consultation
21/08/2017	Email	Registration of interest received
13/09/2017	Email	Invitation mail out
26/09/2017	Email	Agenda mail out
26/09/2017	Email	Confirmation of attendance at AFG
28/09/2017	Email	Emailing stating that Goobah support the proposed sub-surface methodology. Site officer forms and current insurances attached.
11/10/2017	Email	Sent reminder to respond to sub-surface methodology
02/10/2020	Phone call	Checked contact details ahead of sending ACHAR for review
19/10/2020	Email	Invitation to AFG #2
30/10/2020	Phone call	Queried whether they were attending the AFG and whether they had been able to access the ACHAR. Unable to attend AFG, sent apologies
12/11/2020	Email	Consultation period for commenting on the ACHAR has been extended to 30/11.
25/11/20	Email	Reminder that comments close on 30/11.

Didge Ngunawal Clan – Lillie Carroll and Paul Boyd

Date	Form of Contact	Summary
01/08/2017	Email and Letter	Invitation to participate in Aboriginal consultation
04/08/2017	Email	Registration of interest received
13/09/2017	Email and Letter	Invitation mail out
26/09/2017	Email and Letter	Agenda mail out
13/09/2017	Email	Acceptance of invitation to attend AFG.
15/09/2017	Email	Email containing completed site officer forms and asking for confirmation that we had now received these forms
28/09/2017	In person	Paul is from the south coast and is very keen to be involved in the project and has worked on many test excavation and salvage programs
5/10/2017	Email	Email approving the proposed sub-surface test methodology and all proposals
11/10/2017	Email	Sent reminder to respond to sub-surface methodology

Gunjeewong Cultural Heritage — Cherie Carroll Turrise, Elder		
02/10/2020	Phone call	Checked contact details ahead of sending ACHAR for review
07/10/2020	Phone call	Advised that the ACHAR was not yet publicly available but a link would be provided
19/10/2020	Email	Invitation to AFG #2
30/10/2020	Phone call	Queried whether they were attending the AFG and whether they had been able to access the ACHAR. Received and are happy with the report. Unable to attend AFG, sent apologies
05/11/2020	Email from Lilly	"Thanks for keeping us informed"
12/11/2020	Email	Consultation period for commenting on the ACHAR has been extended to 30/11.
25/11/20	Email	Reminder that comments close on 30/11.
Aboriginal Heritage Manager – David Watts		
Date	Form of Contact	Summary
03/08/2017	Email and Letter	Invitation to participate in Aboriginal consultation
04/08/2017	Email	Registration of interest received
13/09/2017	Email	Invitation mail out
26/09/2017	Email	Agenda mail out
11/10/2017	Email	Sent reminder to respond to sub-surface methodology
10/10/2019	Phone call	Advised he shouldn't be a RAP as he works directly for local Council.
Darug Aboriginal Cultural Heritage Assessment – Celestine Everingham and Jamie Eastwood		
Date	Form of Contact	Summary
01/08/2017	Email and Letter	Invitation to participate in Aboriginal consultation
27/08/2017	Email	Registration of interest received. Would like to be involved. Knows of engravings on Wakehurst Parkway
13/09/2017	Email	Invitation mail out
26/09/2017	Email	Agenda mail out
10/10/2017	Email	Wanted to know where survey was carried out – maps are not adequate. Pleas impact will not be on Garigal National Park side of Wakehurst Parkway. Would like a chance to visit the site. Wants to be involved in survey and excavation. Knew that cymbidium orchids once grew at burned Bridge Creek near Balgowlah. Endorsed methodology.
11/10/2017	Email	Sent reminder to respond to sub-surface methodology
02/10/2020	Phone call	Checked contact details ahead of sending ACHAR for review
07/10/2020	Phone call	Advised that the ACHAR was not yet publicly available but a link would be provided
11/10/2020	Email from Jamie	Confirming successful access of the ACHAR
19/10/2020	Email	Invitation to AFG #2
30/10/2020	Phone call	Queried whether they were attending the AFG and whether they had been able to access the ACHAR. Received and has sent some comments back but generally happy with the report. Confirmed attendance at AFG

Gunjewong Cultural Heritage — Cherie Carroll Turrise, Elder			
12/11/2020	Email	Consultation period for commenting on the ACHAR has been extended to 30/11.	
25/11/2020	Email	Reminder that comments close on 30/11	
30/11/20	Email from Jamie	Feedback provided from ARAGUNG on ACHAR	
2/12/20	Email	Response to ACHAR feedback.	
Bilinga, Gunyuu, Munyungu, Murrumbul and Wingikara – Darleen Hoskins McKenzie			
Date	Form of Contact	Summary	
01/08/2017	Email	Invitation to participate in Aboriginal consultation	
26/09/2017	In person	Darleen has lived in or near the study area all her life. She knows where further engravings are on the Wakehurst Parkway and was concerned about the project impacting them. After hearing the proposed methodology, she said she felt relief that they were being properly assessed and protected and would like to be involved in the project. Darleen is saddened by all of the development going on at Frenchs Forest and Warringah Road, especially the new hospital. It is unrecognisable from the place she grew up in. Darleen would like tea to be available for participants at the next AFG.	
28/09/2017	In person	Asked for Bilinga, Gunyuu, Munyungu, Murrumbul and Wingikara to be registered as RAP groups	
11/10/2017	Email	Sent reminder to respond to sub-surface methodology	
Metro LALC			
Date	Form of Contact	Summary	
21/09/2017	Email	Invitation to AFG 1	
26/09/2017	Email	Reminder of upcoming AFG	
05/10/2017	Email	Reminder to respond to sub-surface methodology	
10/10/2017	Email	List of registered RAPS	
24/9/20	Email/Letter from MLALC	Attendance at site inspection on 20 March 2020, statement there are no constraints to the project and to cease work and contact MLALC if Aboriginal significant objects are discovered	
19/10/2020	Email	Invitation to AFG2	
30/10/2020	Call	Queried whether they were attending AFG2 and whether they had been able to access the ACHAR	
30/11/2020	Email/Letter from MLALC	Feedback on the ACHAR	
3/12/2020	Email	Response to comments on the ACHAR.	
Other Consultation			
Date	Form of Contact	Contact	Summary
26/08/2017	Email	Bianca Ceissman (Administration support Officer)	Search conducted by Bianca does not indicate registered Aboriginal owners pursuant to Division 3 of the <i>Aboriginal Land Rights Act 1983</i> . Suggested to contact Metropolitan Local Aboriginal Land Council.
8/08/2017	Email	Bill Dockrill	Adjustment of size of advertisement to make invitation and plan clearer.

Gunjewong Cultural Heritage — Cherie Carroll Turrise, Elder			
17/08/2017	Letter and Email	Fran Scully	OEH haven't received any request for stakeholders from you for that project. If you require a stakeholder list, please send the list through to the Senior Team Leader Planning, Greater Sydney Division, Regional Operations, PO Box 644, Parramatta, NSW 2124.
28/08/2017	Letter and Email	Fran Scully	Asking for an appointment to discuss project. Reply stated that with regard to meeting next week about the Beaches Link and Gore Hill Freeway Connection project, this is a state significant infrastructure project. OEH does not have a regulatory role in state significant infrastructure projects and their role is to provide advice to the Department of Planning and Environment. OEH does not meet with proponents or their consultants in relation to these projects.
1/08/2017	Letter	Nathan Moran	Invitation to participate in Aboriginal consultation
1/08/2017	Letter	Chris Ingrey	Invitation to participate in Aboriginal consultation
1/08/2017	Letter	Gordon Morton	Invitation to participate in Aboriginal consultation
1/08/2017	Letter	Eric Keidge	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Kylie Ann Bell	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Karia Lea Bond	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Lee-Roy James Boota	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Robert Parson	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Newton Carriage	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Mark Henry	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Joanne Anne Stewart	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Pemulwuy Johnson	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Simalene Carriage	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Kaya Dawn Bell	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Hayley Bell	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Aaron Broad	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Christopher Payne	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Ronald Stewart	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Shane Carriage	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Andrew Bond	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Robert Brown	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Suzannah McKenzie	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Levi McKenzie Kirkbright	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Wandai Kirkbright	Invitation to participate in Aboriginal consultation

Gunjeewong Cultural Heritage — Cherie Carroll Turrise, Elder			
1/08/2017	Email	Wendy Smith	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Darren Duncan	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Jennifer Beale	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Steven Johnson and Krystle Carroll	Invitation to participate in Aboriginal consultation
1/08/2017	Email	Newton Carriage	Invitation to participate in Aboriginal consultation
09/9/2017	Email	Stephen Watson	Email explaining Manager Transport and Civil Infrastructure Assets cannot provide list of names of aboriginal people and suggestion to consult the Aboriginal Housing Office instead.
17/10/2017	Email	Phil Hunt	Query from Aboriginal Housing Office regarding why we are proposing to excavate already very disturbed areas?
17/10/2017	Email	Phil Hunt	Response to query

Annexure B - Standard Management Procedure: Unexpected Heritage Items (Roads and Maritime, 2015)



Transport
Roads & Maritime
Services

Unexpected Heritage Items

Heritage Procedure 02

November 2015

Contents

1 Purpose	1
2 Scope	2
3 Types of unexpected heritage items and their legal protection	4
3.1 Aboriginal objects	4
3.2 Historic heritage items	5
3.3 Human skeletal remains	6
4 Responsibilities	7
5 Acronyms	9
6 Overview of the Procedure	10
7 Unexpected heritage items procedure	11
8 Seeking advice	20
9 Related information	21
Key environmental contacts	37
About this release	47

Appendices

Appendix A	Identifying Unexpected Heritage items
Appendix B	Unexpected Heritage Item Recording Form 418
Appendix C	Photographing Unexpected Heritage Items
Appendix D	Key Environment Contacts
Appendix E	Uncovering Bones
Appendix F	Archaeological Advice Checklist
Appendix G	Template Notification Letter
Appendix H	Identifying Unexpected Heritage items

Please note

This procedure applies to all development and activities concerning roads, road infrastructure and road related assets undertaken by Roads and Maritime.

For advice on how to manage unexpected heritage items as a result of activities related to maritime infrastructure projects, please contact the Senior Environmental Specialist (Heritage).

1 Purpose

This procedure has been developed to provide a consistent method for managing unexpected heritage items (both Aboriginal and non-Aboriginal) that are discovered during Roads and Maritime activities. This procedure includes Roads and Maritime's heritage notification obligations under the *Heritage Act 1977* (NSW), *National Parks and Wildlife Act 1974* (NSW), *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) and the *Coroner's Act 2009* (NSW).

This document provides relevant background information in Section 3, followed by the technical procedure in Sections 6 and 7. Associated guidance referred to in the procedure can be found in Appendices A-H.

2 Scope

This procedure assumes that an appropriate level of Aboriginal and non-Aboriginal heritage assessment has been completed before work commences on site. In some cases, such as exempt development, detailed heritage assessment may not be required.

Despite appropriate and adequate investigation, unexpected heritage items may still be discovered during maintenance and construction works. 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 all Road and Maritime construction and maintenance activities

This procedure **applies to**:

- The discovery of any unexpected heritage item (usually during construction), where Roads and Maritime does not have approval to disturb the item or where safeguards for managing the disturbance (apart from this procedure) are not contained in the environmental impact assessment.
- All Roads and Maritime projects that are approved or determined under Part 3A (including Transitional Part 3A Projects), Part 4, Part 5 or Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), or any development that is exempt under the Act.

This procedure must be followed by Roads and Maritime staff, alliance partners (including local council staff working under Road Maintenance Council Contracts, [RMCC]), developers under works authorisation deeds or any person undertaking Part 5 assessment for Roads and Maritime.

This procedure **does not** apply to:

- The legal discovery and disturbance of heritage items as a result of investigations being undertaken in accordance with OEH's *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (2010); an Aboriginal Heritage Impact Permit (AHIP) issued under the *National Parks and Wildlife Act 1974*; or an approval issued under the *Heritage Act 1977*¹.
- The legal discovery and disturbance of heritage items as a result of investigations (or other activities) that are required to be carried out for the purpose of complying with any environmental assessment requirements under Part 3A (including Transitional Part 3A Projects) or Part 5.1 of the EP&A Act.
- The legal discovery and disturbance of heritage items as a result of construction related activities, where the disturbance is permissible in accordance with an AHIP²; an approval issued under the *Heritage Act 1977*; the Minister for

¹ RMS' heritage obligations are incorporated into the conditions of heritage approvals.

² RMS *Procedure for Aboriginal cultural heritage consultation and investigation* (2011) recommends that Part 4 and Part 5 projects that are likely to impact Aboriginal objects during construction seek a whole-of-project AHIP. This type of AHIP generally allows a project to impact known and potential Aboriginal objects within the entire project area, without the need to stop works. It should be noted that an AHIP may exclude impact to certain objects and areas, such as burials or ceremonial sites. In such cases, the project must follow this procedure.

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Planning's conditions of project approval; or safeguards (apart from this procedure) that are contained in the relevant environmental impact assessment.

All construction environment management plans (CEMPs) must make reference to and/or include this procedure (often included as a heritage sub-plan). Where approved CEMPs exist they must be followed in the first instance. Where there is a difference between approved CEMPs and this procedure, the approved CEMP must be followed. Where an approved CEMP does not provide sufficient detail on particular issues, this procedure should be used as additional guidance. When in doubt always seek environment and legal advice on varying approved CEMPs.

3 Types of unexpected heritage items and their legal protection

The roles of project, field and environmental staff are critical to the early identification and protection of unexpected heritage items. **Appendix A** illustrates the wide range of heritage discoveries found on Roads and Maritime projects and provides a useful photographic guide. Subsequent confirmation of heritage discoveries must then be identified and assessed by technical specialists (usually an archaeologist).

An 'unexpected heritage item' means any unanticipated discovery of an actual or potential heritage item, for which Roads and Maritime does not have approval to disturb³ or does not have a safeguard in place (apart from this procedure) to manage the disturbance.

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.

3.1 Aboriginal objects

The *National Park and Wildlife Act 1974* protects *Aboriginal objects* which are 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"*⁴.

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 Aboriginal Heritage Impact Permit (AHIP) is usually required from the Office of Environment and Heritage (OEH)⁵. Also, when a person becomes aware of an Aboriginal object they must notify

³ 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).

⁴ Section 5(1) *National Park and Wildlife Act 1974*.

⁵ Except when Part 3A, Division 4.1 of Part 4 or Part 5.1 of the *EP&A Act* applies.

the Director-General of OEH about its location⁶. Assistance on how to do this is provided in Section 7 (Step 5).

3.2 Historic heritage items

Historic (non-Aboriginal) heritage items may include:

- Archaeological 'relics'
- Other historic items (i.e. works, structures, buildings or movable objects).

3.2.1 Archaeological relics

The *Heritage Act 1977* 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"*⁷.

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 Council⁸. Also, when a person discovers a relic they must notify the NSW Heritage Council of its location⁹. Advice on how to do this is provided in Section 7 (Step 5).

3.2.2 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 Roads and Maritime may encounter include culverts, historic road formations, historic pavements, buried roads, retaining walls, tramlines, cisterns, fences, sheds, buildings and conduits. Although an approval under the *Heritage Act 1977* (NSW) may not be required to disturb these items, their discovery must be managed in accordance with this procedure.

As a general rule, an archaeological relic requires discovery or examination through the act of excavation. An archaeological excavation permit under Section 140 of the *Heritage Act* is required to do this. In contrast, 'other historic items' either exist above the ground's surface (e.g. a shed), or they are designed to operate and exist beneath the ground's surface (e.g. a culvert).

⁶ This is required under s89(A) of the *National Park and Wildlife Act 1974* (NSW) and applies to **all projects** assessed under Part 3A, Part 4, Part 5 and Part 5.1 of the *EP&A Act*, including exempt development.

⁷ Section 4(1) *Heritage Act 1977*.

⁸ Except when Part 3A, Division 4.1 of Part 4 or Part 5.1 of the *EP&A Act* applies.

⁹ This is required under s146 of the *Heritage Act 1977* and applies to **all projects** assessed under Part 3A, Part 4, Part 5 and Part 5.1 of the *EP&A Act*, including exempt development.

Despite this difference, it should be remembered that relics can often be associated with 'other heritage items', such as archaeological deposits within cisterns and underfloor deposits under buildings.

3.3 Human skeletal remains

Human skeletal remains can be classed as:

- Reportable deaths
- Aboriginal objects
- Relics

Where it is suspected that less than 100 years has elapsed since death, human skeletal remains come under the jurisdiction of the State Coroner and the *Coroners Act 2009* (NSW). Under s 35(2) of the Act, 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 old¹⁰ regardless of ancestry. Public health controls may also apply.

Where remains are suspected of being more than 100 years old, they are considered to be either Aboriginal objects or non-Aboriginal relics depending on the ancestry of the individual. Aboriginal human remains are protected under the *National Parks and Wildlife Act 1974*, while non-Aboriginal remains are protected under the *Heritage Act 1977*.

The approval and notification requirements of these Acts are described above in sections 3.1 and 3.2. Additionally, the discovery of Aboriginal human remains also triggers notification requirements to the Commonwealth Minister for the Environment under s 20(1) of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth).

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.

Guidance on what to do when suspected human remains are found is in **Appendix E**.

¹⁰ Under s 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.

4 Responsibilities

The following roles and responsibilities are relevant to this procedure:

Role	Definition/responsibility
Aboriginal Cultural Heritage Advisor (ACHA)	Provides Aboriginal cultural heritage advice to project teams. Acts as Aboriginal community liaison for projects on cultural heritage matters. Engages and consults with the Aboriginal community as per the Roads and Maritime <i>Procedure for Aboriginal Cultural Heritage Consultation and Investigation</i> .
Aboriginal Sites Officer (ASO)	Is an appropriately trained and skilled Aboriginal person whose role is to identify and assess Aboriginal objects and cultural values. For details on engaging Aboriginal Sites Officers, refer to Roads and Maritime <i>Procedure for Aboriginal Cultural Heritage Consultation and Investigation</i> .
Archaeologist (A)	Professional consultant, contracted on a case-by-case basis to provide heritage and archaeological advice and technical services (such as reports, heritage approval documentation etc). Major projects with complex heritage issues often have an on call Project archaeologist.
Project Manager (PM)	Ensures all aspects of this procedure are implemented. The PM can delegate specific tasks to a construction environment manager, Roads and Maritime site representatives or regional environment staff, where appropriate.
Regional Environment Staff (RES)	Provides advice on this procedure to project teams. Ensuring this procedure is implemented consistently by supporting the PM. Supporting project teams during the uncovering of unexpected finds. Reviewing archaeological management plans and liaising with heritage staff and archaeological consultants as needed.
Registered Aboriginal Parties (RAPs)	RAPs are Aboriginal people who have registered with Roads and Maritime to be consulted about a proposed Roads and Maritime project or activity in accordance with OEH's Aboriginal cultural heritage consultation requirements for proponents (2010).
Senior Environmental Specialist (Heritage) (SES(H))	Provides technical assistance on this procedure and archaeological technical matters, as required. Reviewing the archaeological management plans and facilitating heritage approval applications, where required. Assists with regulator engagement, where required.
Team Leader - Regional Maintenance Delivery (TL-RMD)	Ensures Regional Maintenance Delivery staff stop work in the vicinity of an unexpected heritage item. Completes Unexpected Heritage Item Recording Form 418 and notifies WS-RMD.
Technical Specialist	Professional consultant contracted to provide specific technical advice that relates to the specific type of unexpected heritage find (eg a forensic or physical anthropologist who can identify and analyse human skeletal

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	remains).
Works Supervisor - Regional Maintenance Delivery (WS-RMD)	Ensures Regional Maintenance Delivery staff are aware of this procedure. Supports the Team Leader - Regional Maintenance Delivery during the implementation of this procedure and ensures reporting of unexpected heritage items through environment management systems.

5 Acronyms

The following acronyms are relevant to this procedure:

Acronym	Meaning
A	Archaeologist
ACHA	Aboriginal Cultural Heritage Advisor
AHIP	Aboriginal Heritage Impact Permit
ASO	Aboriginal Site Officer
CEMP	Construction Environment Management Plan
OEH	Office of Environment and Heritage.
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PM	Project Manager
RAP	Registered Aboriginal Parties
RES	Regional Environmental Staff
SES(H)	Senior Environmental Specialist (Heritage)
TL-RMD	Team Leader – Regional Maintenance Division
RMD	Regional Maintenance Delivery
RMS	Roads and Maritime
WS-RMD	Works Supervisor - Regional Maintenance Division

6 Overview of the Procedure

On discovering something that could be an unexpected heritage item ('the item'), the following procedure must be followed. There are eight steps in the procedure. These steps are summarised in **Figure 1** below and explained in detail in Section 7.

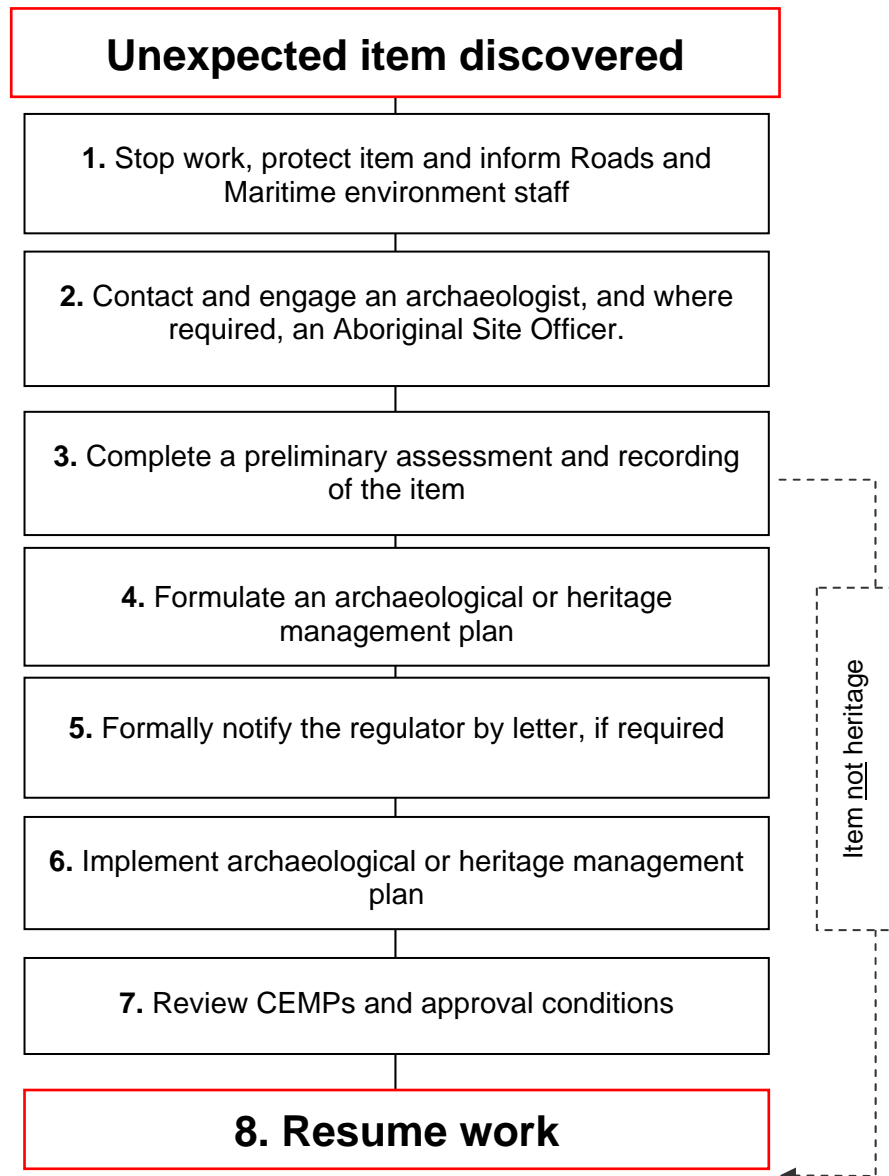


Figure 1: Overview of steps to be undertaken on the discovery of an unexpected heritage item.

IMPORTANT!

RMS may have approval or specific safeguards in place (apart from this procedure) to impact on certain heritage items during construction. If you discover a heritage item and you are unsure whether an approval or safeguard is in place, STOP works and follow this procedure.

7 Unexpected heritage items procedure

Table 1: Specific tasks to be implemented following the discovery of an unexpected heritage item.

Aboriginal Cultural Heritage Advisor (ACHA); Aboriginal Sites Officer (ASO); Archaeologist (A); Project Manager (PM); Regional Environment Staff (RES); Registered Aboriginal Parties (RAPs); Senior Environmental Specialist (Heritage) (SES(H)); Team leader – Roads and Maintenance Division (TL - RMD); Works supervisor – Roads and Maintenance Division (WS - RMD).

Step	Task	Responsibility	Guidance & Tools
1	Stop work, protect item and inform Roads and Maritime environment staff		
1.1	Stop all work in the immediate area of the item and notify the Project Manager or Team Leader-RMD. (For maintenance activities, the Team Leader is to also notify the Works Supervisor-RMD)	All	Appendix A (Identifying Unexpected Heritage items)
1.2	Establish a 'no-go zone' around the item. Use high visibility fencing, where practical.	PM or TL-RMD	
1.3	Inform all site personnel about the no-go zone. No further interference, including works, ground disturbance, touching or moving the item must occur within the no-go zone.	PM or TL-RMD	
1.4	Inspect, document and photograph the item using 'Unexpected Heritage Item Recording Form 418'.	PM or TL-RMD	Appendix B (Unexpected Heritage Item Recording Form 418) Appendix C (Photographing Unexpected Heritage items)

Step	Task	Responsibility	Guidance & Tools
1.5	<p>Is the item likely to be bone?</p> <p>If yes, follow the steps in Appendix E – ‘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.</p> <p>If no, proceed to next step.</p>	PM or WS-RMD	Appendix E (Uncovering Bones)
1.6	<p>Is the item likely to be:</p> <p>a) A relic? (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) and/or</p> <p>b) An Aboriginal object? (An Aboriginal object may include a shell midden, stone tools, bones, rock art or a scarred tree).</p> <p>If yes, proceed directly to Step 1.8</p> <p>If no, proceed to next step.</p>	PM or WS-RMD	Appendix A (Identifying heritage items)
1.7	<p>Is the item likely to be a “work”, building or standing structure? (This may include tram tracks, kerbing, historic road pavement, fences, sheds or building foundations).</p> <p>If yes, can works avoid further disturbance to the item? (E.g. if historic road base/tram tracks have been exposed, can they be left in place?) If yes, works may proceed without further disturbance to the item. Complete Step 1.8 within 24 hours.</p> <p>If works cannot avoid further disturbance to the item, works must not recommence at this time. Complete the remaining steps in this procedure.</p>	PM or WS-RMD	Appendix A (Identifying heritage items)

Step	Task	Responsibility	Guidance & Tools
1.8	Inform relevant Roads and Maritime Regional Environmental Staff of item by providing them with the completed 'Form 418'.	PM or WS-RMD (RES)	Appendix D (Key Environmental Contacts)
1.9	Regional Environmental Staff to advise Project Manager or Works Supervisor whether RMS has an approval or safeguard in place (apart from this procedure) to impact on the 'item'. (An approval may include an approval under the <i>Heritage Act</i> , the <i>National Parks and Wildlife Act</i> or the <i>Planning and Assessment Act</i>). Does RMS have an approval, permit or appropriate safeguard in place to impact on the item? If yes , work may recommence in accordance with the approval, permit or safeguard. There is no further requirement to follow this procedure. If no , continue to next step.		
1.10	Liaise with Traffic Management Centre where the delay is likely to affect traffic flow.	PM or WS-RMD	
1.11	Report the item as a 'Reportable Event' in accordance with the Roads and Maritime <i>Environmental Incident Classification and Reporting Procedure</i> . Implement any additional reporting requirements related to the project's approval and CEMP, where relevant.	PM or WS-RMD	<u>RMS Environmental Incident Classification and Reporting Procedure</u>
2	Contact and engage an archaeologist and, where required, an Aboriginal site officer		
2.1	Contact the Project (on-call) Archaeologist to discuss the location and extent of the item and to arrange a site inspection, if required. The project CEMP may contain contact details of the Project Archaeologist. OR	PM or WS-RMD (A; RES; SES(H))	Also see Appendix D (Key Environmental Contacts)

Step	Task	Responsibility	Guidance & Tools
	Where there is no project archaeologist engaged for the works, engage a suitably qualified and experienced archaeological consultant to assess the find. A list of heritage consultants is available on the RMS contractor panels on the Buyways homepage. Regional environment staff and Roads and Maritime heritage staff can also advise on appropriate consultants.		<u>Buyways</u>
2.2	Where the item is likely to be an Aboriginal object, speak with your Aboriginal Cultural Heritage Advisor to arrange for an Aboriginal Sites Officer to assess the find. Generally, an Aboriginal Sites Officer would be from the relevant local Aboriginal land council. If an alternative contact person (ie a RAP) has been nominated as a result of previous consultation, then that person is to be contacted.	PM or WS-RMD (ACHA; ASO)	
2.3	If requested, provide photographs of the item taken at Step 1.4 to the archaeologist, and Aboriginal Sites Officer if relevant.	PM or WS-RMD (RES)	Appendix C (Photographing Unexpected Heritage items)
3	Preliminary assessment and recording of the find		
3.1	In a minority of cases, the archaeologist (and Aboriginal Sites Officer, if relevant) may determine from the photographs that no site inspection is required because no archaeological constraint exists for the project (eg <i>the item is not a 'relic', a 'heritage item' or an 'Aboriginal object'</i>). Any such advice should be provided in writing (eg via email) and confirmed by the Project Manager or Works Supervisor - RMD.	A/PM/ASO/ WS-RMD	Proceed to Step 8
3.2	Arrange site access for the archaeologist (and Aboriginal Sites Officer, if relevant) to inspect the item as soon as practicable. In the majority of cases a site inspection is required to conduct a preliminary assessment.	PM or WS-RMD	
3.3	Subject to the archaeologist's assessment (and the Aboriginal Sites Officer's assessment, if relevant), 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 has not yet been uncovered. Existing protective fencing established in Step 1.2 may need to be adjusted to	A/PM/ASO/ WS-RMD	

Step	Task	Responsibility	Guidance & Tools
	reflect the extent of the newly assessed protective area. No works are to take place within this area once established.		
3.4	The archaeologist (and Aboriginal Sites Officer, if relevant) may provide advice after the site inspection and preliminary assessment that no archaeological constraint exists for the project (<i>eg the item is not a 'relic', a 'heritage item' or an 'Aboriginal object'</i>). Any such advice should be provided in writing (eg via email) and confirmed by the Project Manager or Works Supervisor - RMD.	A/PM/ASO/ WS-RMD	Proceed to Step 8
3.5	Where required, seek additional specialist technical advice (such as a forensic or physical anthropologist to identify skeletal remains). Regional environment staff and/or Roads and Maritime heritage staff can provide contacts for such specialist consultants.	RES/SES(H)	Appendix D (Key Environmental Contacts)
3.6	Where the item has been identified as a 'relic', 'heritage item' or an 'Aboriginal object' the archaeologist should formally record the item.	A	
3.7	The regulator can be notified informally by telephone at this stage by the archaeologist, Project Manager (or delegate) or Works Supervisor - RMD. Any verbal conversations with regulators must be noted on the project file for future reference.	PM/A/WS-RMD	
4	Prepare an archaeological or heritage management plan		
4.1	The archaeologist must prepare an archaeological or heritage management plan (with input from the Aboriginal Sites Officer, where relevant) shortly after the site inspection. This plan is a brief overview of the following: (a) description of the feature, (b) historic context, if data is easily accessible, (c) likely significance, (d) heritage approval and regulatory notification requirements, (e) heritage reporting requirements, (f) stakeholder consultation requirements, (g) relevance to other project approvals and management plans etc.	A/ASO	Appendix F (Archaeological/ Heritage Advice Checklist)
4.2	In preparing the plan, the archaeologist with the assistance of regional environment staff must review the CEMP, any heritage sub-plans, any conditions of heritage approvals, conditions of project approval (and or Minister's Conditions of Approval) and heritage assessment documentation (eg Aboriginal Cultural Heritage Assessment Report). This will outline if the unexpected item is consistent with previous heritage/project approval(s)	A/RES/PM	Appendix F (Archaeological/ Heritage Advice Checklist)

Step	Task	Responsibility	Guidance & Tools
	and/or previously agreed management strategies. The Project Manager and regional environment staff must provide all relevant documents to the archaeologist to assist with this. Discussions should occur with design engineers to consider if re-design options exist and are appropriate.		
4.3	The archaeologist must submit this plan as a letter, brief report or email to the Project Manager outlining all relevant archaeological or heritage issues. This plan should be submitted to the Project Manager as soon as practicable. Given that the archaeological management plan is an overview of all the necessary requirements (and the urgency of the situation), it should take no longer than two working days to submit to the Project Manager.	A	
4.4	The Project Manager or Works Supervisor must review the archaeological or heritage management plan to ensure all requirements can reasonably be implemented. Seek additional advice from regional environment staff and Roads and Maritime heritage staff, if required.	PM/RES/SES(H)/ WS-RMD	
5	Notify the regulator, if required.		
5.1	Review the archaeological or heritage management plan to confirm if regulator notification is required. Is notification required? If no , proceed directly to Step 6 If yes , proceed to next step.	PM/RES/SES(H)/ WS-RMD	
5.2	If notification is required, complete the template notification letter.	PM or WS-RMD	Appendix G (Template Notification Letter)
5.3	Forward the draft notification letter, archaeological or heritage management plan and the site recording form to regional environment staff and Senior Environmental Specialist (Heritage) for review, and consider any suggested amendments.	PM/RES/SES(H)/ WS-RMD	

Step	Task	Responsibility	Guidance & Tools
5.4	Forward the signed notification letter to the relevant regulator (ie notification of relics must be given to the Heritage Division, Office of Environment and Heritage (OEH), while notification for Aboriginal objects must be given to the relevant Aboriginal section of OEH). Informal notification (via a phone call or email) to the regulator prior to sending the letter is appropriate. The archaeological management plan and the completed site recording form must be submitted with the notification letter. For Part 3A and Part 5.1 projects, the Department of Planning and Environment must also be notified.	PM or WS-RMD	Appendix D (Key Environmental Contacts)
5.5	A copy of the final signed notification letter, archaeological or heritage management plan and the site recording form should be kept on file by the Project Manager or Works Supervisor- RMD and a copy sent to the Senior Environmental Specialist (Heritage).	PM or WS-RMD	
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 the regulator.	A/PM or WS-RMD (RES)	
6.2	Implement the archaeological or heritage management plan. Where impact is expected, this would include such things as 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.	PM or WS-RMD (RAPs and RES)	PACHCI Stage 3
6.3	Where heritage approval is required contact regional environment staff for further advice and support material. Please note time constraints associated with heritage approval preparation and processing. Project scheduling may need to be revised where extensive delays are expected.	PM/RES/WS-RMD	
6.4	For Part 3A/Part 5.1 projects, assess whether heritage impact is consistent with the project approval or if project approval modification is required from the Department of Planning and Environment. Seek advice from regional environment staff and Environment Branch specialist staff if unsure.	PM/RES	

Step	Task	Responsibility	Guidance & Tools
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.	PM or WS-RMD	
6.6	Where statutory approval (or Part 3A/Part 5.1 project modification) is not required and where recording is recommended by the archaeologist, sufficient time must be allowed for this to occur.	PM or WS-RMD	
6.7	Ensure short term and permanent storage locations are identified for archaeological material or other heritage material is removed from site, where required. Interested third parties (eg museums or local councils) should be consulted on this issue. Contact regional environment staff and Senior Environmental Specialist (Heritage) for advice on this matter, if required.	PM or WS-RMD	
7	Review CEMPs and approval conditions		
7.1	Check whether written notification is required to be sent to the regulator before re-commencing work. Where this is not explicit in heritage approval conditions, expectations should be clarified directly with the regulator.	PM	
7.2	Update the CEMP, site mapping and project delivery program as appropriate with any project changes resulting from final heritage management (eg retention of heritage item, salvage of item). Updated CEMPs must incorporate additional conditions arising from any heritage approvals, and Aboriginal community consultation if relevant. Include any changes to CEMP in site induction material and update site workers during toolbox talks.	PM	
8	Resume work		
8.1	Seek written clearance to resume project work from regional environment staff and the archaeologist (and regulator, if required). Clearance would only be given once all archaeological excavation and/or heritage recommendations (where required) are complete. Resumption of project work must be in accordance with the all relevant project/heritage approvals/determinations.	RES/A/PM/WS-RMD	
8.2	If required, ensure archaeological excavation/heritage reporting and other heritage	PM/A/WS-RMD	

Step	Task	Responsibility	Guidance & Tools
	approval conditions are completed in the required timeframes. This includes artefact retention repositories, conservation and/or disposal strategies.		
8.3	Forward all heritage/archaeological assessments, heritage location data and its ownership status to the Senior Environmental Specialist (Heritage). They will ensure all heritage items in Roads and Maritime ownership and/or control are considered for the Roads and Maritime S170 Heritage and Conservation Register.	PM/SES(H)/ WS-RMD	
8.4	If additional unexpected items are discovered this procedure must begin again from Step 1.	PM/TL-RMD	

Step	Task	Responsibility	Guidance & Tools
	approval conditions are completed in the required timeframes. This includes artefact retention repositories, conservation and/or disposal strategies.		
8.3	Forward all heritage/archaeological assessments, heritage location data and its ownership status to the Senior Environmental Specialist (Heritage). They will ensure all heritage items in Roads and Maritime ownership and/or control are considered for the Roads and Maritime S170 Heritage and Conservation Register.	PM/SES(H)/ WS-RMD	
8.4	If additional unexpected items are discovered this procedure must begin again from Step 1.	PM/TL-RMD	

8 Seeking advice

Advice on this procedure should be sought from Roads and Maritime regional environment staff in the first instance. Contractors and alliance partners should ensure their own project environment managers are aware of and understand this procedure. Regional environment staff can assist non-Roads and Maritime project environment managers with enquires concerning this procedure.

IMPORTANT!

Roads and Maritime Services staff and contractors are not to seek advice on this procedure directly from the Office of Environment and Heritage without first seeking advice from regional environment staff and heritage policy staff.

Technical archaeological or heritage advice regarding an unexpected heritage item should be sought from the contracted archaeologist. Technical specialist advice can also be sought from heritage policy staff within Environment Branch to assist with the preliminary archaeological identification and technical reviews of heritage/archaeological reports.

Roads & Maritime Services

9 Related information

Contact details: Senior Environmental Specialist (Heritage), Environment Branch, 02 8588 5754

Effective date: 01 February 2015

Review date: 01 February 2016

This procedure should be read in conjunction with:

- Roads and Maritimes' *Heritage Guidelines 2015*.
- Roads and Maritime Services *Environmental Incident Classification and Reporting Procedure*
- Roads and Maritime's *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*
- RTA *Environmental Impact Assessment Guidelines*.

This procedure replaces:

- Procedure 5.5 ("*unexpected discovery of an archaeological relic or Aboriginal object*") outlined in the RTA's *Heritage Guidelines 2004*.

Other relevant reading material:

- NSW Heritage Office (1998), *Skeletal remains: guidelines for the management of human skeletal remains*.
- Department of Environment and Conservation NSW (2006), *Manual for the identification of Aboriginal remains*.
- Department of Health (April 2008), *Policy Directive: Burials - exhumation of human remains*¹¹.

¹¹ http://www.health.nsw.gov.au/policies/pd/2008/pdf/PD2008_022.pdf

Appendix A

Identifying Unexpected Heritage Items

The following images can be used to assist in the preliminary identification of potential unexpected items (both Aboriginal and non-Aboriginal) during construction and maintenance works. Please note this is not a comprehensive typology.



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).



Wood stave water pipe



Tram tracks



Retaining wall



Cistern

Top left hand picture continuing clockwise: Woodstave water pipe with tar and wire sealing (Horsley Drive); Tram tracks (Sydney); Brick lined cistern (Clyde); Retaining wall (Great Western Highway, Leura).



Top left hand picture continuing clockwise: Road pavement (Great Western Highway, Lawson); Sandstone kerbing and guttering (Parramatta Road, Mays Hill); Telford road (sandstone road base, Great Western Highway, Leura); Ceramic conduit and sandstone culvert headwall (Blue Mountains, NSW); Corduroy road (timber road base, Entrance Road, Wamberai).



Alignment pin



Survey tree



Alignment stone



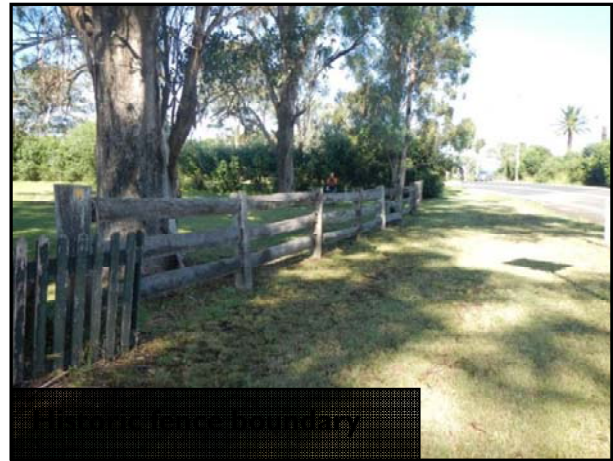
Survey tree



Milestone



Top left hand corner continuing clockwise: Alignment Pin (Great Western Highway, Wentworth Falls); Survey tree (MR7, Albury); Survey tree (Kidman Way, Darlington Point, Murrumbidgee); Survey tree (Cobb Highway, Deniliquin); Milestone (Great Western Highway, Kingswood, Penrith); Alignment Stone (near Guntawong Road, Riverstone). Please note survey marks may have additional statutory protection under the *Surveying and Spatial Information Act 2002*.



Top left hand corner continuing clockwise: Remnant bridge piers (Putty Road, Bulga); Wooden boundary fence (Campbelltown Road, Denham Court); Dairy shed (Ballina); Golden Arrow Mine Shaft.



Top left hand corner: Culturally modified stone discovered on Main Road 92, about two kilometres west of Sassafras. The remaining images show a selection of stone

|

artefacts retrieved from test and salvage archaeological excavations during the Hume Highway Duplication and Bypass projects from 2006-2010.

Appendix B

Unexpected Heritage Item Recording Form 418



Unexpected heritage item recording form

Date:						Recorded by: (Include name and position)			
Project name:									
Description of works being undertaken (eg Removal of failed pavement by excavation and pouring concrete slabs in 1m x 1m replacement sections).									
Description of exact location of item (eg Within the road formation on Parramatta Road, east bound lane, at the corner of Johnston Street, Annandale, Sydney).									
Description of item found (What type of item is it likely to be? Tick the relevant boxes).									
A. A relic		<input type="checkbox"/>	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 bottles, utensils, plates, cups, household items, tools, implements, and similar items.						
B. A 'work, building or structure'		<input type="checkbox"/>	A 'work' can generally be defined as a form infrastructure such as tram tracks, a culvert, road base, a bridge pier, kerbing, and similar items.						
C. An Aboriginal object		<input type="checkbox"/>	An 'Aboriginal object' may include stone tools, stone flakes, shell middens, rock art, scarred trees and human bones.						
D. Bone		<input type="checkbox"/>	Bones can either be human or animal remains. Remember that you must contact the local police immediately by telephone if you are <u>certain</u> that the bone(s) are <u>human remains</u>.						
E. Other		<input type="checkbox"/>							

<p>Provide short description of item (eg Metal tram tracks running parallel to road alignment. Good condition. Tracks set in concrete, approximately 10cms (100 mm) below the current ground surface).</p>	
<p>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).</p>	
<p>Action taken (Tick either A or B)</p>	
<p>A. Unexpected item would not be further impacted on by works <input type="checkbox"/></p>	
<p>Describe how works would avoid impact on the item. (eg The tram tracks will be left <i>in situ</i>, and recovered with road paving).</p>	
<p>B. Unexpected item would be further impacted on by works <input type="checkbox"/></p>	
<p>Describe how works would impact on the item. (eg Milling is required to be continued to 200 mm depth to ensure road pavement requirements are met. Tram tracks will need to be removed).</p>	
<p>Project manager / works supervisor signature</p>	

Appendix C

Photographing Unexpected Heritage Items

Photographs of unexpected items in their current context (*in situ*) may assist heritage staff and archaeologists 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) 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 much value to the subsequent detailed photographs also required (Figure 2).

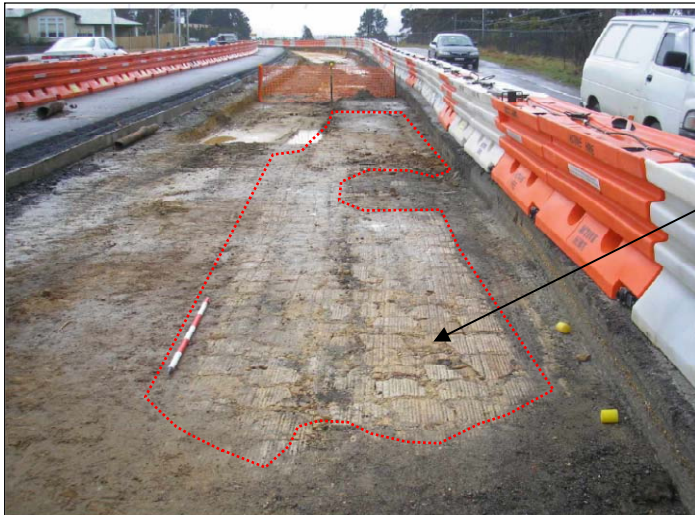


Figure 2: Close up detail of the sandstone surface showing material type, formation and construction detail. This is essential for establishing date of the feature.

Figure 1: Telford road uncovered on the Great Western Highway (Leura) in 2008.

Photographing distinguishing features

Where unexpected items have a distinguishing feature, close up detailed photographs must be taken of this, 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.

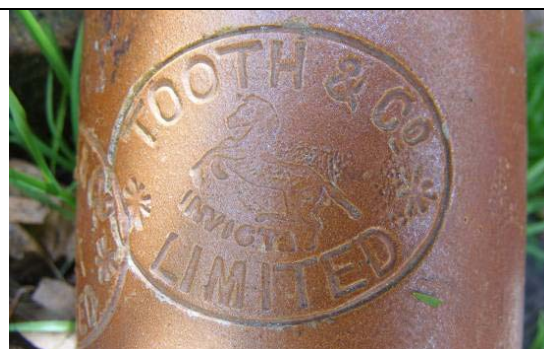


Figure 4: Detail of the stamp allows 'Tooth & Co Limited' to be made out. This is helpful to a specialist in gauging the artefact's origin, manufacturing date and likely significance.

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, Roads and Maritime must contact the police immediately (see Appendix F for detailed guidance). Taking quality photographs of the bones can often resolve this issue quickly. Heritage staff in Environment Branch 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 C

Key Environmental Contacts

Key environmental contacts

Hunter region	Environmental Manager (Hunter)	4924 0440
	Aboriginal Cultural Heritage Advisor	4924 0383
Northern region	Environment Manager (North)	6640 1072
	Aboriginal Cultural Heritage Advisor	6604 9305
Southern region	Environmental Manager (South)	6492 9515
	Aboriginal Cultural Heritage Advisor	4221 2767
South West region	Environment Manager (South West)	6937 1634
	Aboriginal Cultural Heritage Advisor	6937 1647
Sydney region	Environment Manager (Sydney)	8849 2516
	Aboriginal Cultural Heritage Advisor	8849 2583
Western region	Environment Manager (West)	6861 1628
	Aboriginal Cultural Heritage Advisor	6861 1658
Pacific Highway Office	Environment Manager	6640 1375
Regional Maintenance Delivery	Environment Manager	9598 7721
Environment Branch	Senior Environmental Specialist (Heritage)	8588 5754

Heritage Regulators

Heritage Division Office of Environment and Heritage Locked Bag 5020 Parramatta NSW 2124 Phone: (02) 9873 8500	Department of the Environment (Clth) GPO Box 787 Canberra ACT 2601 Phone: (02) 6274 1111
Office of Environment and Heritage (Sydney Metropolitan) Planning and Aboriginal Heritage Section PO Box 668 Parramatta NSW 2124 Phone: (02) 9995 5000	Office of Environment and Heritage (North Eastern NSW) Planning and Aboriginal Heritage Section Locked Bag 914 Coffs Harbour NSW 2450 Phone: (02) 6651 5946
Office of Environment and Heritage (North Western NSW) Environment and Conservation Programs PO Box 2111 Dubbo NSW 2830 Phone: (02) 6883 5330	Office of Environment and Heritage (Southern NSW) Landscape and Aboriginal Heritage Protection Section PO Box 733 Queanbeyan NSW 2620 Phone: (02) 6229 7188

Project-Specific Contacts

Position	Name	Phone Number
Project Manager		
Site/Alliance Environment Manager		
Regional Environmental Officer		
Aboriginal Cultural Heritage Advisor		
Consultant Archaeologist		
Local Police Station		
OEH: Environment Line		131 555

Appendix E

Uncovering Bones

This appendix provides Project Managers with (1) advice on what to do when bones are discovered; (2) guidance on the notification pathways; and (3) additional considerations and requirements when managing the discovery of human remains.

1. First uncovering bones

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. Therefore they must be identified as either human or non-human as soon as possible by a qualified forensic or physical anthropologist. These specialist consultants can be sought by contacting regional environment staff and/or heritage staff at Environment Branch.

On the very rare occasion where it is *instantly 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. 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 clothing are present.

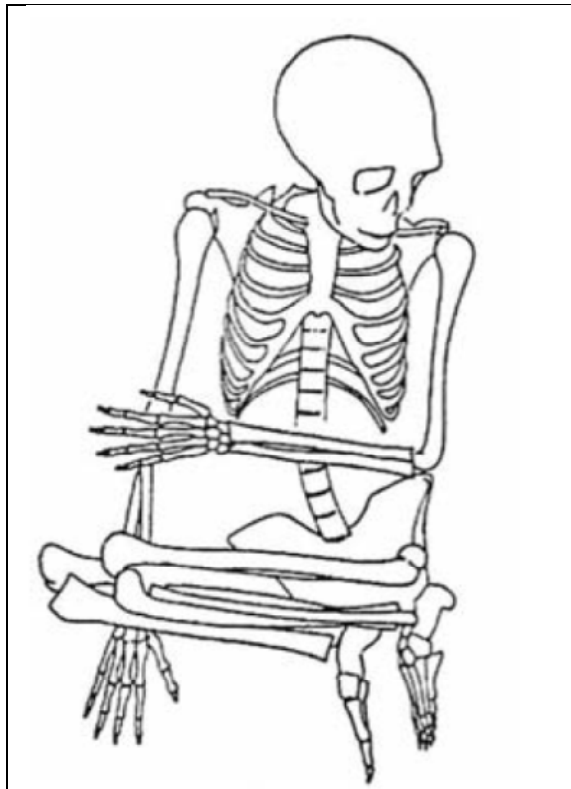


Figure 1: Schematic of a complete skeleton that is 'obviously' human¹².



Figure 2: Disarticulated bones that require assessment to determine species.

This preliminary phone call is to let the police know that Roads and Maritime is undertaking 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.

¹² After Department of Environment and Conservation NSW (2006), *Manual for the identification of Aboriginal Remains*: 17.

Where it is not '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 C. 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 Project Manager or regional environment staff is considered appropriate. This must be followed up later by Roads and Maritime's formal letter notification as per Appendix G 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

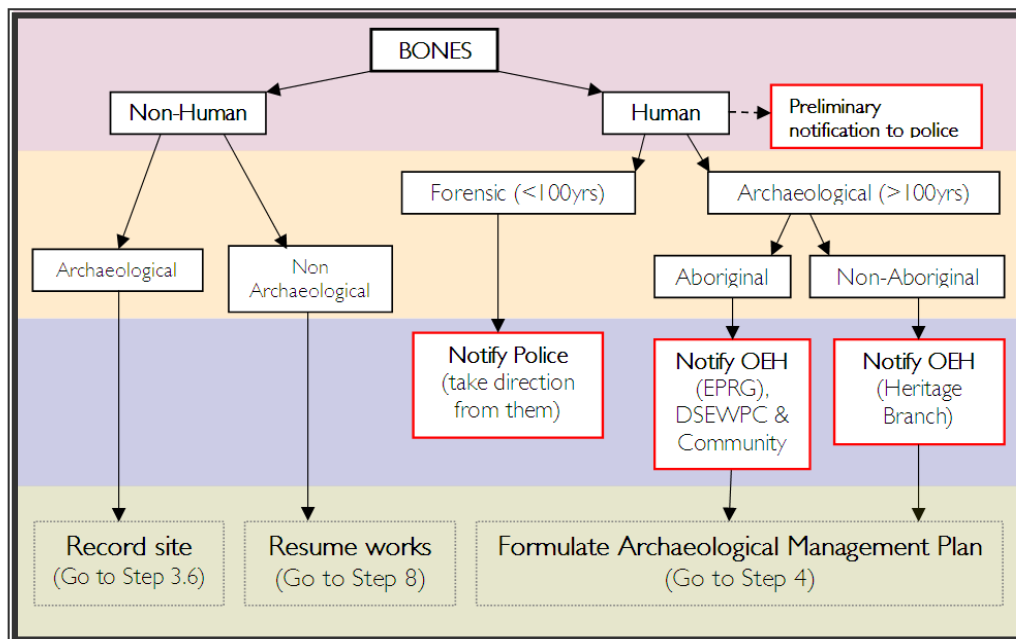
The OEH and the RMS Aboriginal Cultural Heritage Advisor (ACHA) must be notified immediately. The ACHA must contact and inform the relevant Aboriginal community stakeholders who may request to be present on site. Relevant stakeholders are determined by the RTA's *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*.

C. Human bones are archaeological in nature (*more than 100 years old*) and likely to be **non-Aboriginal** remains.

Action

The OEH (Heritage Branch, Conservation Team) must be notified immediately.

The simple diagram below summarises the notification pathways on finding bones.



After the appropriate verbal notifications (as described in B and C), the Project Manager must proceed through the *Unexpected Heritage Items Procedure* to formulate an archaeological management plan (Step 4). Note no archaeological management plan is required for forensic cases (A), 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 recording 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). Roads and Maritime's ACHA can provide advice on this and how to engage with the relevant Aboriginal community. Project Managers, more generally, may also 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, Roads and Maritime is 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)¹³. 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

¹³ This requirement is in addition to heritage approvals under the *Heritage Act 1977*.

|

advised, when works uncover human remains adjacent to cemeteries, to confirm the cemetery's exact boundaries.

Appendix F

Archaeological Heritage Advice Checklist

The following checklist can be used by the Project Manager and the archaeologist to ensure all relevant archaeological issues are considered when developing the management plan required at Step 4 of this procedure.

An archaeological or heritage management plan can include a range of activities and processes, which differ depending on the find and its significance.

	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		
• AHIPs, Section 140, S139 exceptions etc	Yes/No	
• Regulator relics/objects notification	Yes/No	
• Roads and Maritime's S170 Heritage and Conservation Register listing requirements	Yes/No	
• Compliance with CEMP or other project heritage approvals	Yes/No	
Stakeholder consultation		
• Aboriginal stakeholder consultation requirements and how it relates to RTA <i>Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI)</i> .	Yes/No	
• Advice from regional environmental staff, Aboriginal Cultural Heritage Advisor, Roads and Maritime heritage team.	Yes/No	
Artefact/ heritage item management		
• Retention or conservation strategy (eg items may be subject to long conservation and interpretation) • Disposal strategy (eg former road pavement) • Short term and permanent storage locations (interested third parties should be consulted on this issue).	Yes/No	
• Control Agreement for Aboriginal objects.	Yes/No	
Program and budget		
• Time estimate associated with archaeological or heritage conservation work.		
• Total cost of archaeological/heritage work.		

Appendix G

Template Notification Letter

PASTE INTO RMS LETTER TEMPLATE

"[Select and type date]"

[Select and type reference number]

[Select and type file number]

[Insert recipient's name and address, see **Appendix D**]

[Select and type salutation and name],

Re: Unexpected heritage item discovered during Roads and Maritime Services project works.

I write to inform you of an unexpected [select: relic, heritage item or Aboriginal object] found during Roads and Maritime Services construction works at [insert location] on [insert date]. [Where the regulator has been informally notified at an earlier date by telephone, this should be referred to here].

This letter is in accordance with the notification requirement under [select: Section 146 of the *Heritage Act 1977* (NSW) or Section 89(A) of the *National Parks and Wildlife Act 1974* (NSW)] **NB:** There may be not be statutory requirement to notify of the discovery of a 'heritage Item that is not a relic or Aboriginal object].

NB: On finding Aboriginal human skeletal remains this letter must also be sent to the Commonwealth Minister for Sustainability, Environment, Water, Populations and Communities (SEWPC) in accordance with notification requirements under Section 20(1) of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth).

[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) (eg Part 5). Also include any project approval number, if available].

Roads and Maritime Services [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.

Resulting from these preliminary findings, Roads and Maritime Services [or contractor] is proposing [provide a summary of the proposed archaeological/heritage approach (eg 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.

Please contact me if you have any input on this approach or if you require any further information.

Yours sincerely

[Sender name and position]

[Attach the archaeological/heritage management plan and site recording form].

About this release

Reference number	RMS 12.003 PN 285 P02
Title	Unexpected Heritage Items Procedure
Parent procedure	RMS Heritage Guidelines
Prepared by	Environment Officer (Heritage) Gretta Logue Environment Officer (Heritage) Daniel Percival
Approved by	Manager Environmental Policy, Planning and Assessment Michael Crowley
Document location	Objective - SF2013/153770 / Unexpected heritage items procedure.doc
Document status	Version 1.0, 16 March 2015

Version	Date	Revision description
1.0	01/11/11	First issue
Revised	23 July 2012	Amended to reflect that (a) unexpected finds do not include items covered by a relevant approval; (b) Aboriginal people must be consulted where an unexpected find is likely to be an Aboriginal object; (c) the Department of Planning and Environment must be notified in accordance with Step 5 of this procedure for Part 3A and Part 5.1 projects.
Revised	09 October 2013	Amended to clarify that the procedure applies to all types of unexpected heritage items, not just archaeological items. The procedure introduces the term 'Historic Items' to cover both 'archaeological relics' and 'other historic items' such as works, structures, buildings and movable objects. The title of the document has been amended to better reflect this clarification.
Revised	16 March 2015	The procedure was streamlined to address all project types including maintenance works. The separate maintenance procedure (formerly Appendix B) was removed. Names and titles updated throughout.

Your comments and suggestions to improve this or any of the Heritage Guidelines and associated documents may be sent to:

Senior Environmental Specialist (Heritage)
 Environmental Policy, Planning and Assessment
 Environment Branch, Roads and Maritime Services
 Level 17, 101 Miller Street
 North Sydney, NSW 2060
 Ph: 8588 5726



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Annexure C - Archaeological methodology

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

Archaeological methodology

September 2017

Prepared for

Roads and Maritime

Prepared by

Jacobs Group (Australia) Pty Limited

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Contents

1.	Introduction	1
2.	Further investigation	2
2.1	Aims	2
2.2	Methodology	3
2.2.1	Test Excavation	3
2.2.2	Identifying new engraving locations	4
2.2.3	Radiometric dating	5
2.3	Personnel	7
2.4	Research Questions.....	7
2.5	Artefact analysis.....	8
2.5.1	Recorded attributes – artefact class.....	8
2.5.2	Raw material.....	9
2.5.3	Cortex.....	9
2.5.4	Termination.....	9
2.5.5	Platform	9
2.5.6	Tools.....	9
2.5.7	Cores	9
2.5.8	Metrical attributes.....	9
3.	References	11

Appendix A. PAD location mapping

Abbreviations

AFG	Aboriginal Focus Group
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
DEC Heritage)	Department of Environment and Conservation (now the Office of Environment and
DECCW	Department of Environment, Climate Change
DP&E	Department of Planning and Environment
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
Jacobs	Jacobs Group (Australia) Pty Ltd
LALC	Local Aboriginal Land Council
OEH	Office of Environment and Heritage
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PAD	potential archaeological deposit
RAP	registered Aboriginal party
Roads and Maritime	NSW Roads and Maritime Services
SEAR	Secretary's environmental assessment requirements
The project	Western Harbour Tunnels and Beaches Link

1. Introduction

This document presents an archaeological methodology for Aboriginal objects and places for the Western Harbour Tunnel and Beaches Link (WHTBL) Program (the project). The project would be declared state significant infrastructure and requires environmental assessment in accordance with Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) (DoP).

The methodology is designed to be in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (Code of Practice) (OEH 2010). The methodology will also be revised if necessary to meet the Secretary's Environmental Assessment Requirements (SEARs) for the project when they become available.

This archaeological methodology is designed in accordance with the requirements of Stage 2 of NSW Roads and Maritime Services (Roads and Maritime) *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHI) (Roads and Maritime Services 2011). The purpose of this methodology is to describe the implementation of recommendations for managing harm to Aboriginal cultural heritage, as outlined within the *Western Harbour Tunnel and Beaches Link Archaeological Survey Report – Aboriginal* (Costello and Brooks 2017).

The methodology presented in this document comprises two categories:

- A project specific test excavation methodology for further investigation of areas of potential archaeological deposit (PAD) identified within the construction boundary (Section 2 and Table 2.3). This Section also includes a recommended procedure for soil and vegetation removal to locate potential engravings (Section 2.2.2)
- A generic test excavation methodology for further investigation of areas of PAD identified through subsequent assessments as potentially impacted by the project (Section 2.2).

2. Further investigation

As detailed in the *WHTBL Archaeological Survey Report – Aboriginal V4* (Costello and Brooks 2017) desktop assessment and archaeological field survey of the project corridor has been carried out. This assessment identified three areas of PAD that require further investigation in the form of test excavation in order to confirm the presence of archaeological deposits and determine the nature, extent and significance of these deposits to inform the development of appropriate management recommendations.

The PADs requiring further investigation are listed in Table 2.1. Further investigation to locate potential engraving sites covered by vegetation and soil are listed in Table 2.2. Mapping with the location and extent of each PAD can be found in Appendix A.

A further four locations within the project corridor were identified during survey as having potential for rock engravings covered by vegetation and soil (Table 2.2).

Table 2.1 : PADs identified within the survey corridor

PAD names (AHIMS ID)	Assessment area	Likelihood of archaeological deposits	Landform (soil landscape)
Artarmon Park PAD	Northshore	Low-moderate	Gynea / Disturbed
Flat Rock Creek PAD	Northshore	Low-moderate	Gynea / Disturbed
Burnt Bridge Creek PAD	Balgowlah	Low-moderate	Gynea / Disturbed

Table 2.2 : Potential new engraving locations identified within the survey corridor

Potential engraving locations	Assessment area	Likelihood of archaeological deposits	Landform (soil landscape)
Wakehurst Parkway cultural landscape	Northshore	Moderate	Gynea / Disturbed
Artarmon Park	Northshore	Low-moderate	Gynea / Disturbed
Flat Rock Creek	Northshore	Low-moderate	Gynea / Disturbed
Burnt Bridge Creek	Balgowlah	Low-moderate	Gynea / Disturbed

2.1 Aims

The aims of the test excavation and approach to locating new and hidden engravings are to:

- Assess the presence of sub-surface archaeological deposits for all PADs
- Assess the presence of new engravings at the identified locations
- Identify the nature, depth, extent and significance of archaeological deposits within the boundary of the project
- Consult with registered Aboriginal parties (RAP) in regards to this work and the sites being tested
- Develop recommendations to minimise or mitigate potential impacts to any Aboriginal cultural heritage objects identified via the test excavation and through the location of potential new engraving sites.

Preliminary management recommendations and Aboriginal significance may be discussed informally in the field with nominated site offices during this time, however, recommendations will be discussed more formally at a post fieldwork Aboriginal Focus Group (AFG) meeting.

2.2 Methodology

It should be noted that this test excavation methodology is designed to be in accordance with Requirement 16 of *Code of Practise for Archaeological Investigation of Aboriginal Objects in NSW* (OEH 2010) and *Introduction to Rock Art Conservation* (DECC 2007).

2.2.1 Test Excavation

- Test excavation units will be placed on a systematic grid appropriate to the scale of the area being investigated, for example 10, 20 or 40 metre (m) intervals, or other justifiable and regular spacing depending upon observed disturbance of the area, and the predicted sensitivity of the landforms on which the PAD is located. The proposed test pit spacing, number of transects and excavation units required to adequately investigate each PAD within the survey corridor is presented below in Table 2.3. The exact placement and number of excavation units will be determined by the supervising archaeologist in consultation with site officers for the relevant RAP
- Test excavation units will only be placed within the boundaries of the project
- Test excavation units will not be placed in areas where significant ground disturbance has been identified in consultation with site officers for the relevant RAP
- Test excavations units will be excavated using hand tools only (for example shovels or trowels)
- Test excavations will be excavated in 500 mm x 500 mm units
- Test excavations units may be combined and excavated as necessary to understand the characteristics of any site identified. In general, the maximum continuous surface area of a combination of test excavation units at a single excavation point will be no greater than three square metres
- The maximum surface area of all test excavation will be no greater than 0.5 per cent of the PAD area being investigated (See Table 2.3)
- Where test excavations identify sub-surface archaeological deposits, additional excavation units will be placed five, 10 or 20 m away on the four cardinal points in order to establish the horizontal extent of the site
- The first excavation unit will be excavated and documented in 50 mm spits at each PAD being investigated. Based on the evidence of the first excavation unit, 100 mm spits or sediment profile/stratigraphic excavation (whichever is smaller) may then be implemented
- Test excavation units will be excavated to at least the base of the identified Aboriginal object-bearing units, and must continue to confirm the soils below are culturally sterile (B Horizon)
- All material excavated from the test excavation units will be dry sieved using a three or five mm aperture wire-mesh sieve
- Photographic and scale-drawn records of the stratigraphy/soil profile, features and informative Aboriginal objects will be made for each excavation points. This includes recording of the stratigraphy/soil profile of each distinct landform sampled and of each test excavation unit in which an archaeological feature or Aboriginal object were identified
- Soil colour and type, texture, acidity and stratification will be recorded to increase understanding of the sub-surface conditions of PADs and how they may relate to site formation processes influencing the presence and condition of sub-surface archaeological deposits
- Soil colours will be recorded from each soil strata identified, using a Munsell colour chart to ensure consistency

- Soil acidity will be measured for each soil type identified using a pH testing kit
- Test excavations units will be backfilled as soon as practicable
- The location of each excavation unit will be recorded using a mobile GIS Unit (Trimble® GeoXH™ GeoExplorer®, Trimble® Nomad or an IPAD with appropriate spatial capability). This allows for the spatial datasets collected in the field to be post-processed to sub-metre level accuracy once the GPS co-ordinates have been differentially corrected
- All artefacts retrieved during test excavation will be double bagged and labelled with appropriate contextual information. The artefacts will be analysed under laboratory conditions at the North Sydney Jacobs office
- The long term management arrangements for any recovered artefacts will be in consultation and agreement with the RAPs and in accordance with Section 3.7 of the Code of Practice (OEH 2010). The relevant Local Aboriginal Land Council (LALC) offices will be considered for the long storage of recovered artefacts following the test excavation program
- Following test excavation, an Aboriginal Site Impact Recording Form will be completed and submitted to the AHIMS Register as soon as practicable, for each Aboriginal Heritage Information Management Systems (AHIMS) PAD/site that has been the subject of test excavation in accordance with the requirements of the Code of Practice
- If suspected human skeletal remains are encountered, works potentially affecting the find would cease immediately and follow Requirement 25 of the Code of Practice would be followed.

2.2.2 Identifying new engraving locations

Where the potential for engravings, or petroglyphs (produced by breaking through or extracting the rock surface – pecking, pounding, abrading, scratching), exists within the project corridor and may be impacted, further investigation must be carried out to determine the absence of engravings prior to any impacts occurring. The first priority in rock art recording must always be to avoid harm to the art itself (including the panels or surfaces on which the art is located).

Where the absence of engravings is determined works can occur with approval from the archaeologist following consultation with the RAP in the field. Where the presence of rock engravings or petroglyphs within the project corridor are established by investigation all practicable steps must be taken to avoid any impacts to the site and a buffer of at least 5 m or an appropriate distance must be established around the site. Once identified the purpose of the exercise must be to document as much information as possible from the petroglyphs, without harming them.

Where the potential for engravings, or petroglyphs exists within the project corridor and the rock platform is covered by light soil deposit and vegetation the following methodology is designed to generally be in accordance with the recommended procedures for uncovering engravings as detailed in *Introduction to Rock Art Conservation* (DECC 2007).

- Remove vegetation with shovels, brooms or by hand where appropriate, taking care not to scratch the rock surface.
- Remove vegetation carefully as it often takes much of the soil with it.
- Examine small areas and work down slope. Some shovelling may be required to move accumulated soil.

The above techniques will occur in a targeted manner and will be directed through the identification of appropriate locations where sandstone rock platforms occur in elevated landscapes to search for engravings during PACHCI 3 fieldwork. Consultation will occur between field archaeologists and RAP representatives during fieldwork to determine these locations. A list of potential new engraving locations to be examined during PACHCI 3 fieldwork is detailed in Table 2.2.

As per the Conditions of Requirement 22 of the Code of Practice (OEH 2010), while undertaking rock art recording care must be taken to not physically interfere with any pictogram or petroglyph and to minimise movement on or over surfaces with petroglyphs. If an engraving is located an archaeologist in consultation with the RAP will:

- Wash down the site using anything from a knapsack water dispenser to a water tanker depending on the scale of the operation. In order to avoid the risk of surface damage, no high power water jet will be used.
- If necessary, remove soil up to one metre from the edge of the site to avoid future build up.
- If the area is damp allow time for the site to dry. It may then be dry brushed by hand using 100 mm bristle brushes, or larger, soft nylon brushes.
- To conserve the site, consider appropriate drainage and water diversion to prevent soil build up.

If a new engraving site is located, an Aboriginal Heritage Information Management System (AHIMS) form must be completed and submitted to the AHIMS Register as soon as practicable. When recording any new rock art or petroglyphs, care must be taken to avoid, with the exception of necessity (scales, string, tape measures or drawing frames for recording), putting equipment on the art or the surface containing the art.

Recording techniques will employ 3D laser scanning where appropriate, use high definition illumination at night to discern faint feature outlines, use modern photogrammetry techniques and other appropriate techniques and technologies. Photographs must capture:

- Context
- Landscape
- shelter/feature/platform.

2.2.3 Radiometric dating

Samples of organic material suitable for radiometric dating (charcoal, bone, shell, wood etc.) will be collected for the dating of archaeological deposits. The number of samples sent for dating will be determined on the suitability of the sample and the significance of the site. Samples will be collected as follows:

- Samples will be collected using clean nitrile gloves and placed in clean plastic sample bags
- Charcoal samples will also be wrapped in aluminium foil to prevent crushing
- Samples will be removed to the relevant temporary keeping place and dried out to avoid fungal growth during transport
- Samples will be packaged within hard plastic cases for transport to a radiocarbon dating laboratory.

Table 2.3 : Estimated transect and test pit numbers for each PAD

PAD name (AHIMS ID)	Approximate PAD area within the project corridor	Proposed test excavation techniques	Estimated transects	Estimated excavation unit number	Estimated Excavation unit spacing	Estimated excavation area (% of PAD area)	Notes
Artarmon Park PAD	10,412 m ²	Manual excavation	3	25	10 m		
Flat Rock Creek PAD	459 m ²	Manual excavation	4	20	10 m		Terrain will restrict access and ability to excavate
Burnt Bridge Creek PAD	4429 m ²	Manual excavation	5	30	10 m		

2.3 Personnel

Test excavation will be conducted by appropriately qualified and experienced archaeologists (as per Section 1.6 of the Code of Practice) and nominated site officers for the relevant RAP. Where sub-surface Aboriginal objects are identified, nominated site officers will be consulted regarding preferred management measures.

In general, it is proposed that a test excavation team consisting of two field archaeologists and a maximum of four nominated site officers conduct the test excavation. Where additional resources are required, it is proposed that a maximum ratio of one-two site officers to one field archaeologist is maintained, with a maximum of four field archaeologists and eight site officers engaged at any one time. A roster for site officer participation will be developed in consultation with Mark Lester (Aboriginal Cultural Heritage Advisor, Roads and Maritime). If required, a dedicated artefact specialist may also be engaged during the test excavation program to assist with the analysis of large volumes of artefacts.

2.4 Research Questions

Where test excavation identifies a previously unknown Aboriginal cultural heritage value (site) or previously unidentified components of a previously known site, the stratigraphic and artefact analyses detailed above will be utilised to address the following research questions:

- What is the full spatial extent, including depth, of the archaeological deposits?
- What are the key characteristics of the archaeological deposits that constitute the site? Key characteristics might include:
 - Site type (for example artefact scatter, grinding grooves, bora/ceremonial site, burial)
 - Site preservation
 - Contents of the site, particularly the stone artefact assemblage (where present)
 - Site chronology
- How do the key characteristics of the site compare with other known sites in the region?
- Given the key characteristics of the site, what is the significance of the site? Significance assessment will be based upon the four values of the Australia ICOMOS Burra Charter (Australia ICOMOS 2000):
 - Social values
 - Historical values
 - Scientific values. Scientific significance is based upon the following criteria:
 - Site integrity
 - Site structure
 - Site contents
 - Representativeness and rarity
 - Aesthetic values.

Depending on the results of the test excavation and the nature of any archaeological deposits identified additional research questions may be required.

2.5 Artefact analysis

2.5.1 Recorded attributes – artefact class

Stone artefacts can be separated into four main categories; flakes, cores, tools, and angular fragments. It is from these four categories that further distinctions can be made based on identifying specific attributes relating to the reduction process (Holdaway 2004 p. 24).

Flakes

Flakes are defined through the presence of attributes relating to conchoidal fracture (Holdaway and Stern 2008 p. 34). A conchoidal fracture originates from pre-existing flaws and creates what is known as a Hertzian cone (Clarkson 2007 p. 27). Flakes maintain both a ventral and dorsal surface and can be further categorised based on the completeness of the flake. Flakes are generally described as complete, proximal, medial, distal, complete split flakes, longitudinally split flakes and core rejuvenation flakes.

Cores

Cores are defined by the presence of negative flake scars, marking the location of previous flake removal (Holdaway & Stern 2008 p. 179). These flake scars can be used to describe the direction of flake removal (unidirectional, bi-directional, bifacial, multi-directional, and microblade). Cores also include the presence of one or more platforms and can exist as a complete core, or a core fragment, or broken core.

Tools

Tools maintain similar characteristics to flakes, but have evidence of retouch or use wear along lateral margins. Tools retain a ventral surface and can also be categorised based on completeness of artefact remaining, in a similar manner to flakes.

Angular fragments

Angular fragments are flaking debris with none of the above identifiable diagnostic features associated with stone reduction processes. Thus, the defining characteristics as detailed in the above three categories are missing on angular fragments (Hiscock 1988 p. 129).

Table 2.4 : Definition of technical categories to be used

Technological category	Definition
Complete flake	Has a ventral surface that preserves a complete fracture plane, has a platform (or impact point), lateral margins and a termination
Proximal flake	A broken flake that lacks a termination but retains one or more of the following: platform and/or impact point, bulb of percussion, bulbar scar and fissures
Medial flake	Absence of proximal and distal margins but have an identifiable ventral surface
Distal flake	Presence of a termination and the absence of a platform or impact point
Longitudinal split flake	A break that runs parallel to the flaking axis. The flake preserves a portion of the platform and/or impact point and has an identifiable termination
Angular fragment	A flake fragment that cannot be identified in any more detail
Core	Negative flake scarring, no positive scars and therefore no ventral surface

2.5.2 Raw material

Artefact size and morphology are often closely linked to raw material (Hiscock 1988). As such it is important to identify the types of raw material present in the project area. Raw material types are expected to primarily include silcrete and silicified volcanic tuff, as identified via desktop review of previous test excavation results in the area.

2.5.3 Cortex

Cortex will be recorded as a percentage of the artefact covered, the type of cortex and its location. The proportion of the artefact covered by cortex refers to the percentage of cortex located on the dorsal surface for flakes and tools. For cores and angular fragments it refers to the percentage of the whole artefact. Percentages will be given as 0%, 1-50%, 51-99%, and 100%. Cortex type will be defined as either cobble or slab. Cobble refers to water-rounded cortex and slab refers to cortex associated with exposed surfaces or outcrops.

Recording the percentage of remaining cortex on an artefact is important as cortex proportions in lithic assemblages are frequently used as an indicator to suggest reduction intensity (Andrefsky 1998 pp.101-2). They can also suggest distance from the raw material source (Andrefsky 1998 pp.101-2).

2.5.4 Termination

Flake or tool termination refers to the artefact's distal end. Terminations will be recorded as feather, hinge, step, plunge, and crushed. If the termination is not present it will be listed as absent. Differing terminations are the result of different applications of force during the flaking process. For example, a flake with a crushed termination is often the result of bipolar technology.

2.5.5 Platform

Platform types are useful as they indicate the level of work that has been dedicated to a core to enable flake detachment (Holdaway 2004 p. 28). As a result, it is possible to determine stage of reduction and provide information regarding the face of the core (Andrefsky 1998 pp. 89-96). Platforms will be as flaked, focal, and crushed. If the platform is not present it will be listed as absent.

2.5.6 Tools

Where required an analysis of formal tool types will be made to facilitate comparisons with assemblages previously excavated within or close to the project corridor.

2.5.7 Cores

Artefacts with negative flake scars originating from one or more platforms were identified as cores (Holdaway and Stern 2008). As cores are used in the production of flakes, a different set of attributes will be used to describe them. Core scar direction will be detailed as uni-directional, bi-directional, or multidirectional. The number of core platforms, as well as the length of the biggest negative flake scar, will also be recorded.

2.5.8 Metrical attributes

The following metrical attributes will be recorded for all artefacts:

- Maximum dimension – Will be measured on all artefacts, irrespective of technological type. This is defined as the furthest points of division on the artefact. Maximum dimension is a useful concept in that all artefacts present have at least two attributes that can be measured; maximum dimension and weight, regardless of technological type.

- Weight – All artefacts will be weighed, irrespective of technological type. Artefact weight is probably the most reliable size characteristic for discriminating between reduction stages of stone artefacts. It is easy to take and is replicable and it correlates well with other linear dimensions which all relate to the size of the flake (Andrefsky 1998 p. 96). Although small flakes may be removed early in the reduction sequence, the heavier material comes from the early stages of knapping and reduces thereafter.

3. References

Andrefsky, W.J. 1998 *Lithics: macroscopic approaches to analysis*. Cambridge: Cambridge University Press.
Australia ICOMOS 2000 *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance*
1999. Burwood, Victoria: Australia ICOMOS Incorporated.

Clarkson, C. 2007 *Lithics in the Land of the Lightning Brothers: The Archaeology of Wardaman Country, Northern Territory*. Canberra: ANU E Press.

Costello, A. and B. Brooks 2017 *Western Harbour Tunnel and Beaches Link Archaeological Survey Report*.

DECC 2007 *Introduction to Rock Art Conservation*.

DoP 2012 *Environmental Planning and Assessment Act 1979*,. <http://www.legislation.nsw.gov.au>.

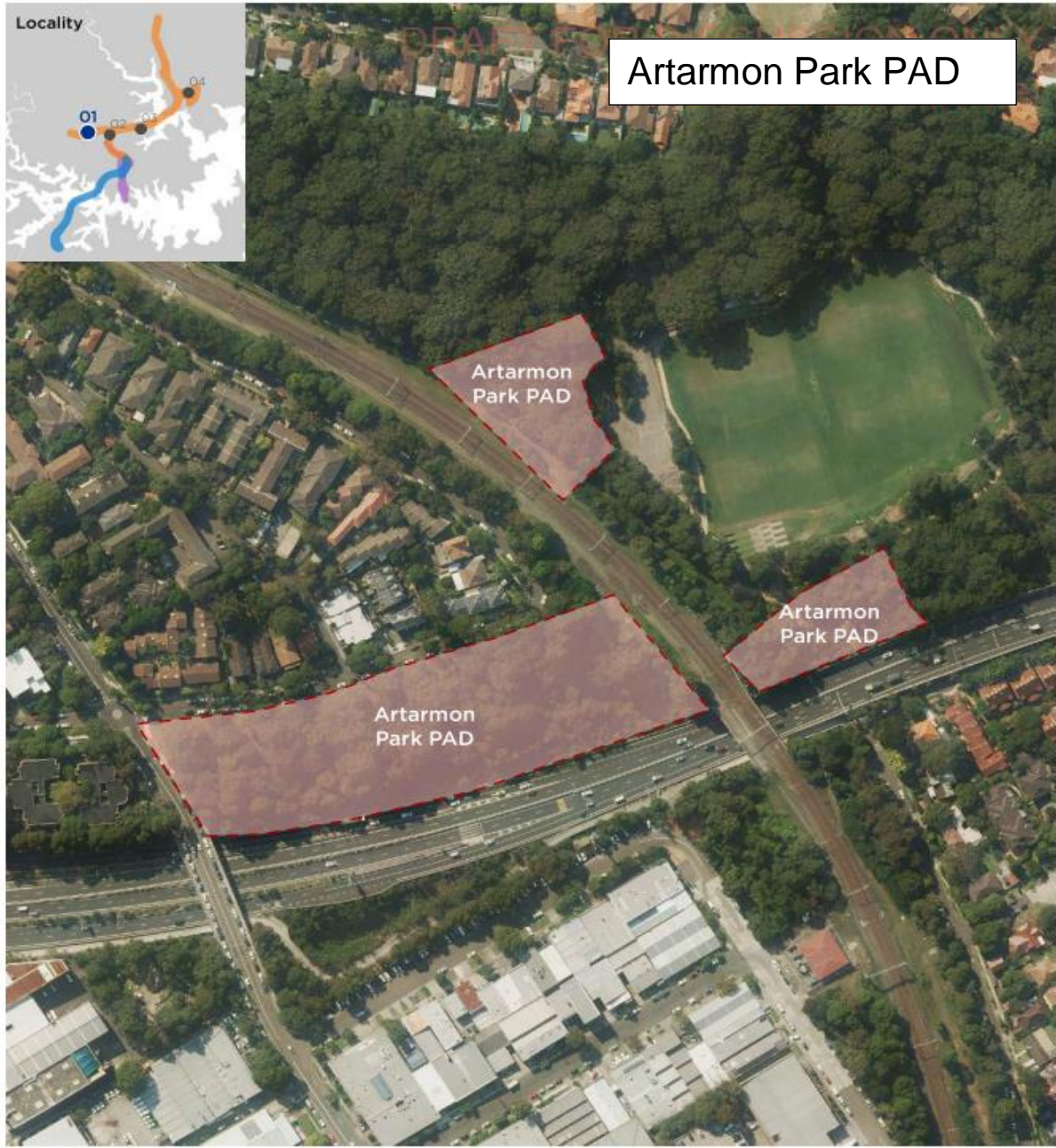
Hiscock, P. 1988 *Prehistoric Settlement Patterns and Artefact Manufacture at Lawn Hill, Northwest Queensland*, Department of Anthropology and Sociology, University of Queensland,

Holdaway, S.J. and N. Stern 2008 *A Record in Stone: The Study of Australia's Flaked Stone Artefacts*. Melbourne and Canberra: Museum Victoria and Aboriginal Studies Press.

OEH 2010 *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*. Sydney.

Roads and Maritime Services 2011 *Procedure for Aboriginal and Cultural Heritage Consultation and Investigation*. Sydney.

Appendix A. PAD location mapping



Key
Potential Archaeological Deposits

Indicative only, subject to design development
0 100 m N

Archaeological Sub-surface Testing Methodology
Western Harbour Tunnel and Beaches Link - Environmental Advisor - PACHCI Stage 2

Figure A.1 : Artarmon Park PAD



Key
Potential Archaeological Deposits

Indicative only, subject to design development
0 100 m N

Page 02 of 04

Archaeological Sub-surface Testing Methodology
Western Harbour Tunnel and Beaches Link - Environmental Advisor - PACHCI Stage 2

Figure A.2 : Flat Rock Creek PAD



Figure A.3: Burnt Bridge Creek PAD

Annexure D - Archaeological assessment report

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

Archaeological assessment report

December 2020

Prepared for

Transport for NSW

Prepared by

Jacobs Group (Australia) Pty Ltd.

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Contents

1.	Introduction	1
1.1	Overview.....	1
1.2	The project.....	1
1.3	Project location.....	1
1.4	Key features of the project.....	2
1.5	Key construction activities.....	6
1.6	Purpose of this report.....	9
1.7	Study area.....	9
1.8	Authorship.....	9
2.	Previous archaeological work	11
2.1	Archaeological context.....	11
2.2	Other assessments.....	12
2.3	Summary.....	14
3.	Desktop assessment result and predictive model.....	15
3.1	Methodology	15
3.2	Database searches.....	15
3.3	Predictive modelling.....	17
3.4	Conclusions from the desktop assessment.....	19
4.	Archaeological survey.....	20
4.1	Aims.....	20
4.2	Timing and personnel	20
4.3	Survey sampling strategy and methodology	21
4.4	Constraints	22
4.5	Results	22
5.	Archaeological test excavations and further assessment for concealed engraving locations	28
5.1	Introduction	28
5.2	Aims.....	28
5.3	Methodology	28
5.4	Timing and personnel	28
5.5	Refinement of the study area in relation to PAD locations	29
5.6	Results	30
6.	Archaeological sites	32
6.1	Summary of archaeological sites	32
6.2	Archaeological analysis	32
7.	Significance assessment	39
7.1	Methodology	39
7.2	Statement of significance	40

7.3	Summary of significance	45
8.	References	47

List of appendices

Attachment A	Glossary	49
Attachment B	AHIMS search results.....	52
Attachment C	AHIMS registered sites within 300m of the study area.....	53
Attachment D	Archaeological survey areas.....	55
Attachment E	Archaeological survey results.....	56
Attachment F	Artarmon Park PAD Stratigraphic Profile	57
Attachment G	Test excavation mapping	58

List of tables

Table 3-1	AHIMS sites within 300 metres of the study area	16
Table 3-2	Predictive model based on geographic settings for the identification of areas of high, moderate and low archaeological sensitivity	18
Table 4-1	Field survey timing and personnel	20
Table 4-2	Effective coverage rating definitions	23
Table 4-3	Archaeological survey results summary	24
Table 4-4	Sites re-inspected during the archaeological survey	26
Table 4-5	PADs identified during the archaeological survey	26
Table 4-6	Potential new engraving location identified within or next to the study area.....	27
Table 5-1	Fieldwork timing and personnel.....	29
Table 5-2	Text excavation summary.....	30
Table 6-1	Archaeological sites or areas of PAD identified within the study area.....	32
Table 6-2	Raw material breakdown.....	34
Table 6-3	Technological categories.....	34
Table 6-4	Raw material in relation to artefact technological category.....	34
Table 6-5	Average maximum dimension in relation to technological category.....	35
Table 7-1	Statement of significance – Bantry Bay Aboriginal Engraving Site (45-6-0655)	40
Table 7-2	Statement of significance – Rock engraving (Garigal National Park) (45-6-2940).....	41
Table 7-3	Statement of significance –Wakehurst Engraving MAN 104; (45-6-3032).....	42
Table 7-4	Statement of significance – Clive Park 8; Shelter and Midden (45-6-3012).....	43
Table 7-5	Statement of significance – Clive Park 1; Northbridge (45-6-0654)	43
Table 7-6	Statement of significance – Clive Park 2; Taplin's Cicada Pupa Cave (45-6-0996)	44
Table 7-7	Statement of significance – Artarmon Park artefact scatter (45-6-3599).....	45
Table 7-8	Summary of the significance assessment for identified Aboriginal sites located within the study area	45

List of figures

Figure 1-1	Key features of the Beaches Link component of the project	4
Figure 1-2	Key features of the Gore Hill Freeway Connection component of the project.....	5
Figure 1-3	Overview of the construction footprint.....	8
Figure 6-1	Red silcrete artefacts located at Artarmon Park artefact scatter.....	35
Figure 6-2	Various artefacts located at Artarmon Park artefact scatter	35
Figure 6-3	Quartzite artefact located at Artarmon Park artefact scatter	36
Figure 6-4	Red silcrete core located at Artarmon Park artefact scatter	36

Abbreviations

ACHAR	Aboriginal cultural heritage assessment report
AFG	Aboriginal Focus Group
AHIMS	Aboriginal Heritage Information Management System
DECCW	Department of Environment, Climate Change and Water (now Heritage NSW)
EIS	Environmental impact statement
GIS	Geographic Information Systems
Jacobs	Jacobs Group (Australia) Pty Ltd
LALC	Local Aboriginal Land Council
NSW	New South Wales
OEH	Office of Environment and Heritage (now Heritage NSW)
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PAD	Potential archaeological deposit
RAP	Registered Aboriginal Party
Roads and Maritime	NSW Roads and Maritime Services (now part of Transport for NSW)
The project	Beaches Link and Gore Hill Freeway Connection project

1. Introduction

This section provides an overview of the Beaches Link and Gore Hill Freeway Connection (the project), including its key features and location. It also outlines the Secretary's environmental assessment requirements addressed in this technical working paper.

1.1 Overview

The Greater Sydney Commission's *Greater Sydney Region Plan – A Metropolis of Three Cities* (Greater Sydney Commission, 2018) proposes a vision of three cities where most residents have convenient and easy access to jobs, education and health facilities and services. In addition to this plan, and to accommodate for Sydney's future growth the NSW Government is implementing the *Future Transport Strategy 2056* (Transport for NSW, 2018), that sets the 40 year vision, directions and outcomes framework for customer mobility in NSW. The Western Harbour Tunnel and Beaches Link program of works is proposed to provide additional road network capacity across Sydney Harbour and Middle Harbour and to improve transport connectivity with Sydney's Northern Beaches. The Western Harbour Tunnel and Beaches Link program of works include:

- The Western Harbour Tunnel and Warringah Freeway Upgrade project which comprises a new tolled motorway tunnel connection across Sydney Harbour, and an upgrade of the Warringah Freeway to integrate the new motorway infrastructure with the existing road network and to connect to the Beaches Link and Gore Hill Freeway Connection project
- The Beaches Link and Gore Hill Freeway Connection project which comprises a new tolled motorway tunnel connection across Middle Harbour from the Warringah Freeway and the Gore Hill Freeway to Balgowlah and Killarney Heights and including the surface upgrade of the Wakehurst Parkway from Seaforth to Frenchs Forest and upgrade and integration works to connect to the Gore Hill Freeway at Artarmon.

A combined delivery of the Western Harbour Tunnel and Beaches Link program of works would unlock a range of benefits for freight, public transport and private vehicle users. It would support faster travel times for journeys between the Northern Beaches and areas south, west and north-west of Sydney Harbour. Delivering the program of works would also improve the resilience of the motorway network, given that each project provides an alternative to heavily congested existing harbour crossings.

1.2 The project

Transport for NSW is seeking approval under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* to construct and operate the Beaches Link and Gore Hill Freeway Connection project, which would comprise two components:

- Twin tolled motorway tunnels connecting the Warringah Freeway at Cammeray and the Gore Hill Freeway at Artarmon to the Burnt Bridge Creek Deviation at Balgowlah and the Wakehurst Parkway at Killarney Heights, and an upgrade of the Wakehurst Parkway (the Beaches Link)
- Connection and integration works along the existing Gore Hill Freeway and surrounding roads at Artarmon (the Gore Hill Freeway Connection).

A detailed description of these two components is provided in Section 1.4.

1.3 Project location

The project would be located within the North Sydney, Willoughby, Mosman and Northern Beaches local government areas, connecting Cammeray in the south with Killarney Heights, Frenchs Forest and Balgowlah in the north. The project would also connect to both the Gore Hill Freeway and Reserve Road in Artarmon in the west.

Commencing at the Warringah Freeway at Cammeray, the mainline tunnels would pass under Naremburn and Northbridge, then cross Middle Harbour between Northbridge and Seaforth. The mainline tunnels would then split under Seaforth into two ramp tunnels and continue north to the Wakehurst Parkway at Killarney Heights

and north-east to Balgowlah, linking directly to the Burnt Bridge Creek Deviation to the south of the existing Kitchener Street bridge.

The mainline tunnels would also have on and off ramps from under Northbridge connecting to the Gore Hill Freeway and Reserve Road east of the existing Lane Cove Tunnel. Surface works would also be carried out at the Gore Hill Freeway in Artarmon, Burnt Bridge Creek Deviation at Balgowlah and along the Wakehurst Parkway between Seaforth and Frenchs Forest to connect the project to the existing arterial and local road networks.

1.4 Key features of the project

Key features of the Beaches Link component of the project are shown in Figure 1-1 and would include:

- Twin mainline tunnels about 5.6 kilometres long and each accommodating three lanes of traffic in each direction, together with entry and exit ramp tunnels to connections at the surface. The crossing of Middle Harbour between Northbridge and Seaforth would involve three lane, twin immersed tube tunnels
- Connection to the stub tunnels constructed at Cammeray as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project
- Twin two lane ramp tunnels:
 - Eastbound and westbound connections between the mainline tunnel under Seaforth and the surface at the Burnt Bridge Creek Deviation, Balgowlah (about 1.2 kilometres in length)
 - Northbound and southbound connections between the mainline tunnel under Seaforth and the surface at the Wakehurst Parkway, Killarney Heights (about 2.8 kilometres in length)
 - Eastbound and westbound connections between the mainline tunnel under Northbridge and the surface at the Gore Hill Freeway and Reserve Road, Artarmon (about 2.1 kilometres in length).
- An access road connection at Balgowlah between the Burnt Bridge Creek Deviation and Sydney Road including the modification of the intersection at Maretimo Street and Sydney Road, Balgowlah
- Upgrade and integration works along the Wakehurst Parkway, at Seaforth, Killarney Heights and Frenchs Forest, through to Frenchs Forest Road East
- New open space and recreation facilities at Balgowlah
- New and upgraded pedestrian and cyclist infrastructure
- Ventilation outlets and motorway facilities at the Warringah Freeway in Cammeray, the Gore Hill Freeway in Artarmon, the Burnt Bridge Creek Deviation in Balgowlah and the Wakehurst Parkway in Killarney Heights
- Operational facilities, including a motorway control centre at the Gore Hill Freeway in Artarmon, and tunnel support facilities at the Gore Hill Freeway in Artarmon and the Wakehurst Parkway in Frenchs Forest
- Other operational infrastructure including groundwater and tunnel drainage management and treatment systems, surface drainage, signage, tolling infrastructure, fire and life safety systems, roadside furniture, lighting, emergency evacuation and emergency smoke extraction infrastructure, Closed Circuit Television (CCTV) and other traffic management systems.

Key features of the Gore Hill Freeway Connection component of the project are shown in Figure 1-2 and would include:

- Upgrade and reconfiguration of the Gore Hill Freeway between the T1 North Shore & Western Line and T9 Northern Line and the Pacific Highway
- Modifications to the Reserve Road and Hampden Road bridges
- Widening of Reserve Road between the Gore Hill Freeway and Dickson Avenue
- Modification of the Dickson Avenue and Reserve Road intersection to allow for the Beaches Link off ramp
- Upgrades to existing roads around the Gore Hill Freeway to integrate the project with the surrounding road network
- Upgrade of the Dickson Avenue and Pacific Highway intersection
- New and upgraded pedestrian and cyclist infrastructure
- Other operational infrastructure, including surface drainage and utility infrastructure, signage and lighting, CCTV and other traffic management systems.

A detailed description of the project is provided in Chapter 5 (Project description) of the environmental impact statement.

Subject to obtaining planning approval, construction of the project is anticipated to commence in 2023 and is expected to take around five to six years to complete.

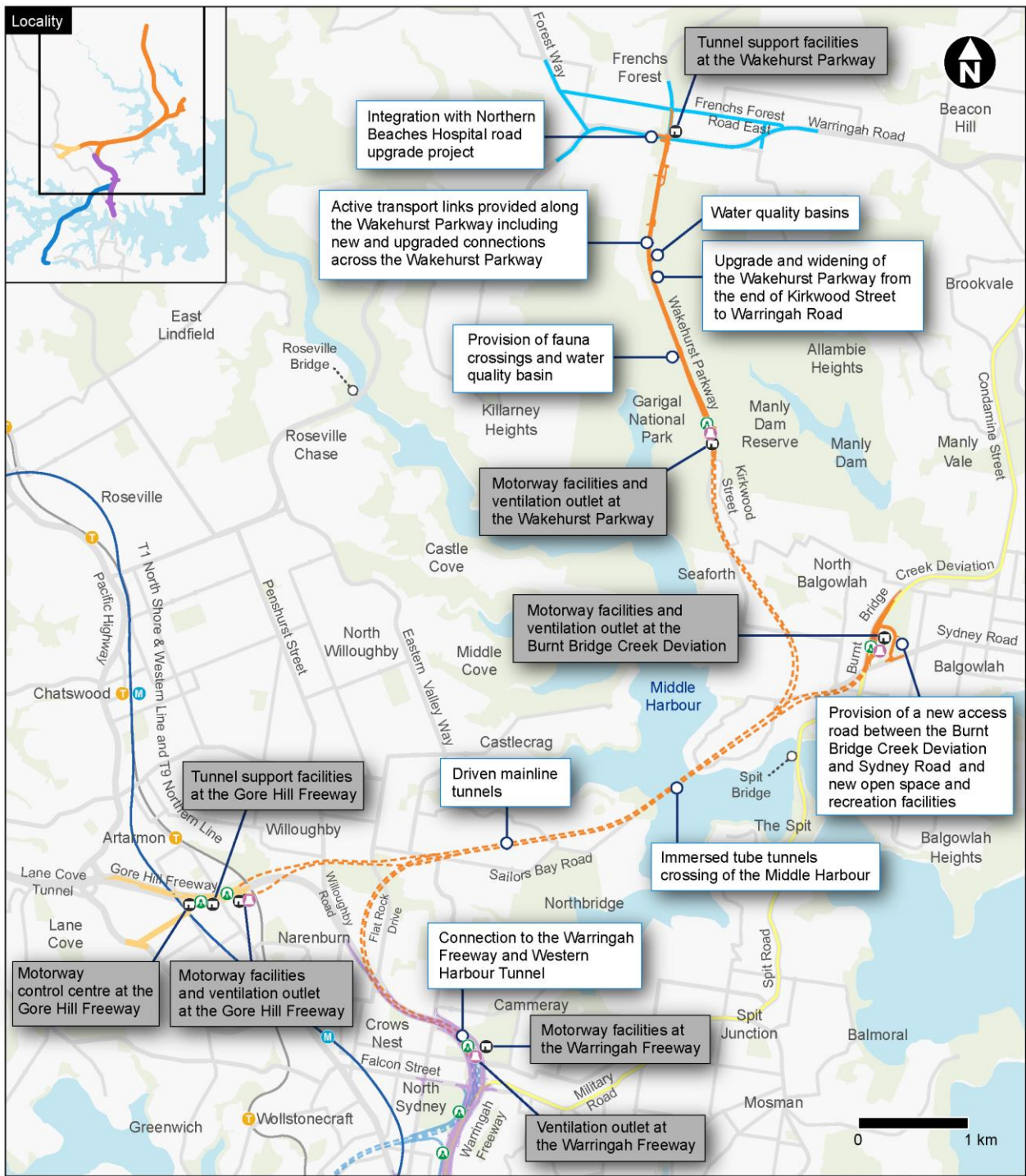


Figure 1-1 Key features of the Beaches Link component of the project

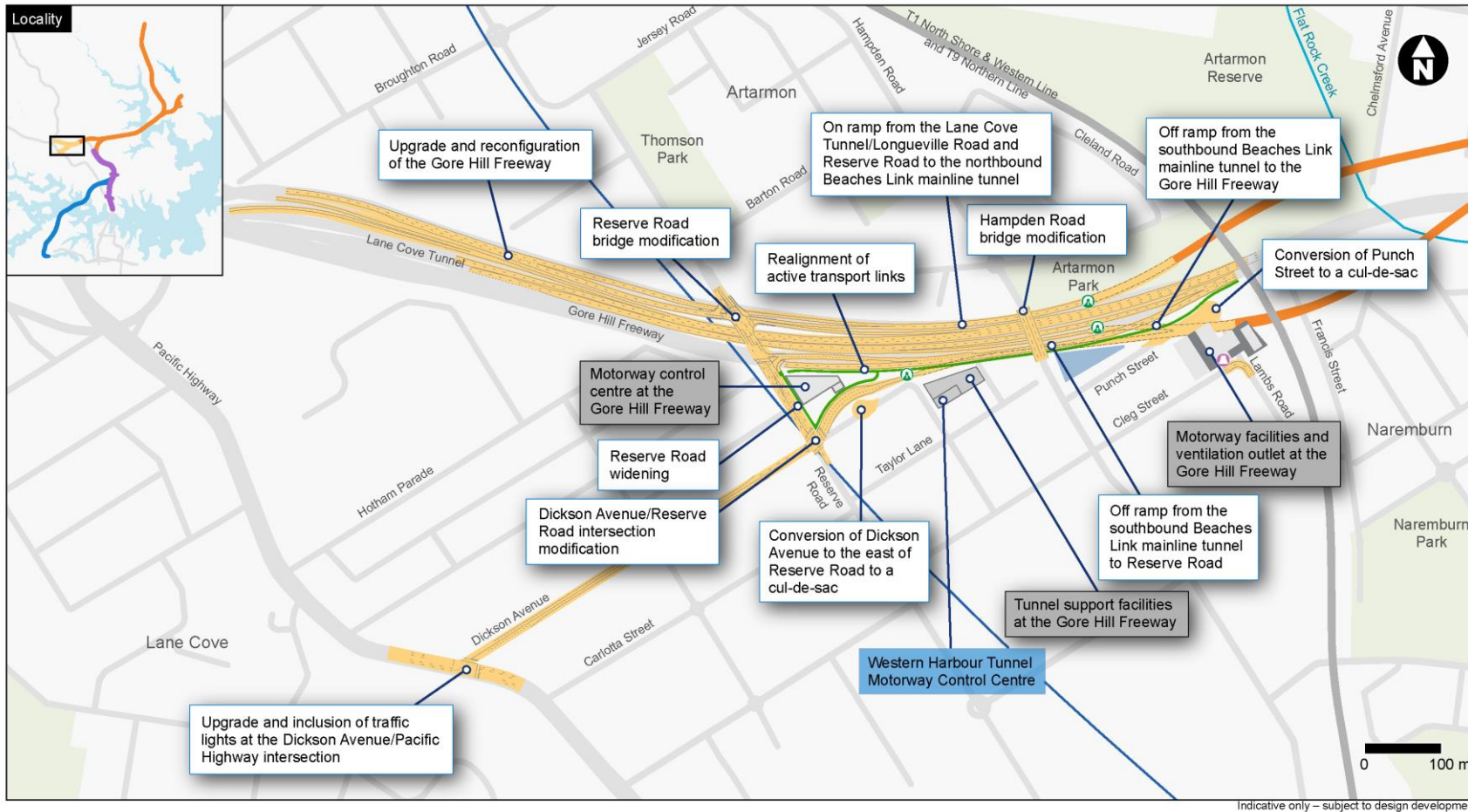


Figure 1-2 Key features of the Gore Hill Freeway Connection component of the project

1.5 Key construction activities

The area required to construct the project is referred to as the construction footprint. The majority of the construction footprint would be located underground within the mainline and ramp tunnels. However, surface areas would also be required to support tunnelling activities and to construct the tunnel connections, tunnel portals, surface road upgrades and operational facilities.

Key construction activities would include:

- Early works and site establishment, with typical activities being property acquisition and condition surveys, utilities installation, protection, adjustments and relocations, installation of site fencing, environmental controls (including noise attenuation and erosion and sediment control), traffic management controls, vegetation clearing, earthworks, demolition of structures, building construction support sites including acoustic sheds and associated access decline acoustic enclosures (where required), construction of minor access roads and the provision of property access, temporary relocation of pedestrian and cycle paths and bus stops, temporary relocation of swing moorings and/or provision of alternative facilities (mooring or marina berth) within Middle Harbour
- Construction of the Beaches Link, with typical activities being excavation of tunnel construction access declines, construction of driven tunnels, cut and cover and trough structures, construction of surface upgrade works, construction of cofferdams, dredging and immersed tube tunnel piled support activities in preparation for the installation of immersed tube tunnels, casting and installation of immersed tube tunnels and civil finishing and tunnel fitout
- Construction of operational facilities comprising:
 - A motorway control centre at the Gore Hill Freeway in Artarmon
 - Tunnel support facilities at the Gore Hill Freeway in Artarmon and at the Wakehurst Parkway in Frenchs Forest
 - Motorway facilities and ventilation outlets at the Warringah Freeway in Cammeray (fitout only of the Beaches Link ventilation outlet at the Warringah Freeway (being constructed by the Western Harbour Tunnel and Warringah Freeway Upgrade project), the Gore Hill Freeway in Artarmon, the Burnt Bridge Creek Deviation in Balgowlah and the Wakehurst Parkway in Killarney Heights
 - A wastewater treatment plant at the Gore Hill Freeway in Artarmon
 - Installation of motorway tolling infrastructure
- Staged construction of the Gore Hill Freeway Connection at Artarmon and upgrade and integration works at Balgowlah and along the Wakehurst Parkway with typical activities being earthworks, bridgeworks, construction of retaining walls, stormwater drainage, pavement works and linemarking and the installation of roadside furniture, lighting, signage and noise barriers
- Testing of plant and equipment and commissioning of the project, backfill of access declines, removal of construction support sites, landscaping and rehabilitation of disturbed areas and removal of environmental and traffic controls.

Temporary construction support sites would be required as part of the project (refer to Figure 1-3) and would include tunnelling and tunnel support sites, civil surface sites, cofferdams, mooring sites, wharf and berthing facilities, laydown areas, parking and workforce amenities. Construction support sites would include:

Cammeray Golf Course (BL1)

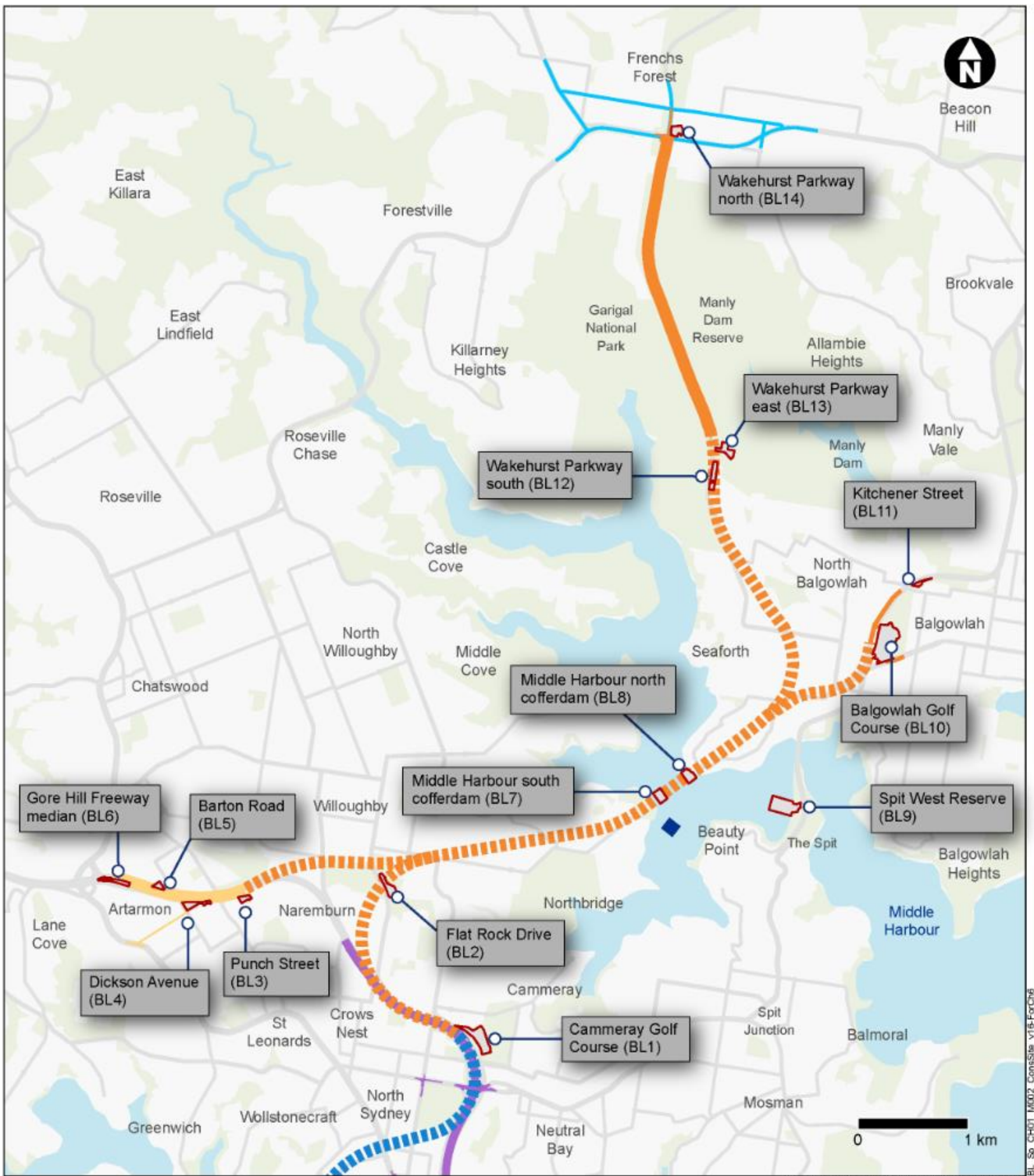
- Flat Rock Drive (BL2)
- Punch Street (BL3)
- Dickson Avenue (BL4)
- Barton Road (BL5)
- Gore Hill Freeway median (BL6)
- Middle Harbour south cofferdam (BL7)
- Middle Harbour north cofferdam (BL8)
- Spit West Reserve (BL9)
- Balgowlah Golf Course (BL10)
- Kitchener Street (BL11)

Beaches Link and Gore Hill Freeway Connection

Archaeological assessment report

- Wakehurst Parkway south (BL12)
- Wakehurst Parkway east (BL13)
- Wakehurst Parkway north (BL14).

A detailed description of construction works for the project is provided in Chapter 6 (Construction work) of the environmental impact statement.



Legend

Construction features

- Beaches Link
- Gore Hill Freeway Connection
- Construction support site
- Temporary mooring facility for completed immersed tube tunnel units

Connecting projects

- Western Harbour Tunnel
- Warringah Freeway Upgrade
- Northern Beaches Hospital road upgrade project (completed 2020)

Figure 1-3 Overview of the construction footprint

1.6 Purpose of this report

This report has been prepared to support the environmental impact statement for the project and to address the environmental assessment requirements of the Secretary of the Department of Planning, Industry and Environment ('the Secretary's environmental assessment requirements').

The scope of the archaeological assessment detailed in this report is in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a) and the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (DECCW 2010). While this report forms an annexure to Appendix L (Technical working paper: Aboriginal heritage) for the project, it also must be a stand-alone technical report. This has involved:

- A desktop assessment, including a search of the Aboriginal Heritage Information Management System (AHIMS), to identify known Aboriginal heritage sites and areas of potential archaeological sensitivity that required further assessment, namely archaeological site survey
- Archaeological site survey with nominated site officers from the registered Aboriginal parties (RAPs) for the project to investigate known sites, and to investigate areas of potential archaeological sensitivity for the presence of previously unknown Aboriginal cultural heritage values, including potential archaeological deposits (PADs)
- Archaeological test excavation of identified PADs to establish the extent and nature of any extant sub-surface cultural deposits
- Consultation with the nominated site officers for the registered RAPs during field investigations
- Significance assessment of Aboriginal cultural heritage values potentially impacted by the project. This includes both scientific (archaeological) and cultural significance for Aboriginal heritage sites and places. Cultural significance has been informed by the consultation with RAPs for the project.

The objective of the assessment documented in this report is as follows:

- Comply with the legislative requirements, codes of practice and assessment procedures relevant to the project (refer to Chapter 2 of Appendix L (Technical working paper: Aboriginal heritage))
- Comply with the Secretary's environmental assessment requirements for the project, issued on 15 December 2017 (Application number SSI 8863). Full details of the Secretary's environmental assessment requirements for the project relating to Aboriginal cultural heritage are provided in Section 1.1 of Appendix L (Technical working paper: Aboriginal heritage).
- Comply with Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime Services 2011). In particular, this report constitutes an archaeological report as required for Stage 3 of PACHCI.

1.7 Study area

For the purposes of this report, the study area is defined as the construction footprint associated with surface works, plus land above the tunnel alignments. To account for potential impacts due to vibration or settlement, a 50 metre search area around the surface works and tunnel alignments has also been considered in this impact assessment.

A separate study was carried out to identify potential submerged Aboriginal sites (Cosmos Archaeology 2018). The study area applied to the consideration of potential submerged Aboriginal sites is outlined in Annexure E (Potential Submerged Sites Assessment) of Appendix L (Technical working paper: Aboriginal heritage).

1.8 Authorship

This report has been written by Alistair Carr and Andrew Costello (Senior Archaeologists, Jacobs) and Chelsea Jones (Graduate Archaeologist, Jacobs). Alistair and Andrew hold appropriate qualifications for performing the following investigation as required by the *Code of Practice for Archaeological Investigation of Aboriginal Objects*

in NSW (DECCW 2010b). The report was reviewed by Dr David Collard (Technical Lead, Roads and Heritage, Jacobs).

The Potential Submerged Sites Assessment (Cosmos Archaeology 2018) was written by Cosmos Coroneos, a qualified maritime archaeologist.

2. Previous archaeological work

This chapter presents a review and synthesis of previous archaeological work in the immediate vicinity of the study area to provide context and a baseline for what is already known about Aboriginal cultural heritage in this area. This will be used to inform:

- The development of a predictive model for Aboriginal cultural heritage in and next to the study area
- The assessment of archaeological significance for any Aboriginal cultural heritage identified with the potential to be impacted by the project.

2.1 Archaeological context

Aboriginal occupation of the Sydney basin is likely to have spanned at least 20,000 years, although dates of more than 40,000 years have been obtained from artefacts found in gravels of the Cranebrook Terrace on the Nepean River (Stockton and Holland 1974). A study of the Sydney region reveals that Aboriginal sites are distributed across the whole range of physiographic units and environmental zones, although certain types of sites may be more frequently associated with certain parts of the landscape (for example, shelter sites are particularly common in areas of Hawkesbury Sandstone), and different parts of the landscape contain different resources, which may be seasonally available or highly localised. Hence, shell middens are common in the Port Jackson region around the shores of bays, rivers, harbours and the coast, in areas where shellfish are available. Accordingly, the Port Jackson archaeological record is different to that of the Cumberland Plain of Sydney, partly because of the different resources in these areas (Attenbrow 1990).

There is evidence of Aboriginal occupation throughout the study area, with areas of plentiful food resources associated with shorelines, riparian zones and nearby areas. During urban development, many of these areas have been covered by fill, concealing original formations. Some evidence of Aboriginal occupation may also be present along movement pathways and meeting and camping sites, which were often associated with ridgelines.

It should also be recognised that the archaeological evidence within any particular site can vary considerably in quantity and the range of evidence present, and that the number of sites or amount of archaeological evidence found in any specific area varies. Further, the distribution of presently recorded sites in some areas is unlikely to be indicative of the original distribution of Aboriginal sites and therefore may not be a reliable guide to the occupation history of that area (Koettig 1996). Accordingly, without professional archaeological assessment of an area, the sites most likely to have been recorded are those which are most obvious to non-professionals, such as rock shelters and art sites. Therefore, with Hawkesbury Sandstone outcrops underlying much of the study area it may be expected that occupation deposits will most frequently be found in rock shelters, and that art (including engravings) and axe grinding grooves will be present in the area as it contains the appropriate resources (sandstone). The Sydney Basin Rock Art Project (carried out by Jo McDonald over several years, for the National Parks & Wildlife Service (now DECCW) and as part of her doctoral research) revealed that most shelters with art are located on hilltops (with some found on valley bottoms and ridgetops). About a quarter of shelters with art sites are associated with known archaeological deposit, most rock engravings are located on horizontal sandstone exposures on ridgetops or slopes (or occasionally in valleys), and about 13 per cent of rock engravings are associated with axe grinding grooves (Brayshaw McDonald Pty Ltd 1990). However, it should be noted that some sites cannot be detected through inspection of the ground surface or rock surfaces alone and that shelters without visible occupation deposit may be Aboriginal sites (Koettig 1996 p. 57).

Archaeological and historical records show that marine and estuarine resources formed an important part of the subsistence activities of the Aboriginal people that inhabited the Port Jackson area around the shores of bays, rivers, harbours and the coast. The Aboriginal people of the coastal plain of NSW were hunter gatherers and able to exploit the marine environment (Morris 1986). Shellfish not only formed an important subsistence resource, but were also used as fish-hooks, shafted onto spears, used for repairing spears, and for cutting (Attenbrow 2010). Other locally available raw materials, including quartz, were also favoured for cutting edges (Baker 2004). One of the earliest known land grants to Aboriginal people was made in the mid-1810s at Middle Head and, as such, may include more evidence of occupation than other sites (Morris 1986).

2.2 Other assessments

2.2.1 F2 Freeway

An archaeological survey along the route of the F2 (now the Hills M2 Motorway) – Castlereagh Freeway located two rock shelters with archaeological deposit (Haglund 1989). Both shelters contained middens with oyster and whelk shell recorded, while one also had possible remnants of stencil art along the back wall.

The route of the Hills M2 Motorway upgrade was investigated by AECOM in 2009/2010 (AECOM 2010). The route extended from Lane Cove Road in North Ryde to Windsor Road at Baulkham Hills. Fifteen Aboriginal sites were located within the Hills M2 Motorway corridor.

2.2.2 Lane Cove National Park

A comprehensive survey of the Lane Cove River State Recreation Area, now known as Lane Cove National Park, was conducted as part of an archaeological study (Conyers 1990). About one-third of the Lane Cove National Park study area was surveyed. Seven previously unrecorded Aboriginal sites were located including two engraving sites, two middens, and three rock shelters with cultural deposit. Five potential habitation sites were also recorded along with three engraving sites which had previously been recorded.

In 2000, Bobbie Oakley completed a survey for a proposed sewerage upgrade within Lane Cove National Park (Oakley 2000). Two new Aboriginal sites were located in the southern portion of the National Park. Both new sites were shell midden scatters and associated areas of PAD. It was recommended that the sewer line should be redirected to avoid these sites or, if this was not possible, that further archaeological work such as test excavation should be conducted.

In 2011, Artefact Heritage conducted a survey of an area along the northern edge of Stringybark Creek in Lane Cove West, about three kilometres west of the northern construction site (Artefact Heritage 2011). A previously recorded rock shelter with a charcoal drawing of two fish was relocated. Although the shelter had been disturbed by construction of a sewer pipe, the rock art was recorded as being in good condition. No new Aboriginal sites were located during the survey.

2.2.3 Delhi Road at Ryde

Wirrina Consulting conducted a survey for the widening of Delhi Road at Ryde by the Roads and Traffic Authority (Wirrina Consulting 1995). During the survey, a previously recorded rock shelter with midden was revisited and recorded.

Tessa Corkhill conducted an excavation of a rock shelter with PAD at Riverside Corporate Park (Corkhill 1997). The PAD was first located in 1991 and it was recommended at that time that further investigation would be required if the site was to be affected by development. Ten test pits were excavated to bedrock at depths varying from 47 centimetres to 18 centimetres. Fourteen stone artefacts were recovered, although the deposit was found to be relatively disturbed with evidence of European material throughout much of the profile.

Artefact Heritage prepared an archaeological assessment for the North Ryde Station Precinct for a rezoning study (Artefact Heritage 2012). That investigation concluded that there were no recorded Aboriginal objects within the study area and that, overall, there was limited potential for archaeological significance.

2.2.4 Chatswood West

Total Earth Care (2007) conducted an Aboriginal heritage and archaeological assessment of a property at 126 Greville Street at Chatswood West. The study area was located on the western margin of the main Chatswood Ridge near to channels draining into the Lane Cove River. The study area is located about 1.3 kilometres north-west of the northern construction footprint for the project.

Although the study area was located next to Blue Gum Creek, a tributary of Lane Cove River, Total Earth Care did not identify any Aboriginal objects or areas of archaeological potential. It was noted that there were no suitable areas for occupation within the study area and that areas of occupation were likely to have been located closer to Lane Cove River (Total Earth Care 2007).

The results of the assessment are noteworthy for the current investigation, as they suggest increased intensity of Aboriginal occupation in areas with estuarine resources such as Lane Cove River and its major tributaries.

2.2.5 North West Rail Link and Epping to Thornleigh Third Track

Archaeological investigations conducted for the North West Rail Link (now the Sydney Metro Northwest) included an initial assessment of an earlier version of the proposed corridor by JMCD CHM (JMCD CHM 2006) and a later Aboriginal heritage assessment as part of the environmental impact statement prepared for major civil construction works (GML & JMCD CHM 2012). The assessment prepared by JMCD CHM identified the rail corridor between Epping and Beecroft train stations as demonstrating low archaeological sensitivity. The areas around Epping Station investigated for the environmental impact statement were described as disturbed with a high level of surface impact and no potential for Aboriginal heritage (GML & JMCD CHM 2012). These sites were situated in a similar ridge crest landform context to the current north shore component of the study area.

An Aboriginal cultural heritage assessment prepared by Artefact Heritage for the Epping to Thornleigh Third Track project did not identify any Aboriginal sites and concluded that the entire rail easement between Epping and Thornleigh demonstrated low/no archaeological potential (Artefact Heritage 2012b). During Epping to Thornleigh Third Track construction works, several unexpected Aboriginal finds were encountered. These sites included three surface artefact concentrations and one isolated find. The artefacts were identified on similar ridge crest landforms that exist within the current study area. The landform location (ridge crest) and distance from water was interpreted to suggest low associated archaeological potential (Artefact Heritage 2014). The generally high levels of surface disturbance associated with rail infrastructure and residential development also justified the assessment of low archaeological potential and low archaeological significance for each site.

2.2.6 Royal North Shore Hospital

An Aboriginal heritage assessment of the Royal North Shore Hospital site did not identify any Aboriginal objects or areas of archaeological potential (Steele 2006). Survey observations by Steele note a high level of disturbance, including "clearance of original timber and consequent heightened natural erosion, and more extensively by the earthworks and construction works associated with the building of the hospital complex" (Steele 2006).

2.2.7 Manly Vale

Several sites were identified in the Manly Vale area as part of an investigation for a subdivision including four rock shelter sites with pigment art, three rock engravings and a single recorded artefact. However, further investigation and consultation with the local Aboriginal community found the engravings not to be Aboriginal in origin (Associates Archaeology and Heritage 2015).

2.2.8 Bantry Bay Road

Previous assessment carried out at Bantry Bay Road located seven recorded sites within one kilometre of the project study area. The seven sites comprised a shelter with midden and art, another with deposit and rock engravings and four other rock engraving sites (Kelly 1991). The seventh site is an unregistered engraving site that was unable to be relocated.

2.2.9 Wakehurst Parkway

Previous surveys of the Wakehurst Parkway area have identified an assortment of engravings, open middens, shelters and artefact scatters. Many of these sites were reported to be heavily disturbed or damaged by

vandalism in the 1980s (Hawthorne 1982). One of the sites WGC1 (AHIMS ID: 46-5-0662) is a rock shelter, comprising drawings and hand stencils and an axe grinding groove. Another site WGC2 (AHIMS ID: 46-5-2940) depicts 10 hand stencils at the intersection of the back wall and ceiling. A rock engraving of a kangaroo is registered as WGC 3 (AHIMS ID: 46-5-0899). WGC 4 (AHIMS ID: 46-5-0884) is an engraving of two fish. Just beside the creek bed, WGCC 5 (no AHIMS ID identified during registry search) incorporates a series of engravings, some distinct and others partially blurred by silt and Casuarina regrowth moss. WGC 6 (AHIMS ID: 46-5-0963) includes pictographs of two kangaroos, a whale, fish and an object not yet identified.

In 2011, a single engraving was identified on a damaged sandstone exposure situated between Wakehurst Parkway road and the Engraving Trail (Jackson 2011). Depicting a zoomorph (marine organism), the petroglyph is about two metres long and 0.55 metres wide. A possible grinding groove has also been identified toward the northern half of the engraving. The platform, on which the engraving is situated, is slightly damaged owing to heavy machinery damage (Jackson 2011). A previous survey showed that the weathering may be bleaching the platform, which is also exposed to detrimental deterioration as an effect of heavy vehicle damage and other disturbances associated with road construction next to the platform (Jackson 2011).

2.3 Summary

The review of existing archaeological assessments near the study area confirms its location within a highly urbanised environment that has been subject to substantial disturbance. Remnant pockets of archaeological sensitivity and PAD will be associated with relatively undisturbed landforms. It is also noted through the review of previous archaeological assessments near the study area that the Sydney region has previously been subject to extensive archaeological survey and recording.

A review of previous assessments near the study area suggest that in the Middle Harbour, Cammeray, Northbridge and Balgowlah geographic settings increased archaeological sensitivity will be associated with waterways, creek lines, associated elevated terraces, sandstone outcrops and alluvial terraces. Typical site types associated with these landscapes will be rock shelters, grinding grooves, engravings, middens, burials, artefact scatters and campsites. Although most of the sites within this landscape will have been previously identified and recorded, there is some potential for sites or artefact deposits to be found where major landscape development has not occurred.

In the Wakehurst Parkway and Artarmon landform regions, increased archaeological sensitivity will be associated with elevated ridgelines, sandstone outcrops, and escarpments. Typical site types associated with these landscapes will be rock shelters, engravings, artefact scatters, and scarred trees. Again, most of the sites within this landscape will have been previously identified and recorded. However, there is some potential for areas of flat sandstone suitable for engravings to have become obscured by vegetation, and engravings may not be visible without exposing the ground surface.

Information compiled in this background review of previous archaeological assessments relevant to the development of a predictive model for site location is discussed further in Section 3.3.

3. Desktop assessment result and predictive model

This chapter details the desktop assessment results and the methodology used for the predictive model.

The aims of the archaeological desktop assessment were to:

- Identify any known Aboriginal heritage sites or Aboriginal cultural places with potential to be impacted by the project
- Identify areas where there are likely to be previously unknown Aboriginal heritage sites with potential to be impacted by the project.
- Fulfil requirements 1 to 4 of the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010a).

3.1 Methodology

In order to complete the desktop assessment, the heritage and spatial data relating to the study area was used to inform:

- A search and review of the relevant Aboriginal heritage register – the AHIMS
- Use of the ArcGIS system established for this assessment to analyse the following datasets:
 - Data from AHIMS
 - Heritage data from previous archaeological assessments
 - Aerial imagery
 - The assessment area (the study area)
 - Soil landscape data
 - Contour data (one metre intervals).

This spatial data was then used to determine the areas of the study area which were likely to be of archaeological sensitivity and require further assessment in the form of archaeological survey. Archaeological survey is recommended where:

- There are known Aboriginal heritage sites and Aboriginal cultural places
- Landforms of moderate to high potential archaeological sensitivity are identified based upon the predictive model developed in Section 3.3.

3.2 Database searches

A search of AHIMS and Commonwealth and State heritage registers and relevant Local Environmental Plan registers in relation to the study area was carried out by Andrew Costello (Senior Archaeologist, Jacobs) on 1 May 2017. The database registry search was based on a search area of 300 metres to provide detail on sufficient Aboriginal sites in the geographic region for the development of accurate predictive models.

A further search of AHIMS sites was carried out on 08 April 2020 to determine if any new AHIMS sites were apparent. No new AHIMS sites were determined.

The results of the AHIMS search are presented in Attachment B (AHIMS search results) and Table 3-1. In summary, 33 Aboriginal sites were identified from the AHIMS search. Most of these sites included more than one component. They consist of:

- 20 rock engravings
- 14 rock shelter/occupation sites
- 14 middens
- A single burial

- A single sub-surface artefact scatter
- A single axe grinding groove.

Of the 33 registered Aboriginal sites identified, seven were determined to be located within the study area. The location and condition of AHIMS site 45-6-0662 could not be confirmed during field inspection and the Aboriginal Heritage Office has advised that the site was likely covered by gravel/vegetation. A description of these sites is provided in Table 3-1 which includes details of all known AHIMS sites within 300 metres of the study area.

Table 3-1 AHIMS sites within 300 metres of the study area

AHIMS ID	Site name	Site type	Located within study area
45-6-2222	Clive Park 4; Northbridge	Shelter with midden	No
45-6-0271	Clive Park; Northbridge	Rock engraving	No
45-6-2049	Bantry bay 1	Shelter with midden	No
45-6-1271	Lavender Bay Milsons Point	Shelter with midden	No
45-6-2111	Clive Park 3	Shelter with rock engraving	No
45-6-0645	Northbridge; Mowbray Point	Rock engraving	No
45-6-0646	Northbridge; Mowbray Point	Rock engraving	No
45-6-0654	Clive Park 1; Northbridge	Burial/s, shelter, rock engraving, midden	Yes
45-6-0655	Frenchs Forest; Bantry Bay Road	Rock engraving	Yes
45-6-1234	Bluff Head; Foot Cave	Shelter, rock engraving, midden	No
45-6-0963	Frenchs Forest	Rock engraving	No
45-6-0662	Frenchs Forest; Bantry Bay; Wakehurst Parkway	Rock engraving	Yes (site location and condition could not be confirmed during field inspection as likely covered by gravel/vegetation)
45-6-0666	Frenchs Forest; Frenchs Forest Road	Rock engraving	No
45-6-0884	Middle Harbour Creek; East Lindfield; Switching Station Shelter; dredged shell	Midden	No
45-6-0899	Balgowlah; Bantry	Rock engraving	No
45-6-0964	Balgowlah	Rock engraving	(Not a site)
45-6-0965	Balgowlah; 200 FT Cave	Shelter with rock engraving	(Not a site)
45-6-1808	Seaforth	Burial/s and midden	No
45-6-1700	Munro Park A.G.G.	Axe grinding groove	No

AHIMS ID	Site name	Site type	Located within study area
45-6-0992	Chatswood	Shelter with midden	No
45-6-0993	Chatswood	Shelter with midden	No
45-6-0994	Northbridge	Midden	No
45-6-0995	Northbridge	Shelter with midden	No
45-6-0996	Clive Park 2; Northbridge; Cicada Pupa Cave	Shelter, rock engraving, midden	Yes
45-6-1002	Balgowlah	Shelter with rock engraving	No
45-6-1003	Frenchs Forest	Shelter with deposit (stone artefacts)	No
45-6-1004	Frenchs Forest	Shelter with rock engraving	No
45-6-1587	Seaforth	Rock engraving	No
45-6-2940	Rock engraving (Garigal National Park)	Rock engraving	Yes
45-6-3011	Clive Park Midden WILL 169	Midden	No
45-6-3012	Clive Park, Shelter Midden WILL 170	Midden	Yes
45-6-3032	Wakehurst Engraving MAN 104	Rock engraving on outcrop	Yes (damage to site observed during inspection in September 2020)
45-6-3033	JAF Fenwick Engraving MAN 105	Rock engraving	No

3.3 Predictive modelling

Following a search of AHIMS, review of the previous literature, and analysis of relevant archaeological reports and assessments, the following predictive summary statements can be made about different geographical locations within the study area.

3.3.1 Middle Harbour, Cammeray, Northbridge and Balgowlah

There are geographic settings within the study area that are typically directly next to shoreline zones. The following statements can be made about these geographic settings:

- The most archaeologically sensitive landforms will be shoreline zones and spur crests bordering the harbour, although all elevated landforms will have some archaeological potential
- Sandstone rock shelters along the shoreline may contain engravings, middens, art, burials and sub-surface scatters of stone artefacts
- Elevated landforms next to foreshore at Clive Park possess high archaeological potential
- Where present, intact sub-surface archaeological deposit may contain stone artefacts
- Axe grinding grooves may be located near or in water courses
- The most common site type will be middens, grinding grooves, engravings and rock shelters with associated sub-surface scatters of stone artefacts

- Sparse surface and sub-surface deposits comprising stone artefacts may be present in slightly elevated areas with sandy, better-drained sediments next to the margins of, or within, the swamp
- Where present, sub-surface archaeological deposit is most likely to be within 100 metres of a water source (river or creek).

3.3.2 Wakehurst Parkway and Artarmon

There are geographic settings within the study area that are located further inland and are typically associated with elevated ridgelines and crests. The following statements can be made about these geographic settings:

- The most archaeological sensitive landforms will be elevated ridgelines and crests containing suitably flat areas of sandstone where engravings will occur
- Elevated landforms next to foreshore possess high archaeological potential
- Where present, intact sub-surface archaeological deposit may contain stone artefacts
- The most common site type will be engravings and rock shelters with associated occupational deposit below outcrops and rock platforms
- Areas of flat sandstone suitable for engravings may have become obscured by vegetation and leaf litter and may not be visible without ground clearance.

Sensitivity ratings for the predictive model shown in Table 3-2 reflect the likelihood for archaeological sites to occur within each geographic region, as well as an indication of the potential significance of the sites. For example, a high rating shows that the areas with these specific landform characteristics are predicted to have a higher potential for the discovery of archaeological sites.

Table 3-2 Predictive model based on geographic settings for the identification of areas of high, moderate and low archaeological sensitivity

Geographic setting	Sensitive landforms within geographic region	Sensitivity rating	Site types associated with landscape	Issue relating to assigning sensitivity ratings
Middle Harbour, Cammeray, Northbridge and Balgowlah	Waterways, creek lines, associated elevated terraces, sandstone outcrops, alluvial terraces	High	Rock shelters, grinding grooves, engravings, middens, burial, artefact scatters and campsites	Sites likely to be previously recorded. Midden sites may be eroding or more extensive than recorded. Rock shelters and art sites may have been vandalized. Some potential for sites or artefact deposits to be found where major landscape development has not occurred.
Wakehurst Parkway and Artarmon	Elevated ridgelines, sandstone outcrops, escarpments	High	Rock shelters, engravings, artefact scatters, scarred trees	Areas of flat sandstone suitable for engravings have become obscured by vegetation and may not be visible without exposing the ground surface.

3.3.3 Expected site types

The predictive model for site types developed for the study area shows that certain site types are more likely to be prevalent. The degree of preservation and intactness will vary dependent on historical and current land use and the nature of the site.

Rock shelters/occupation sites: These sites will be located in areas of prominent sandstone outcrops and may include archaeological features such as art, stone artefacts, middens and archaeological deposit. They will typically be found close to the shoreline within the study area.

Rock engravings: These sites will be located in areas containing flat sandstone suitable for engravings. These locations will be typically associated with rock shelters or sandstone outcrops on ridgelines or elevated landforms. These locations may have become obscured by vegetation and may not be visible without exposing the ground surface.

Midden sites: These sites will occur in tidal estuarine foreshore zones (that is, within 10 metres of high water level) in areas not subject to notable landscape modification. Shell midden sites may be considerable distances from existing foreshore areas and may represent past foreshore environments.

3.4 Conclusions from the desktop assessment

The aims of the desktop assessment were to identify any known Aboriginal heritage sites or Aboriginal cultural places with potential to be impacted by the project and identify areas where there are likely to be previously unknown Aboriginal heritage sites with potential to be impacted by the project.

The desktop assessment has identified a total of 33 previously recorded AHIMS sites within 300 metres of the study area and a total of seven AHIMS sites within the study area itself (the construction footprint and within 50 metres of the construction footprint).

The most common Aboriginal sites within 300 metres of the study area include rock engravings, rock shelters/occupation sites (these sites typically contain various archaeological components) and shell middens. The predictive modelling developed for the study area suggests that Aboriginal sites are associated with different landform features dependent on geographic region. The predictive modelling suggests that all geographic settings within the study area have a high sensitivity rating. However, the potential for identifying new Aboriginal sites will depend on prior ground disturbance and urbanisation. The archaeological survey will focus on the locations of known Aboriginal sites as well as sensitive landforms associated with different geographic settings in the study area (Table 3-2).

4. Archaeological survey

4.1 Aims

The aims of the archaeological survey were to identify and record any existing surface evidence of past Aboriginal activity within the study area or areas of PAD. This was completed to develop strategies for avoiding and/or mitigating potential harm to Aboriginal sites. On-site consultation with the nominated site officer from the Metropolitan Local Aboriginal Land Council (LALC) and the Transport for NSW Aboriginal Cultural Heritage Officer enabled the development of recommendations for any further assessment (such as further investigation and test excavation) and management.

During the archaeological survey, all previously recorded AHIMS sites within the study area were visited (where possible). Survey of the study area was conducted on foot and by vehicle, during which notes about the ground surface visibility, integrity (land condition) and archaeological sensitivity were taken. All data were recorded on a hand-held GPS unit and photographs were taken. All Aboriginal archaeological sites/objects identified during the survey were recorded to a standard required by the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b). The results of the archaeological survey are presented in Table 4-3.

4.2 Timing and personnel

Field surveys were carried out during May, June and August 2017, August 2018, March 2020 and September 2020 with the nominated site officer from the Metropolitan LALC present during all surveys except for the one on 18 May as the nominated site officer was unable to attend. Details of fieldwork activities and the participation of the nominated site officer are provided in Table 4-1.

Table 4-1 Field survey timing and personnel

Date	Survey area	Jacobs personnel	Roads and Maritime personnel	Metro LALC
17 May 2017	St Leonards Park, Cammeray Golf course, ANZAC Park, Artarmon Park, Punch Street, Flat Rock Creek and Clive Park	Andrew Costello	Mark Lester	Selina Timothy
18 May 2017	Spit Reserve, North Balgowlah, Balgowlah Golf Course and Burnt Bridge Creek, Wakehurst Parkway	Andrew Costello	Mark Lester	-
1 June 2017	Wakehurst Parkway	Andrew Costello Andy Roberts	Mark Lester	Selina Timothy
9 August 2017	Wakehurst Parkway, Killarney Heights side of road and Allambie Heights side of road, Sailors Bay Road, Northbridge, Artarmon reserve	Alistair Carr Chelsea Jones	N/A	Selina Timothy

Date	Survey area	Jacobs personnel	Roads and Maritime personnel	Metro LALC
	area opposite Artarmon Park PAD area on			
24 August 2018	Flat Rock Baseball Diamond, Flat Rock Creek walking track and bush reserve, Seaforth Oval and Wakehurst Parkway	Andrew Costello	Lee Davison	Kevin Telford
20 March 2020	Flat Rock Reserve, Wilksch Walk and Wakehurst Parkway	Andrew Costello	Lee Davison	Kevin Telford
15 September 2020	Lister Avenue and Wakehurst Parkway	Andrew Costello	Lee Davison, Lucy Smith, Adam Noonan, Lisa Granqvist	Kevin Telford

4.3 Survey sampling strategy and methodology

In line with Requirement 5 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a), the archaeological survey adopted a sampling strategy which targeted geographic settings and sensitive landforms identified in the predictive modelling. Where the predictive model determined landforms of high potential archaeological sensitivity (refer to Table 3-2), these landforms were targeted for full survey coverage with an awareness of the likelihood of certain site types potentially occurring within particular landforms. Full coverage of the study area within landforms was carried out with the nominated site officer from Metropolitan LALC where possible. The sampling strategy had the following directives:

- Areas of higher visibility and exposures of the ground surface were targeted for particular scrutiny for the presence of engravings, midden material and stone artefacts
- Water margins were targeted for the presence of midden material
- All mature trees in the study area were inspected for cultural modification and scarring
- Hawkesbury Sandstone outcrops and escarpments located in association with Middle Harbour landforms were targeted to assess potential for Aboriginal rock shelter sites and engravings
- Undisturbed parts of the study area in association with sensitive landforms (ie waterways) were targeted to assess presence of PAD.

The methodology for the archaeological survey consisted of:

- Pedestrian survey with nominated site officers from Metro LALC, which was carried out via transects (linear survey unit) with the field team walking parallel in about five metre intervals as ground conditions allowed, so that the survey of the study area was carried out by traversing the area in a systematic manner
- Mapping archaeological sites and PADs identified and survey transects into a Geographic Information System database
- Recording the following details for each surveyed area:
 - Landform
 - Ground surface exposure and nature of exposure
 - Visibility as a result of vegetation
 - Degree of disturbance

- Nature of current and historical land use.

AHIMS site recording forms were completed for any new Aboriginal site and PAD recorded and submitted to AHIMS. AHIMS site recording forms were updated to reflect revised location coordinated or site conditions as applicable.

4.4 Constraints

The information detailed in previously registered AHIMS site cards contains several examples of locational errors and many site record cards lack detail.

The location and condition of AHIMS 45-6-0662 was unable to be confirmed during field inspection on 15 September 2020 as the site was likely covered by gravel/vegetation.

Significant damage to AHIMS-6-3032 since the previous site recording in 2011 was observed during the site inspection on 15 September 2020.

4.5 Results

Based on the results of the desktop assessment and predictive modelling (refer to Table 4-3), all accessible areas within the study area recommended for archaeological site survey were surveyed in partnership with a representative from the Metropolitan LALC (except for on 18 May 2017).

Three new PADs were identified during archaeological survey (Flat Rock Creek PAD 45-6-3361, Burnt Bridge Creek 45-6-3363 and Artarmon Park 45-6-3362). Several previously registered sites located within and next to the study area were re-inspected. Details of all the sites re-inspected can be found in Table 4-4. Additional details of the survey results are presented in Attachment D (Archaeological survey area) and Attachment E (Archaeological survey results).

During the test excavations, an artefact scatter (Artarmon Park artefact scatter, 45-6-3599), was identified in association with Artarmon Park PAD (45-6-3362).

The Frenchs Forest; Bantry Bay; Wakehurst Parkway (45-6-0662) site was unable to be assessed during the site inspection on 15 September 2020 as site location could not be confirmed and the Aboriginal Heritage Office has advised that the site was likely covered by gravel/vegetation.

The Wakehurst Engraving MAN 104 rock engraving site (45-6-3032) was inspected on 15 September 2020. Significant damage to the site was observed in the site inspection as the previous site recording in 2011 showed the exposed rock to be much more extensive than was seen on site. An extensive area of bedrock appeared to have been cut back, with a significant portion missing, exceeding one square metre in extent. Discovery of significant damage to the site resulted in notification to Heritage NSW on 28 September 2020, with Transport for NSW recommending an investigation into the observed damage at the site.

4.5.1 Visibility, exposure and coverage

The detection of Aboriginal sites and cultural material is dependent upon ground surface visibility. Ground surface visibility is also affected by erosional processes and surface vegetation. Effective survey coverage calculations try to quantify the efficacy of the survey. The following formula for quantifying effective survey coverage (Witter 1990) was used to calculate effective coverage for the activity area (refer also to Table 4-2):

EC = (a) x (e) x (v) x (b), where:

- EC = effective coverage
- a = area surveyed in square metres
- e = erosion

- v = visibility
- b = background effect.

Table 4-2 Effective coverage rating definitions

Erosion rating (the index of sedimentation)	Visibility rating (estimation of the percentage of bare ground)	Background effect (measure of the occurrence of materials that impedes the detection of cultural deposits)
e	v	b
= aggrading surface = stable surface 1.0 = degrading surface	= negligible visibility = (1–25%) = (26–50%) = (51–75%) = (76–99%) 1.0 = 100%	0.1 = high 0.5 = medium 1.0 = low

Approximately 100 per cent of the targeted survey areas detailed in Table 4-3 were surveyed during the standard assessment. Visibility fluctuated throughout the activity area dependent on vegetation coverage but was generally poor due to grass coverage. Visibility at times improved at survey locations associated with sandstone outcrops. However, these were typically covered in vegetation. The average total effective survey coverage was low, at 5.9 per cent (Table 4-3).

Table 4-3 Archaeological survey results summary

Targeted survey area based on predictive modelling	Total surveyed area (m ²)	Erosion rating (e)	Visibility rating (v)	Background rating (b)	Effective survey coverage (m ²)	Effective survey coverage (%)	Field survey results
Artarmon Park	9800	0.5	0.3	0.5	735	7.5	One PAD identified near large sandstone outcrop area with potentially intact deposit.
Punch Street	18,500	0.5	0.2	0.5	925	5	No Aboriginal cultural heritage or PAD identified.
Flat Rock Creek	52,800	0.5	0.3	0.5	3960	7.5	One PAD identified near large sandstone outcrop area with potentially intact deposit.
Clive Park	26,300	0.5	0.2	1.0	2630	10	Several known sites re-inspected. No new Aboriginal cultural heritage or PAD identified.
Flat Rock Creek and Gully	7600	0.5	0.2	0.5	380	5	One PAD identified near large sandstone outcrop area with potentially intact deposit.

Targeted survey area based on predictive modelling	Total surveyed area (m ²)	Erosion rating (e)	Visibility rating (v)	Background rating (b)	Effective survey coverage (m ²)	Effective survey coverage (%)	Field survey results
Balgowlah Golf Course	126,600	0.5	0.2	0.1	1266	1	High levels of disturbance. Two recorded AHIMS sites unable to be relocated. No new Aboriginal cultural heritage or PAD identified.
North Balgowlah	11,700	0.5	0.2	0.5	585	5	No new Aboriginal cultural heritage or PAD identified.
Burnt Bridge Creek	5800	0.5	0.2	0.5	290	5	Two recorded AHIMS sites unable to be relocated. No new Aboriginal cultural heritage or PAD identified.
Wakehurst Parkway	17,700	0.5	0.3	0.5	1327.5	7.5	Several known sites re-inspected. No new Aboriginal cultural heritage or PAD identified.
Total	276,800				12,098.5		

Table 4-4 Sites re-inspected during the archaeological survey

AHIMS ID	Site name	Site type	Located within study area
45-6-0654	Clive Park 1; Northbridge	Burial/s, shelter, rock engraving, midden	Yes
45-6-0655	Frenchs Forest; Bantry Bay Road	Rock engraving	Yes
45-6-0964	Balgowlah	Rock engraving	No
45-6-0965	Balgowlah; 200 FT Cave	Shelter with rock engraving	No
45-6-1700	Munro Park A.G.G.	Axe grinding groove	No
45-6-0995	Northbridge	Shelter with midden	No
45-6-0996	Clive Park 2; Northbridge; Cicada Pupa Cave	Shelter, rock engraving, midden	Yes
45-6-2940	Rock engraving (Garigal National Park)	Rock engraving	Yes
45-6-3011	Clive Park Midden WILL 169	Midden	No
45-6-3012	Clive Park, Shelter Midden WILL 170	Midden	Yes

4.5.2 Potential archaeological deposits

A total of three areas of PAD were identified during the archaeological survey. Areas of PAD were all located near to waterways on what was generally determined to be relatively undisturbed landforms. PAD areas were often near to known Aboriginal sites. The identification of PAD areas in these locations is consistent with the site prediction model detailed in Section 3.3. The archaeological potential of each PAD was determined based on the site prediction model, observed levels of disturbance and the environmental context.

Table 4-5 provides a summary of PAD locations identified during the archaeological survey.

Table 4-5 PADs identified during the archaeological survey

PAD name	AHIMS ID	Assessment area	Likelihood of archaeological deposits
Flat Rock Creek PAD	45-6-3361	Flat Rock Creek and Gully	Moderate-high
Burnt Bridge Creek PAD	45-6-3363	Burnt Bridge Creek	Moderate-high
Artarmon Park PAD	45-6-3362	Artarmon Park and Reserve	Moderate-high

4.5.3 Potential new engraving locations

One location was identified during the survey as having potential for new, concealed engravings (study area near to Wakehurst Parkway). This location is near to existing engraving locations and relatively undisturbed Hawkesbury sandstone landforms. The existence of concealed engraving sites on such landforms and near to known engraving locations is consistent with the site prediction model detailed in Section 3.3.

Table 4-6 provides a summary of the potential new engraving location identified during the archaeological survey.

Table 4-6 Potential new engraving location identified within or next to the study area

Potential new engraving locations	Existing AHIMS engravings near to Wakehurst Parkway	Potential for new engraving locations
<p>Study area near to Wakehurst Parkway</p>	<p>Rock engraving (Garigal National Park) (45-6-2940)</p> <p>Frenchs Forest; Bantry Bay; Wakehurst Parkway (45-6-0662) - unable to confirm location and condition during field inspection as the site was likely covered by gravel/vegetation</p> <p>Frenchs Forest (45-6-0963)</p> <p>Frenchs Forest; Frenchs Forest Road (45-6-0666)</p> <p>Wakehurst Engraving MAN 104 (45-6-3032)</p>	<p>Moderate (existing engraving locations occur nearby. However, area is disturbed through prior road and associated construction activities).</p>

5. Archaeological test excavations and further assessment for concealed engraving locations

5.1 Introduction

As detailed in Section 4 and Annexure C – Archaeological methodology, the archaeological field survey identified three areas of PAD. The methodology details that these areas of PAD require further investigation in the form of test excavation to confirm the presence of archaeological deposits and determine the nature, extent and significance of these deposits to inform the development of appropriate management recommendations.

Between the completion of the archaeological methodology and the start of test excavations, project refinements resulted in avoidance of Flat Rock Creek PAD (45-6-3361) and Burnt Bridge Creek PAD (45-6-3363). Archaeological test excavations therefore focused on Artarmon Park PAD (45-6-3362).

The methodology also details the need for further assessment of potential concealed and unrecorded engraving locations at the study area near to Wakehurst Parkway.

5.2 Aims

The aims of the test excavation and approach to locating unrecorded and concealed engravings was to:

- Assess the presence of sub-surface archaeological deposits at Artarmon Park PAD (45-6-3362)
- Assess the presence of concealed/covered engravings at the study area near to Wakehurst Parkway
- Identify the nature, depth, extent and significance of any new potential Aboriginal sites within the boundary of the project
- Consult with RAPs about this work and the sites being tested
- Develop recommendations to minimise or mitigate potential impacts to any Aboriginal sites identified via the test excavation and through the location of potential new engraving sites.

For any site identified via test excavation, preliminary discussions about management recommendations and Aboriginal significance were conducted informally in the field with nominated RAP site officers. Following field investigations, recommendations were discussed more formally at a post-excavation Aboriginal Focus Group meeting and via the Aboriginal cultural values assessment conducted for the project (refer to Sections 3 and 5 of Appendix L (Technical working paper: Aboriginal heritage)).

5.3 Methodology

In line with the requirements of the Stage 2 PACHCI, following the archaeological survey of the study area, a stand-alone archaeological methodology was developed to describe how further investigations would be conducted. This methodology included a project-specific test excavation methodology for investigation of areas of PAD identified within the study area and a project-specific methodology for assessing potential new, concealed engraving locations. The project-specific test excavation methodology was designed to be consistent with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b).

In line with Stage 3 of PACHCI and the Secretary's environmental assessment requirements for the project, the archaeological methodology was provided along with an archaeological survey report to all project RAPs and Heritage NSW for review and comment (refer to Section 3 of Appendix L (Technical working paper: Aboriginal heritage)). The archaeological methodology is presented in Annexure C – Archaeological methodology.

5.4 Timing and personnel

Fieldwork associated with the above works was conducted on consecutive work days between 8 January and 24 January 2018. Details of fieldwork activities and the participants are provided in Table 5-1.

Table 5-1 Fieldwork timing and personnel

Dates	Jacobs archaeologists	Roads and Maritime personnel	Aboriginal stakeholder involvement
8 January – 12 January 2018	Alistair Carr Andy Roberts Chelsea Jones Andrew Costello Deb Farina	Lee Davison	Paul Boyd Chad Gowen Shey Taylor Selina Timothy Jamie Eastmond Renee Taylor Mark Newham Ryan Johnson Joshua Marr Tanya Laughton Jack Thomson
15 January – 19 January 2018	Andy Roberts Chelsea Jones Andrew Costello Deb Farina	Lee Davison	Paul Boyd Chad Gowen Shey Taylor Selina Timothy Jamie Eastmond Renee Taylor Mark Newham Ryan Johnson Joshua Marr Tanya Laughton Jack Thomson
22 January – 24 January 2018	Andy Roberts Chelsea Jones	Lee Davison	Paul Boyd Chad Gowen Shey Taylor Selina Timothy Jamie Eastmond Renee Taylor Mark Newham Ryan Johnson Joshua Marr

5.5 Refinement of the study area in relation to PAD locations

Between the finalisation of the Western Harbour Tunnel and Beaches Link archaeological methodology and the start of the associated fieldwork, project refinements reduced the potential construction impacts associated with Artarmon Park PAD (45-6-3362). This resulted in a smaller part of the PAD being potentially impacted during construction (Appendix G (Test excavation mapping)).

In consultation with the RAPs, proposed excavation unit numbers at Artarmon Park PAD (45-6-3362) were also revised from those estimated in the archaeological methodology (Annexure C) to reflect the smaller component of the PAD being potentially impacted.

5.6 Results

5.6.1 Test excavations at Artarmon Park PAD (45-6-3362)

During the test excavations at Artarmon Park PAD (45-6-3362), a total of 18 test excavation units were excavated across the potential impact points. A total of 15 sub-surface stone artefacts at Artarmon Park artefact scatter (45-6-3599) were identified during test excavation at the PAD location at a number of shovel test pit and test pit locations.

A summary of the test excavations can be found in Attachment F (Summary of test excavation results). Mapping of all the test excavation locations can be found in Attachment G (Test excavation mapping).

In total, test excavation at Artarmon Park PAD (45-6-3362) consisted of:

- One test pit (1000 millimetres x 1000 millimetres)
- 17 shovel test pits (500 millimetres x 500 millimetres).

A brief summary of the test excavation conducted at Artarmon Park PAD (45-6-3362) is presented in Table 5-2.

Table 5-2 Text excavation summary

PAD/Site name (AHIMS ID)	GPS coordinates / Primary coordinate (MGA Zone 56H)		Predicted archaeological sensitivity	Landform	Number of excavation units (dimensions mm)	Aboriginal objects (material)
	Easting	Northing				
Artarmon Park PAD (45-6-3362)	██████	██████	Moderate-high	Slight elevation at confluence of two waterways and an elevated landform with partially exposed sandstone outcrop	18	15 (Chert, silcrete, quartzite, mudstone), (Artarmon Park artefact scatter, 45-6-3599)

5.6.2 Identifying unrecorded engraving locations

Section 4 of this report and the archaeological methodology (Annexure C) detailed the need for further assessment of potentially concealed and unrecorded engraving locations at the study area near to Wakehurst Parkway. This occurred through additional survey at identified potential engraving locations with RAP site officers as detailed in Table 5-1. Specific details about the approach and methodology for identifying unrecorded engraving locations are set out in the archaeological methodology (Annexure C). The approach to this part of the fieldwork was opportunistic and relied on the identification of exposed sandstone surfaces, or sandstone surfaces with light vegetation coverage that could easily be further investigated to determine potential for concealed engravings.

During these works, no new engraving locations that would need a new AHIMS site registration were identified. However, some previously unrecorded components of existing engraving locations were identified and recorded. Updated AHIMS site cards (including detailed photography, hand drawings and measurements) have been prepared, in close collaboration with RAP site officers, for these engraving locations and submitted to Heritage NSW. Further updates to these site cards using photogrammetry and 3D-capture techniques are recommended

within the management recommendations in Section of Appendix L (Technical working paper: Aboriginal heritage).

It must be noted that not all sandstone surfaces within the study area (particularly those with heavy vegetation coverage) have been investigated as part of these works due to an inability to adequately assess unexposed sandstone surfaces in some areas.

6. Archaeological sites

6.1 Summary of archaeological sites

Archaeological assessment of the study area, including desktop assessment, archaeological survey and test excavation, identified a total of 11 archaeological sites or areas of PAD within or next to (within 50 metres) the study area. Many of these sites contain multiple site components and are detailed in Table 6-1.

Details of the location and extent of these sites and PAD areas are shown in Attachment C (AHIMS registered sites within the study area). The analysis of archaeological material located at Artarmon Park artefact scatter (45-6-3599) is discussed in Section 6.2.

Table 6-1 Archaeological sites or areas of PAD identified within the study area

Site/PAD (AHIMS ID)	Description
Artarmon Park artefact scatter (45-6-3599)	Artefact scatter
Artarmon Park PAD (45-6-3362)	Potential archaeological deposit (partially excavated as part of this assessment)
Flat Rock Creek PAD (45-6-3361)	Potential archaeological deposit
Wakehurst Engraving MAN 104 (45-6-3032)	Rock engraving on outcrop (damage to the site was observed during field inspection)
Clive Park 8; Shelter and Midden (45-6-3012)	Rock shelter/occupation site and midden
Clive Park 1; Northbridge (45-6-0654)	Burial/s, rock shelter/occupation site, rock engraving, midden, artefact scatter
Clive Park 2; Taplin's Cicada Pupa Cave (45-6-0996)	Rock shelter/occupation site, rock engraving, and midden
Burnt Bridge Creek PAD (45-6-3363)	Potential archaeological deposit
Bantry Bay Aboriginal Engraving Site (45-6-0655)	Rock engraving
Rock engraving (Garigal National Park) (45-6-2940)	Rock engraving
Frenchs Forest; Bantry Bay; Wakehurst Parkway (45-6-0662)	Rock engraving

6.2 Archaeological analysis

6.2.1 Introduction

The analysis of Aboriginal sites within and next to the study area involved:

- The analysis of stone artefacts located at Artarmon Park artefact scatter (45-6-3599)
- Fieldwork to update AHIMS site cards for Aboriginal sites within the study area.

Updated AHIMS site cards for all sites within the study area have been lodged with Heritage NSW. Management recommendations in Appendix L (Technical working paper: Aboriginal heritage) also specify that further detailed recording (photogrammetry and 3D-capture techniques) of these sites must occur with a representative from the Metropolitan LALC before construction (Section 9 of Appendix L (Technical working paper: Aboriginal heritage)).

6.2.2 Artarmon Park artefact scatter

6.2.2.1 Introduction

Australian Aboriginal archaeological sites are often said to be records of stone and bone, two of the most durable products of human activity. Stone artefacts, being inorganic, do not deteriorate rapidly on a human time scale and are ubiquitous reminders of human activity in the past. Understanding stone use in the past allows interpretations of human behaviour to be made. Interpretation of human behaviour from stone material analysis is derived from fracture mechanics studies, ie why different materials fracture.

The occurrence and distribution of stone raw materials are discussed to try to develop the understating of the way people were using the landscape at the location of Artarmon Park artefact scatter (45-6-3599). The number of artefacts resulting from the test excavations was particularly small, at 15 stone artefacts. As such, there are limited inferences that can be drawn from the following brief analysis.

6.2.2.2 Aims

The following analysis was carried out to summarise the technological composition of the assemblage:

- Raw material representation
- Technological analysis
- Regional comparative analysis.

6.2.2.3 Methodology

Analysis was performed under laboratory conditions. All artefacts were first washed in water to remove the considerable amounts of dirt and mud found on most artefacts.

Each stone artefact was classified according to its raw material type and technological category and entered into a database. In classifying each artefact into a technological category, careful examination of the artefact was performed. Initial examination of the artefact involved deciding the location of the ventral and dorsal sides. Negative flake scars or cortex was indicative of dorsal attributes. Bulbs of percussion, impact points, fissures and ripples show ventral attributes. These indicators, as well as others such as a platform and termination point, are the deciding factors as to which technological category each piece was assigned.

The maximum dimension measurement was taken on all stone artefacts. Measurements of orientated length, width and thickness were taken on complex stone artefacts (complete flakes) only. Platform measurements and termination descriptions were taken on stone artefacts, where these attributes were present. The presence of cortex was also recorded for all artefacts. The amount of cortex present on a flake has been used to show the reduction stage in which a flaked piece was removed from a core (the parent material). This is due to the exclusive presence of cortex on the exterior surface of the lithic raw material, and the fact that the exterior will be the first area removed during core reduction.

A glossary of the terms used in the stone analysis is provided in Attachment A (Glossary).

6.2.2.4 Results

A small sample size of 15 stone artefacts was located during the test excavations at Artarmon Park artefact scatter (45-6-3599) (Table 6-2). As previously mentioned, limited inferences can be drawn from such a small sample size. However, the following analysis provides a general description of material present and attempts to place Artarmon Park artefact scatter (45-6-3599) in a comparative regional context.

6.2.2.5 Raw material

Chert was the predominant raw material (33.3 per cent), followed by silcrete (26.7 per cent), mudstone (20 per cent), quartzite (13.3 per cent) and quartz (6.7 per cent) (refer to Table 6-2).

Table 6-2 Raw material breakdown

Raw material	Number of artefacts	Percentage (%) of artefacts
Chert	5	33.3
Silcrete	4	26.7
Mudstone	3	20.0
Quartzite	2	13.3
Quartz	1	6.7
Total	15	100

6.2.2.6 Technological categories

The frequency of artefact types is shown in Table 6-3. The assemblage contains all major technological categories of artefacts: flakes, cores and angular fragments created during the core reduction and the flake curation process. Typological analysis did not identify any obvious tools. Angular fragments were the most common artefact type, making up 60 per cent of the assemblage, followed by flakes (33.3 per cent) and a single core (6.7 per cent).

Table 6-3 Technological categories

Technological category	Number of artefacts	Percentage of artefacts (%)
Angular fragment	9	60.0
Flake	5	33.3
Core	1	6.7
Total	15	100

6.2.2.7 Raw material in relation to artefact technological category

Chert is the dominant raw material in the assemblage followed by silcrete, mudstone, quartzite and quartz. Table 6-4 details raw materials in relation to technological category.

Table 6-4 Raw material in relation to artefact technological category

Raw material	Artefact technology		
	Angular fragments	Flakes	Cores
Chert	3	2	nil
Silcrete	2	1	1
Mudstone	3	nil	nil
Quartzite	nil	2	nil
Quartz	1	nil	nil
Total	9	5	1

6.2.2.8 Average maximum dimension in relation to technological category

The maximum dimension was measured on all artefacts. In general, the average maximum dimension across all technological categories was between 15 millimetres and 25 millimetres (refer to Table 6-5). The single core

identified in the assemblage had a slightly larger maximum dimension of 25 millimetres. The slightly larger maximum dimension for the core is to be expected considering it is the parent material that associated artefacts were knapped from. However, the core is small and suggests that workable stone material was not readily available. The measurements throughout the assemblage align with expected Australian Small Tool Tradition artefact maximum dimensions.

Table 6-5 Average maximum dimension in relation to technological category

	Angular fragments	Flakes	Cores
Average maximum dimension (mm)	17.1	20.75	25

Figure 6-1 to Figure 6-4 show artefacts found at Artarmon Park PAD.

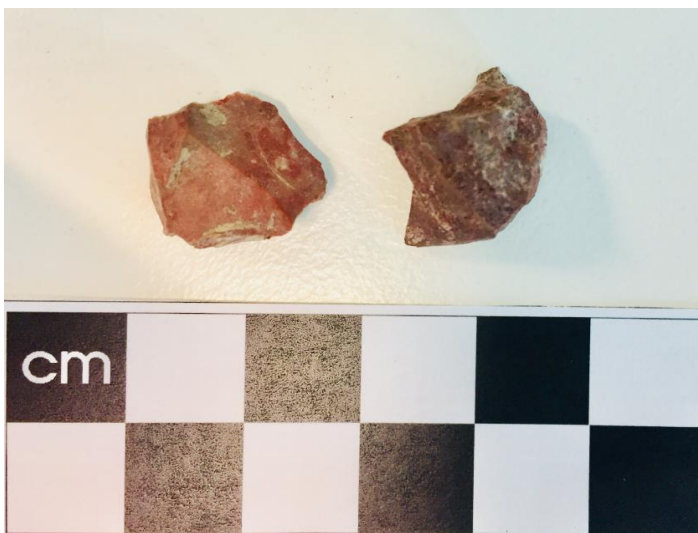


Figure 6-1 Red silcrete artefacts located at Artarmon Park artefact scatter



Figure 6-2 Various artefacts located at Artarmon Park artefact scatter

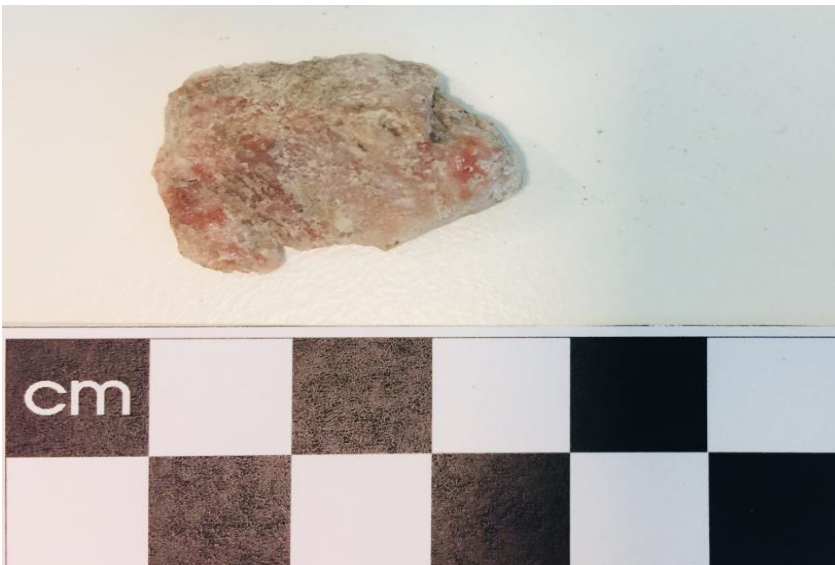


Figure 6-3 Quartzite artefact located at Artarmon Park artefact scatter

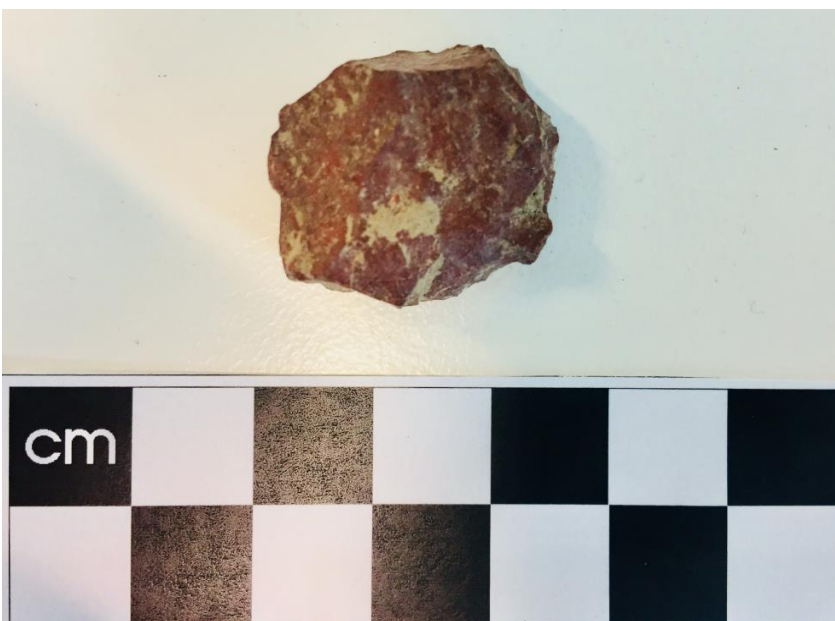


Figure 6-4 Red silcrete core located at Artarmon Park artefact scatter

6.2.2.9 Comparative analysis

In isolation, this brief analysis contributes little to the regional picture of Aboriginal stone reduction strategies. It is therefore worthwhile comparing the results of this analysis with other analyses performed within the region to contribute to establishing a regional pattern of stone use. A review of the previous archaeological assessment reports near to the study area provides little comparative data. Few of these assessments involved test excavation due to the disturbed nature of the often urbanised environment they occurred in.

In the broader Sydney region there have been extensive archaeological investigations that have involved test excavation that identified stone artefacts. Many of these excavations have occurred most recently in the Parramatta region and across the Cumberland Plain landform in Western Sydney (Carr and Costello 2015; Godden Mackay Logan Pty Ptd. 2014; McDonald 2002; McDonald 2005; 2006). However, due to the small artefact numbers associated with Artarmon Park artefact scatter (45-6-3599) it is not appropriate to draw definitive conclusions through a comparative analysis with these larger regional excavations as the artefact assemblages identified are of a considerably different scale.

Despite this, there are several key features of the Artarmon Park artefact scatter (45-6-3599) that can be examined and compared to regional assemblages. These are discussed briefly below:

- The presence of red silcrete identified in the Artarmon Park artefact scatter (45-6-3599) assemblage is important as there are known raw material sources that have been located at Plumpton Ridge, Twin Creeks, St Clair, Eastern Creek and Blacktown (Corkill 1991). Red silcrete is a common raw material type in the greater Sydney region and is typically found in most significant artefact assemblages. The presence of red silcrete artefacts in the assemblage suggests that Aboriginal people curating stone tools at Artarmon Park artefact scatter (45-6-3599) were accessing these raw material sources directly at locations identified in western Sydney or were in contact with people that were.
- Raw materials identified in the Artarmon Park artefact scatter (45-6-3599) assemblage are typically consistent with raw materials identified in the broader Sydney region. As mentioned, known silcrete material sources exist in western Sydney. More than likely, silcrete would have occurred as cobbles or gravels at these locations. Based on a comparative analysis with regional assemblages (Carr and Costello 2015; Godden Mackay Logan Pty Ptd. 2014; McDonald 2002; McDonald 2005; 2006), silcrete appears to be the most easily accessible raw material with it making up the vast majority of stone material in regional assemblages. The silcrete material itself is of good quality for flaking and stone tool curation purposes.
- The Artarmon Park artefact scatter (45-6-3599) assemblage is representative of technological categories and average maximum dimensions associated with the Australian Small Tool Tradition. This places the Artarmon Park artefact scatter (45-6-3599) assemblage in a comparable technological context to assemblages identified in the broader Sydney region.

6.2.2.10 Re-recording existing AHIMS sites

As detailed in the Western Harbour tunnel and Beaches Link archaeological survey report (Costello et al. 2017), there was a requirement for the AHIMS site cards associated with existing sites within the study area to be assessed and updated where detail was lacking or inconclusive. The original AHIMS site cards are often very old, and new recording techniques and photographic standards can be employed to update them. Updating the AHIMS site cards also enabled recent disturbance at the sites to be assessed and commented on. Furthermore, as a result of updating the AHIMS site cards the baseline data for sites is strengthened considerably.

Updated AHIMS site cards have been prepared for the following sites within or next to the study area:

- Bantry Bay Aboriginal Engraving Site (45-6-0655)
- Rock engraving (Garigal National Park) (45-6-2940)
- Clive Park 1; Northbridge (45-6-0654)
- Clive Park 2; Taplin's Cicada Pupa Cave (45-6-0996)
- Clive Park 8; Shelter and Midden (45-6-3012).

The above AHIMS site cards have been updated by providing:

- Extensive photographic records
- Stratigraphic drawings
- Site plans
- Landform descriptions
- Updated condition assessments
- Flora and faunal surveys
- Up-to-date RAP consultation and management recommendations where applicable.

Effort has been made to go 'over and above' the requirements of Heritage NSW site card recording forms to provide comprehensive baseline data for further assessment of Aboriginal sites during and after construction activities. As mentioned, this activity will provide accurate baseline data for measuring any potential disturbance to sites during construction.

Additionally, it is recommended that photogrammetry and 3D-capture techniques be used to record Aboriginal sites before and after construction to determine the impacts from construction activity (refer to Section 9 of Appendix L (Technical working paper: Aboriginal heritage)).

7. Significance assessment

7.1 Methodology

7.1.1 Basis of assessment

A significance assessment is made up of several significance criteria that attempt to define why a site is important. Such assessment recognises that sites may be important for different reasons to different people, and even at different times. The assessment of Aboriginal cultural heritage in this assessment is based upon the four values of the Australia ICOMOS Burra Charter (Australia ICOMOS 2013).

- Social values
- Historical values
- Scientific values
- Aesthetic values.

Each of these values is assessed below for Aboriginal sites in the study area, and an overall significance is assigned based on an average across the values. This is inherently a reductive process and oversimplifies what is important for different reasons to a range of different stakeholders, but is a necessary process in being able to create comparative values between sites. The significance of each site ultimately informs the management of sites and places.

It should be noted that only existing Aboriginal sites within the study area are assessed for significance here.

7.1.2 Social significance

The significance of a heritage item does not relate only to its scientific or research value. Aboriginal people's views on the significance of archaeological sites are usually related to traditional, cultural and educational values, although some Aboriginal people also value any scientific information a site may be able to provide.

Aboriginal cultural significance was assessed from consultation with the nominated site officers for the relevant RAPs during and following field assessments. It should be noted that Aboriginal significance assessed in this manner may not reflect the views of all members of the community.

7.1.3 Historic significance

The historic value of a site is determined through its association with historically important people, events or activities.

7.1.4 Scientific significance

Research potential or scientific significance of an Aboriginal archaeological site can be assessed by using the criteria set out below. Each criterion is rated as low, moderate or high.

- Site integrity – The integrity of a site refers to its state of preservation, or condition. A site can be disturbed through a number of factors including natural erosion processes, destructive land use practices or repeated use of a site in the past by both humans and animals
- Site structure – Structure refers to a site's physical dimensions, that is, size and stratigraphy. A large site or a site with stratified deposits has more research potential than small sites and/or surface scatters. Sometimes, however, specific research questions may be aimed at smaller sites, in which case they would be rated at a higher significance than normal. Site structure cannot be assessed for scarred trees or isolated artefacts
- Site contents – This category refers to the range and type of occupation debris found in a site. Generally, complex art sites, extensive quarries with associated debris and surface sites that contain a large and varied amount of organic and non-organic materials are considered to have greater research potential than those

sites with small, uniform artefacts, single motif art sites and small quarries with little or no debris. For scarred trees, contents may refer to the size and type of scar and/or how many scars there are on the one tree

- Representativeness and rarity – Representativeness refers to how much variability exists between the subject site and others inside or outside the subject area. It also considers the types of sites already conserved in the area and how much connectivity between sites exists. Rarity considers how often a particular site type occurs in an area. Assessment of representativeness and rarity requires some knowledge of the background archaeology of the area or region in which a study is being carried out. Rarity also relates to whether the subject site or area is important in demonstrating a distinctive way of life, custom, process, land use, function or design which is no longer practiced (DECCW 2011).

7.1.5 Aesthetic significance

This refers to the sensory value of a place, and can include aspects such as form, texture, and colour, and can also include the smell and sound elements associated with use or experience of a site (Australia ICOMOS 2013). Additionally, in the context of the current investigation the aesthetic significance may also relate to a setting that allows its place in a larger and more complex landscape to be better understood and appreciated. Aesthetic significance can be closely linked to the social value of a site.

7.1.6 Scale of significance

Significance of sites and places is assigned to different geographic scales, such as local, regional, state and national, appropriate to the scale of importance. For example, K’Garri (Fraser Island) is significant at a national (and world) scale, whereas a local historic building may only be significant on a local scale. This is reflected in the variety of heritage lists held by local councils, up to state and federal government. In scale of significance, the criteria presented above as well as educational or research potential, representativeness and rarity (Australia ICOMOS 2013) have been considered in determinations of significance.

Each site has been assessed and its scale of significance has been identified as being of importance at the State, regional or local level. Each site has also been given a grading of its significance overall based on the grading of each of the individual values. The grading of low, moderate and high has been assigned comparatively across the sites investigated in the region.

7.2 Statement of significance

Significance assessments for seven of the Aboriginal sites identified during the cultural heritage assessment of the study area are presented below. Statements of significance for PADs are not provided below as project refinements allowed PAD locations are avoided, and hence they were not excavated. However, Artarmon Park PAD (45-6-3362) was partially excavated at two areas of potential impact and Artarmon Park artefact scatter (45-6-3599) was located at the PAD location. Artarmon Park artefact scatter (45-6-3599) has a statement of significance provided below. The location and condition of the Frenchs Forest; Bantry Bay; Wakehurst Parkway (45-6-0662) site could not be confirmed during field inspection as the site was likely covered by gravel/vegetation. As such, a desktop assessment of this site was carried out, and no significance assessment has been carried out.

7.2.1 Bantry Bay Aboriginal Engraving Site (45-6-0655)

Table 7-1 Statement of significance – Bantry Bay Aboriginal Engraving Site (45-6-0655)

Criterion	Assessment
Social significance	Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in Sections 3 and 5 of Appendix L (Technical working paper: Aboriginal heritage)). This is particularly the case for Bantry Bay Aboriginal Engraving Site (45-6-0655), which is a large site containing multiple rock engravings. It has been suggested by RAPs that the site has ceremonial significance. The site has high social significance at

Criterion	Assessment
	the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The site is a widely known Aboriginal rock engraving location within Sydney. There are multiple historical accounts relating to the site and the rock engravings have been recorded on numerous occasions and referred to widely in the written archaeological record. There are also accounts of the site being visited by early European settlers and the location was one of the first major rock art sites visited by Captain Phillip after the First Fleet arrival (McDonald 2007). As such, the site has high historical significance.
Scientific significance	The site has high scientific significance at the local level as it is ranked as having high integrity, high structure and high representativeness/rarity. The integrity and structure of the site is high as the rock engravings are very well preserved and have been protected from development. The site is made up of multiple rock engravings and hence has increased scientific significance. The site has high representativeness/rarity as it is an example of a large engraving location made up of multiple engravings.
Aesthetic significance	The site has high aesthetic significance at the local level as it contains multiple rock engravings in an aesthetically pleasing bushland location. The site is also publicly accessible and a well-known rock engraving location within Sydney. It therefore helps to define what Sydney rock art looks like for the general public and encourages connection to the region's Aboriginal past.
Summary statement of significance	Overall, the Bantry Bay Aboriginal Engraving Site (45-6-0655) is of high significance at the local level. It is of high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people. It has high historical significance. It has high scientific significance due to its integrity and structure, high representativeness and rarity. The site has high research and educational potential about the way local Aboriginal populations lived in the area. Additionally, the site is of particular importance as it is a strong example of how Aboriginal people expressed artistic and creative endeavour before European arrival.

7.2.2 Rock engraving (Garigal National Park) (45-6-2940)

Table 7-2 Statement of significance – Rock engraving (Garigal National Park) (45-6-2940)

Criterion	Assessment
Social significance	Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in Sections 3 and 5 of Appendix L (Technical working paper: Aboriginal heritage)). This is the case for the Rock engraving (Garigal National Park) (45-6-2940), which contains an engraving of a figure of a man holding two canoes. It has been suggested by RAPs that the site has ceremonial significance. The site has high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The site is a widely known Aboriginal rock engraving location within Sydney. There are multiple historical accounts relating to the site and the rock engravings have been recorded on numerous occasions (first recorded in 1789 by Governor Phillip) (Popp <i>et al.</i> 1997). The site and nearby associated rock engravings are referred to widely in the written archaeological record. As such, the site has high historical significance.
Scientific significance	The site has moderate-high scientific significance at the local level as it is ranked as having moderate integrity, high structure, and high representativeness/rarity. The integrity of the site is moderate as the engravings, while visible, are now faint. The structure of the site is high as the rock engraving depiction and potential ceremonial

Criterion	Assessment
	meaning and interconnectedness with nearby engravings has research potential. The site has high representativeness/rarity due to the unique nature of the engraving depiction (man holding two canoes).
Aesthetic significance	The site has high aesthetic significance at the local level as it contains a rock engraving in an aesthetically pleasing bushland location.
Summary statement of significance	Overall, Rock engraving (Garigal National Park) (45-6-2940) is of high significance at the local level. It is of high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people. It has high historical significance. It has moderate-high scientific significance due to its integrity and structure, high representativeness and rarity. The site has high research and educational potential about the way local Aboriginal populations lived in the area.

7.2.1 Wakehurst Engraving MAN 104; (45-6-3032)

Table 7-3 Statement of significance –Wakehurst Engraving MAN 104; (45-6-3032)

Criterion	Assessment
Social significance	<p>Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in Sections 3 and 5 of Appendix L (Technical working paper: Aboriginal heritage)). Wakehurst Engraving MAN 104; (45-6-3032) comprises an engraved sandstone outcrop. The site was last recorded in 2011 and comprised a moderate sized sandstone rock engraving which once showed a man and percussive features.</p> <p>Significant damage to the site was noted in the site inspection on 15 September 2020 as the previous site recording in 2011 showed the exposed rock to be much more extensive than was seen on site. An extensive area of bedrock appeared to have been cut back, with a significant portion missing, exceeding one square metre in extent. Discovery of significant damage to the site resulted in notification to Heritage NSW on 28 September 2020 with Transport for NSW recommending an investigation as to the cause of damage.</p> <p>Following reinspection in September 2020 it is considered that the site retains high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people. A section of the rock remains at the site with visible peck marks, as observed during the 15 September 2020 inspection.</p>
Historical significance	This site does not meet this criterion. There are no known written or oral historical references to the site.
Scientific significance	Prior to site inspection in September 2020, the site was considered to have low scientific significance at the local level as it was ranked as having low-moderate integrity, low structure and high representativeness/rarity as it is a rock engraving within the urbanised Sydney environment. Following reinspection in September 2020, the integrity and structure of the site is now low as the site has been subject to major irreversible disturbance. The representative/rarity of the site remains high. Overall, the Wakehurst Engraving MAN 104; (45-6-3032) retains a low scientific significance.
Aesthetic significance	Prior to site inspection in September 2020, the site was considered to have low aesthetic significance as it is located in an urbanised setting with all aspects obscured by residential developments. The damage to the main stone panel has removed much of the art and severely damaged its aesthetic qualities. Overall, the Wakehurst Engraving MAN 104; (45-6-3032) retains a low aesthetic significance.
Summary statement of significance	Overall, Wakehurst Engraving MAN 104; (45-6-3032) is of low significance at the local level. It is of high social significance as it provides tangible evidence of the use of the

Criterion	Assessment
	area by Aboriginal people. It has low historical significance. It has low scientific significance due to its state of preservation and recent disturbance/damage, high representativeness and rarity and existence in the urbanised Sydney environment. The site has low research and educational potential about the way local Aboriginal populations lived in the area.

7.2.2 Clive Park 8; Shelter and Midden (45-6-3012)

Table 7-4 Statement of significance – Clive Park 8; Shelter and Midden (45-6-3012)

Criterion	Assessment
Social significance	Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in Sections 3 and 5 of Appendix L (Technical working paper: Aboriginal heritage)). Clive Park 8; Shelter and Midden (45-6-3012) comprises a shell midden and rock shelter. The site has high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The site does not meet this criterion. There are no known written or oral historical references to the site.
Scientific significance	The site has high scientific significance at the local level as it is ranked as having moderate integrity, moderate structure, and high representativeness/rarity. The midden material is up to 200 millimetres in depth and predominantly rock oyster and cockle. The shelter has a soot blackened ceiling and is heavily eroded. No deposit with potential for archaeological material is present. The integrity and structure of the site is low-moderate as the site has been subject to disturbance. The rock shelter does not have a PAD or engraving/pigment art associated with it. Clive Park 8; Shelter and Midden (45-6-3012) is therefore ranked as having high scientific significance.
Aesthetic significance	The site has high aesthetic significance as it is located in a bushland setting with a pleasing easterly aspect towards Middle Harbour.
Summary statement of significance	Overall, Clive Park 8; Shelter and Midden (45-6-3012) is of high significance at the local level. It is of high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people. It has high scientific significance due to its high representativeness and rarity although it is likely the site is disturbed. The site has moderate-high research and educational potential about the way local Aboriginal populations lived in the area.

7.2.3 Clive Park 1; Northbridge (45-6-0654)

Table 7-5 Statement of significance – Clive Park 1; Northbridge (45-6-0654)

Criterion	Assessment
Social significance	Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in Sections 3 and 5 of Appendix L (Technical working paper: Aboriginal heritage)). Clive Park 1; Northbridge (45-6-0654) comprises a shell midden, rock shelter, art site (engraving and pigment), artefact scatter and burial. The site is a very large rock shelter with a very deep rich shell midden. Rock engravings and pigment art have previously been recorded in the shelter. A large fish engraving is also located at this site. Previous excavations at Clive Park 1; Northbridge (45-6-0654) located flakes from axes, a bi-polar blade and fragments of a human skeleton. The site has high social significance at the local level as it provides tangible evidence of the use of the area by

Criterion	Assessment
	Aboriginal people.
Historical significance	This site does not meet this criterion. There are no known written or oral historical references to the site.
Scientific significance	The site has moderate-high scientific significance at the local level as it is ranked as having moderate integrity, high structure and high representativeness/rarity. The integrity and structure of the site is moderate-high as the site has been subject to disturbance. However, the site has high representativeness/rarity as it is a multi-component site displaying a rich archaeological history within the urbanised Sydney environment. Clive Park 1; Northbridge (45-6-0654) is therefore ranked as having high scientific significance.
Aesthetic significance	The site has high aesthetic significance as it is located in a bushland setting with a pleasing easterly aspect towards Middle Harbour.
Summary statement of significance	Overall, Clive Park 1; Northbridge (45-6-0654) is of high significance at the local level. It is of high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people. It has high historical significance. It has high scientific significance due to its high representativeness and rarity and existence as a multi-component site in the urbanised Sydney environment. The site has high research and educational potential about the way local Aboriginal populations lived in the area.

7.2.4 Clive Park 2; Taplin’s Cicada Pupa Cave (45-6-0996)

Table 7-6 Statement of significance – Clive Park 2; Taplin’s Cicada Pupa Cave (45-6-0996)

Criterion	Assessment
Social significance	Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in Sections 3 and 5 of Appendix L (Technical working paper: Aboriginal heritage)). Clive Park 2 is a rock shelter and shell midden. The rock shelter also contains a hand stencil. The site has high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	This site does not meet this criterion. There are no known written or oral historical references to the site.
Scientific significance	The site has moderate-high scientific significance at a local level as it is ranked as having low-moderate integrity, moderate structure, and potential sub-surface deposit. The integrity and structure of the site is low-moderate as the site may have been subject to disturbance as a result of being located within an urban environment. The rock art recorded originally is no longer visible as a result of the combined effect of weathering and graffiti disturbance. The site is highly disturbed as evidenced by the concrete path built to access the beach which also leads to a small memorial bench located under the rock shelter. The site is made up of more than one component (midden and rock shelter and potentially also burial and art) and hence increases the scientific significance to moderate-high.
Aesthetic significance	The site has moderate aesthetic significance at the local level as it is a rock shelter with a pleasant east-facing perspective towards Middle Harbour.
Summary statement of significance	Overall, Clive Park 2 is of moderate-high significance at a local level as it provides tangible evidence of the use of the area by Aboriginal people. It has moderate-high scientific significance due to its moderate representativeness and rarity but also low-moderate integrity owing to pathway and bench construction at the site. The site has high research and educational potential about the way local Aboriginal populations lived

Criterion	Assessment
	in the area.

7.2.5 Artarmon Park artefact scatter (45-6-3599)

Table 7-7 Statement of significance – Artarmon Park artefact scatter (45-6-3599)

Criterion	Assessment
Social significance	Consultation with RAPs has identified that all Aboriginal cultural heritage values in the study area are considered to be of high cultural (social) significance (refer to consultation in Sections 3 and 5 of Appendix L (Technical working paper: Aboriginal heritage)). Artarmon Park artefact scatter (45-6-3599) is a sub-surface artefact scatter located at the confluence of Flat Rock Creek and a tributary. The site has high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	This site does not meet this criterion. There are no known written or oral historical references to the site.
Scientific significance	The site has moderate scientific significance at a local level as it is ranked as having low-moderate integrity, low structure, and further potential for sub-surface deposit. The integrity and structure of the site is low-moderate as the site has been subject to disturbance as a result of being located within an urban environment. The site has moderate representativeness/rarity as it is an artefact scatter, which are common site types in the broader Sydney region. However, due to increased development and urbanisation, sub-surface artefact scatters are becoming increasingly rarer. Artarmon Park artefact scatter (45-6-3599) is therefore ranked as having moderate scientific significance.
Aesthetic significance	The site has low aesthetic significance at the local level as it is a sub-surface artefact scatter located in a disturbed area beneath the Gore Hill Freeway.
Summary statement of significance	Overall, Artarmon Park artefact scatter (45-6-3599) is of low-moderate significance at a local level as it provides tangible evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate as the site is likely to have been subject to disturbance as a result of being located within an urban environment. However, the site has moderate representativeness/rarity due to its location within a developed, urban environment. The site has low-moderate research and educational potential about the way local Aboriginal populations lived in the area.

7.3 Summary of significance

The summary of the significance assessment of Aboriginal sites located within the study area is presented below in Table 7.7. Mapping of all Aboriginal sites identified within and adjacent to the study area is presented in Figure 4-1 to Figure 4-5 of Appendix L (Technical working paper: Aboriginal heritage).

Table 7-8 Summary of the significance assessment for identified Aboriginal sites located within the study area

Name (AHIMS ID)	Social significance	Historical significance	Scientific significance	Aesthetic significance	Overall significance
Bantry Bay Aboriginal Engraving Site (45-6-0655)	High	High	High	High	High

Rock engraving (Garigal National Park) (45-6-2940)	High	High	Moderate-high	High	High
Wakehurst Engraving MAN 104 (45-6-3032)	High	N/A	Low	Low	Low
Clive Park 8; Shelter and Midden (45-6-3012)	High	N/A	High	High	High
Clive Park 1; Northbridge (45-6-0654)	High	N/A	Moderate-high	High	High
Clive Park 2; Taplin's Cicada Pupa Cave (45-6-0996)	High	N/A	Moderate-high	Moderate	Moderate-high
Artarmon Park artefact scatter (45-6-3599)	High	N/A	Moderate	Low	Low-moderate
Unable to confirm location during field inspection as likely covered by gravel/vegetation					
Frenchs Forest; Bantry Bay; Wakehurst Parkway (45-6-0662)	The site area has been identified to likely be within 50 m of the construction footprint. Presumed to be in poor condition and located in a degraded roadside verge underneath gravel/vegetation adjacent to Wakehurst Parkway. The condition of the site has not been verified during this assessment and an independent inspection and verification is required by a representative of the Aboriginal Heritage Office, the last agency to have conducted a condition assessment of the site.				

7.3.1 Potential submerged sites significance assessment

The potential submerged sites assessment is included in Annexure E – Potential submerged sites assessment.

The assessment examines the proposed tunnel alignment on the bed of Middle Harbour. Using modelling based on remote sensing information, it identifies the sensitivity of different zones based upon the likelihood that they retain archaeological deposits pre-dating sea-level rise. Any Aboriginal sites or artefacts that pre-date sea level rise are likely to hold high archaeological and cultural significance.

Any potential submerged Aboriginal archaeological sites are likely to have very high scientific significance due to the potential to yield information that would contribute to an understanding of the NSW natural and cultural history. Submerged Aboriginal archaeological sites and Pleistocene Aboriginal archaeological sites are both, on their own, rare site types within a NSW context. The identification of submerged Pleistocene landscapes and associated Aboriginal archaeological resources would be an extremely rare discovery within Australia.

8. References

AECOM 2010 M2 *Upgrade Environment Assessment*.

Artefact Heritage 2011 *150 Epping Rd, Lane Cove West–Heritage Study Aboriginal Cultural Heritage Assessment and Assessment of non-Indigenous heritage for a Concept Plan application* (unpublished report to Rose Group).

Artefact Heritage 2012 *North Ryde Station Precinct Rezoning Study*.

Artefact Heritage 2014 *ETTT Aboriginal Sites Assessment of Significance*.

Associates Archaeology and Heritage 2015 *Aboriginal Cultural Heritage Due Diligence Advice for the Manly Vale Public School*, Prepared for Government's Architect's Office on behalf of the Department of Education.

Attenbrow, V. 1990 *Port Jackson Archaeological Project - Stage II: Preliminary report on excavations undertaken in August/September 1990 under NPWS permit dated 30/7/1990*.

Attenbrow, V. 2010 *Sydney's Aboriginal past: Investigating the archaeological and historical records*. Sydney: University of New South Wales Press Ltd.

Australia ICOMOS 2013 *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance* 2013. Burwood, Victoria: Australia ICOMOS Incorporated.

Baker, N. 2004 *Archaeological Salvage of an Aboriginal Site at William Street, East Sydney* (report to Zonie Construction and Design Pty Ltd).

Brayshaw McDonald Pty Ltd 1990 *Archaeological Survey of Proposed Raymond Terrace By-Pass, Pacific Highway, New South Wales*, Report to the NSW Roads and Traffic Authority, Newcastle.

Carr, A. and A. Costello 2015 *St Marys Salvage Excavation Report* (Sydney Water).

Carr, A. and A. Costello 2017 *Western Harbour Tunnel and Beaches Link archaeological methodology*.

Conyers, B. 1990 'Survey for Aboriginal Archaeological Sites: Lane Cove River State Recreation Area', unpublished report prepared for the State Recreation Area Trust and NSW National Parks and Wildlife Service.

Corkhill, T. 1997 *Test Excavation of Rockshelter, CSIRO PAD 1, site 2 Riverside Corporate Park, North Ryde, NSW* (unpublished report to Australia Pacific Projects).

Corkill, T. 1991 *Survey for Aboriginal archaeological sites at Ulan Colliery, NSW*, Report to Connell Wagner Pty. Ltd.

Cosmos Archaeology 2018 *WHTBL Potential Submerged Terrestrial Sites Assessment*.

Costello, A., A. Carr and C. Jones 2017 *Western Harbour Tunnel and Beaches Link Archaeological Survey Report*.

Department of Environment, Climate Change and Water 2010a *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*. Sydney.

Department of Environment, Climate Change and Water 2010b *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW*. Sydney.

Department of Environment, Climate Change and Water 2011 *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*. Sydney

GML & JMCD CHM 2012 *North West Rail Link and Epping to Thornleigh Third Track Environmental Impact Statement Aboriginal heritage assessment.*

Godden Mackay Logan Pty Ptd. 2014 *Jordan Springs WP1 Archaeological Salvage Excavation.*

Haglund, L. 1989 *Preliminary survey for Aboriginal sites along F2 Castlereagh Freeway Pennant Hills Road to Lane Cove River.*

Holdaway, S.J. and N. Stern 2008 *A Record in Stone: The Study of Australia's Flaked Stone Artefacts.* Melbourne and Canberra: Museum Victoria and Aboriginal Studies Press.

Jackson 2011 *Aboriginal Site survey Proposed Mountain bike Track Route: Berowra Valley Regional Park and Bantry/Garigal National Park.* Epacris Environmental Consultants.

JMcD CHM 2006 *North West Rail Link and Epping to Thornleigh Third Track Aboriginal heritage assessment.*

Kelly 1991 *Archaeological survey of the proposed renewal of the Warringah to Bantry Bay Watermain, Frenchs Forest NSW.*

Koettig, M. 1996 *Hornsby Shire Aboriginal Heritage Study* (consultancy report to HSC).

McDonald, J. 2002 *Archaeological Survey for Aboriginal Heritage Sites at the Former CSIRO Animal Research Laboratory, Prospect NSW, Report to Rose Consulting Group on behalf of Stockland Constructors Pty Ltd, NSW.*

McDonald, J. 2005 *Archaeological Salvage Excavation of Site RTA-G1.* 109-113 George Street, Parramatta, NSW. Report to Landcom.

McDonald, J. 2006 *Archaeological Salvage Excavation of Site CG3.* 101A-105 George Street, Parramatta, NSW. Report to Rahi Developments Pty Ltd.

McDonald, J. 2007 *Dreamtime superhighway: an analysis of Sydney Basin rock art and prehistoric information exchange.* Canberra: ANU E Press.

Morris, A. 1986 *An Archaeological Survey of North Port Jackson.*

Oakley, B. 2000 *Indigenous Heritage Assessment – Proposed Sewerage Upgrade REF, Lane Cove National Park* (unpublished report to Australian Water Technologies Pty. Ltd).

Popp, T., N. Popp and B. Walker 1997 *Footprints on Rock. Aboriginal Art of the Sydney Region.* Sydney: Metropolitan Local Aboriginal Land Council.

Steele, D. 2006 *Final Aboriginal Archaeological Excavation Report – The KENS Site (Kent, Erskine, Napoleon and Sussex Streets), Sydney, NSW, containing DECC Site 45-6-2647 and associated areas of PAD* (unpublished report to Leighton Contractors Pty Ltd).

Stockton, E.D. and W. Holland 1974 *Cultural sites and their environment in the Blue Mountains.* Archaeology and Physical Anthropology in Oceania 9(1):36-65.

Total Earth Care 2007 *126 Greville Street, Chatswood West: Aboriginal Heritage and Archaeological Assessment*

Wirrina Consulting 1995 *Archaeological survey for Aboriginal sites. Delhi Rd – Main Rd No. 191, CSIRO to Northern Suburbs Crematorium, Lane Cove, NSW.*

Witter, D.C. 1990 *Regions and Resources.* Canberra: Thesis (Ph.D.) - Australian National University.

Attachment A Glossary

Aboriginal cultural heritage: The material (objects) and intangible (mythological places, dreaming stories etc) traditions and practices associated with past and present day Aboriginal communities.

Aboriginal Cultural Heritage Assessment Report: A report combining an Aboriginal archaeological assessment and Aboriginal cultural assessment, required to be submitted to Heritage NSW for any Part 6 *National Parks and Wildlife Act 1974* approval or prepared for projects under Part 5.1 of the *Environmental Planning and Assessment Act 1979* where Aboriginal cultural heritage is identified as a key issue.

Aboriginal object: Any deposit, object or material evidence (not being a handicraft made for sale), including ancestral remains, relating to the Aboriginal habitation of NSW.

Aboriginal place: Any place declared to be an Aboriginal place under s.94 of the *National Parks and Wildlife Act 1974*.

Aboriginal Focus Group (AFG): An acronym for 'Aboriginal Focus Group'. This refers to organised meetings where RAPs can be consulted on Roads and Maritime projects.

Angular fragment: A flaked piece of stone that does not have characteristic features which allow for it to be positively identified as a flake, core or tool.

Archaeological site: A location that has evidence of past Aboriginal activity (both material and mythological/ritual).

Area of archaeological sensitivity: A part of the landscape that contains demonstrated occurrences of cultural material. The precise level of sensitivity will depend on the density and significance of the material.

Artefact scatter: Where two or more stone artefacts are found within an area of potential archaeological deposit or a site.

Chert: A fine-grained rock composed of cryptocrystalline silica. It exhibits a range of textures and colours including red, green or black. Chert is easy to work and retains a sharp edge for an extensive period of time before resharpening is required. It has a low to medium fracture toughness.

Complete flake: Characterised by a bulb of percussion, striking platform remnant and clear termination.

Core: A stone piece from which a flake has been removed by percussion (striking it) or by pressure. It is identified by the presence of flake scars showing the negative attributes of flakes, from where flakes have been removed.

Cortex: The outer weathered surface of stone; if smooth, it can show the source of stone was a pebble.

Crushed platform: This term is used to describe a flake that has a damaged platform and where the platform's attributes cannot be recorded as a result.

Flake: A stone piece removed from a core by percussion (striking it) or by pressure. It is identified by the presence of a striking platform and bulb of percussion, not usually found on a naturally shattered stone.

Flake scar: Often called a 'negative flake scar', it is the remnant of a previous flake that was struck from the core. This appears on the dorsal surface of a flake.

Flaked platform: This term is used to describe a platform that has been worked previously; one or more flakes were removed prior.

Geomorphic: Relating to the structure, shape and development of landforms.

Hinge termination: A hinge termination occurs when “the fracture meets the surface of the core at approximately right angles to the longitudinal axis of the flake” (Holdaway and Stern 2008:130). This can present as a rounded surface that curves downwards at the distal end of a flake.

Humic: Soil that contains organic matter (from ‘humus’).

In situ: A description of any cultural material that lies undisturbed in its original point of deposition.

Knapping: The removal of flakes and flaked pieces from a stone core by the use of percussion.

Layer: In stratigraphy, it is used to describe a horizon (soil, rock, charcoal) that is distinct from its surrounds.

Longitudinally split flake: This is a flake that is broken (split) from the point of percussion (the strike) through to the termination.

Midden: The term midden is a Danish word meaning a mound of kitchen refuse. In archaeological terms, a midden refers to an accumulation of shell deposited after people had collected and eaten shellfish. These could contain estuarine and fresh water shellfish species in addition to faunal remains, stone artefacts and charcoal from cooking fires. In many areas of northern NSW, burials have been recorded in direct association with midden deposits.

Mudstone: A sedimentary rock formed from mud/clay.

Munsell colour: This is a colour code chart used to standardise colour specifications.

Potential Archaeological Deposit (PAD): A PAD is a location that is considered to have a potential for sub-surface cultural material. This is determined from a visual inspection of the site, background research of the area and the landform’s cultural importance.

pH: A measure of the acidity or alkalinity of the soil. Neutral is indicated by a pH of 7, with strongly acidic being 0 and strongly basic (alkaline) being 14. The ‘pH’ is said to stand for ‘potential of hydrogen’.

Platform: On a flake, this is a core remnant from where the flake was struck off the core.

Platform width: This is a measurement taken across the width of a platform between the two lateral margins of a flake.

Platform thickness: This is a measurement taken from the ventral to dorsal surfaces of a flake (beginning at the point of impact/percussion).

Quartz: A mineral composed of silica with an irregular fracture pattern. The quartz used in artefact manufacture is generally semi-translucent, although it varies from milky white to glassy. Glassy quartz can be used for conchoidal flaking, but poorer quality material is more commonly used for block fracturing techniques. Quartz can be derived from water worn pebbles, crystalline or vein (terrestrial) sources.

Quartzite: A form of metamorphosed sandstone. It is often white or grey in colour, but can occur in other shades due to mineral impurities.

Registered Aboriginal Parties (RAPs): Members of a local Aboriginal land council, Aboriginal groups or other Aboriginal people who have registered their interest with Roads and Maritime to be consulted about a proposed project or activity

Sandstone: Is a sedimentary rock formed from sand-sized predominantly quartz grains.

Scarred trees: Trees that feature Aboriginal derived scars are distinct due to the scar’s oval or symmetrical shape and the occasional use of steel, or more rarely, stone axe marks on the scar’s surface. Scarred trees are identified

by the purposeful removal of bark for use in the manufacture of artefacts such as containers, shields and canoes. The bark was also used for the construction of shelters. Other types of scarring include toeholds cut in the trunks or branches of trees for climbing purposes and the removal of bark to indicate the presence of burials in the area.

Silcrete: Soil, clay or sand sediments that have silicified under basalt through groundwater percolation. It ranges in texture from very fine grained to coarse grained. At one extreme it is cryptocrystalline with very few clasts. It generally has characteristic yellow streaks of titanium oxide that occur within a grey and, less commonly, reddish background. Used for flaked stone artefacts.

Spit: Refers to an arbitrarily defined strata of soil removed during excavation (often 50 millimetres to 100 millimetres in depth).

Stratification: The way in which soil forms in layers.

Stratigraphy: The study of soil stratification (layers) and deposition.

Sub-surface testing: An archaeological method used to determine the cultural sensitivity of an area by excavating small (0.5 metre x 0.5 metre) pits and recording the stratigraphy, Aboriginal cultural material (such as stone tools) and disturbance.

Termination: Refers to the shape of the distal end of a flake.

Tool: A stone flake that has undergone secondary flaking or retouch.

TP: Acronym for 'test pit'. Generally, this refers to a 1-metre x 1-metre or 2-metre x 1-metre pit dug by shovel, trowel or mattock. Test pits were used to determine the extent of possible features (such as shell middens) in a controlled excavation of 50-millimetre spits.

Visibility: Refers to the degree to which the surface of the ground can be observed. This may be influenced by natural processes such as wind erosion or the character of the native vegetation, and by land use practices, such as ploughing or grading. It is generally expressed in terms of the percentage of the ground surface visible for an observer on foot.

Attachment B AHIMS search results



SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-6-2222	Clive Park 4;Northbridge; Contact					Closed site	Valid	Shell : -, Artefact : -	Shelter with Midden	1809
45-6-0271	Clive Park;Northbridge; Contact					Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
45-6-1271	Lavender Bay Milsons Point Contact					Closed site	Valid	Shell : -, Artefact : -	Shelter with Midden	
45-6-2111	Clive Park 3; Contact					Stage Office				
45-6-2122	NSC Cave; Contact					Closed site	Valid	Shell : -, Artefact : -	Shelter with Midden	
45-6-0645	Northbridge;Mowbray Point; Contact					Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
45-6-0654	Clive Park One;Northbridge; Contact					Closed site	Valid	Shell : -, Artefact : -, Art (Pigment or Engraved) : -, Burial : -	Burial/s,Shelter with Art,Shelter with Midden	1809
45-6-0655	Frenchs Forest;Bantry Bay Road; Contact					Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	2183,2184,102473
45-6-1234	Bluff Head;Foot Cave; Contact					Closed site	Valid	Shell : -, Artefact : -, Art (Pigment or Engraved) : -	Shelter with Art,Shelter with Midden	
45-6-0662	Frenchs Forest;Bantry Bay;Wakehurst Parkway; Contact					Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	102473
45-6-0666	Frenchs Forest;Frenchs Forest Road; Contact					Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
45-6-0964	Balgowlah Contact					Open site	Destroyed	Art (Pigment or Engraved) : -	Rock Engraving	

Report generated by AHIMS Web Service on 09/04/2020 for Alexandra Seifertova for the following area at Search using shape-file BL_Shp.SHP with a buffer of 0 meters. Additional Info :

Archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 28

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-6-0965	Balgowlah;200 FT Cave; Contact					Closed site	Destroyed	Art (Pigment or Engraved) : - Permits	Shelter with Art	
45-6-1808	Seaforth; Contact					Open site	Valid	Shell : -, Artefact : -, Burial : - Permits	Burial/s,Midden	
45-6-0993	Chatswood; Contact					Closed site	Valid	Shell : -, Artefact : - Permits	Shelter with Midden	
45-6-0996	Clive Park Two;Northbridge;Cicada Pupa Cave. Contact					Closed site	Valid	Art (Pigment or Engraved) : -, Shell : -, Artefact : - Permits	Shelter with Art,Shelter with Midden	1809
45-6-1004	Frenchs Forest; Contact					Closed site	Valid	Art (Pigment or Engraved) : - Permits	Shelter with Art	
45-6-1587	Seaforth Contact					Open site	Valid	Art (Pigment or Engraved) : - Permits	Rock Engraving	
45-6-2940	Rock engraving (Garigal National Park) Contact					Open site	Valid	Art (Pigment or Engraved) : - Permits		102473
45-6-3011	Clive Park Midden WILL 169 Contact					Open site	Valid	Shell : 1 Permits		
45-6-3012	Clive Park 8, Shelter Midden WILL 170 Contact					Closed site	Valid	Shell : - Permits		
45-6-3032	Wakehurst Engraving MAN 104 Contact					Open site	Valid	Art (Pigment or Engraved) : 1 Permits		
45-6-3033	JAF Fenwick Engraving MAN 105 Contact					Open site	Valid	Art (Pigment or Engraved) : 1 Permits		
45-6-3599	ARTARMON PARK ARTEFACT SCATTER Contact					Open site	Partially Destroyed	Artefact : 1 Permits		
45-6-3672	David Shelter MAN-119 Contact					Open site	Valid	Potential Archaeological Deposit (PAD) : 1 Permits		

Report generated by AHIMS Web Service on 09/04/2020 for Alexandra Seifertova for the following area at Search using shape-file BL_Shp.SHP with a buffer of 0 meters. Additional Info :

Archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 28

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AHIMS Web Services (AWS)

Extensive search - Site list report

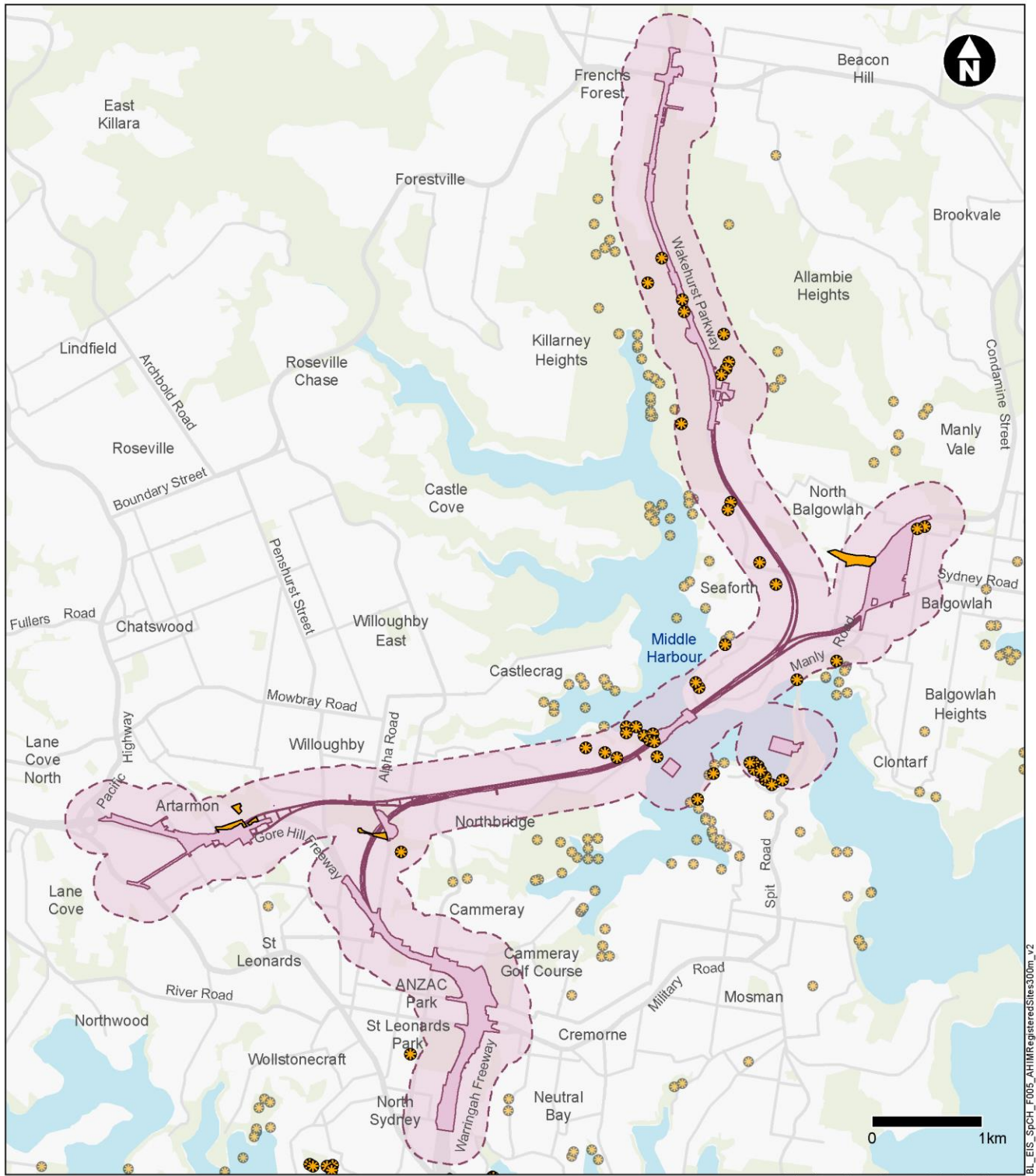
SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-6-3361	FLAT ROCK CREEK PAD					Open site	Valid	Potential Archaeological Deposit (PAD) : 1		
	Contact					p (Australia) Pty Ltd - North Sydney		Permits		
45-6-3362	ARTARMON PARK PAD					Open site	Partially Destroyed	Potential Archaeological Deposit (PAD) : 1		
	Contact					ustralia Pty Ltd - Sydney,Mr.Andrew Costello,Jacob:		Permits		
45-6-3363	BURNT BRIDGE CREEK PAD					Open site	Valid	Potential Archaeological Deposit (PAD) : 1		
	Contact					p (Australia) Pty Ltd - North Sydney		Permits		

Report generated by AHIMS Web Service on 09/04/2020 for Alexandra Seifertova for the following area at Search using shape-file BL_Shp.SHP with a buffer of 0 meters. Additional Info :

Archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 28

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Attachment C AHIMS registered sites within 300m of the study area



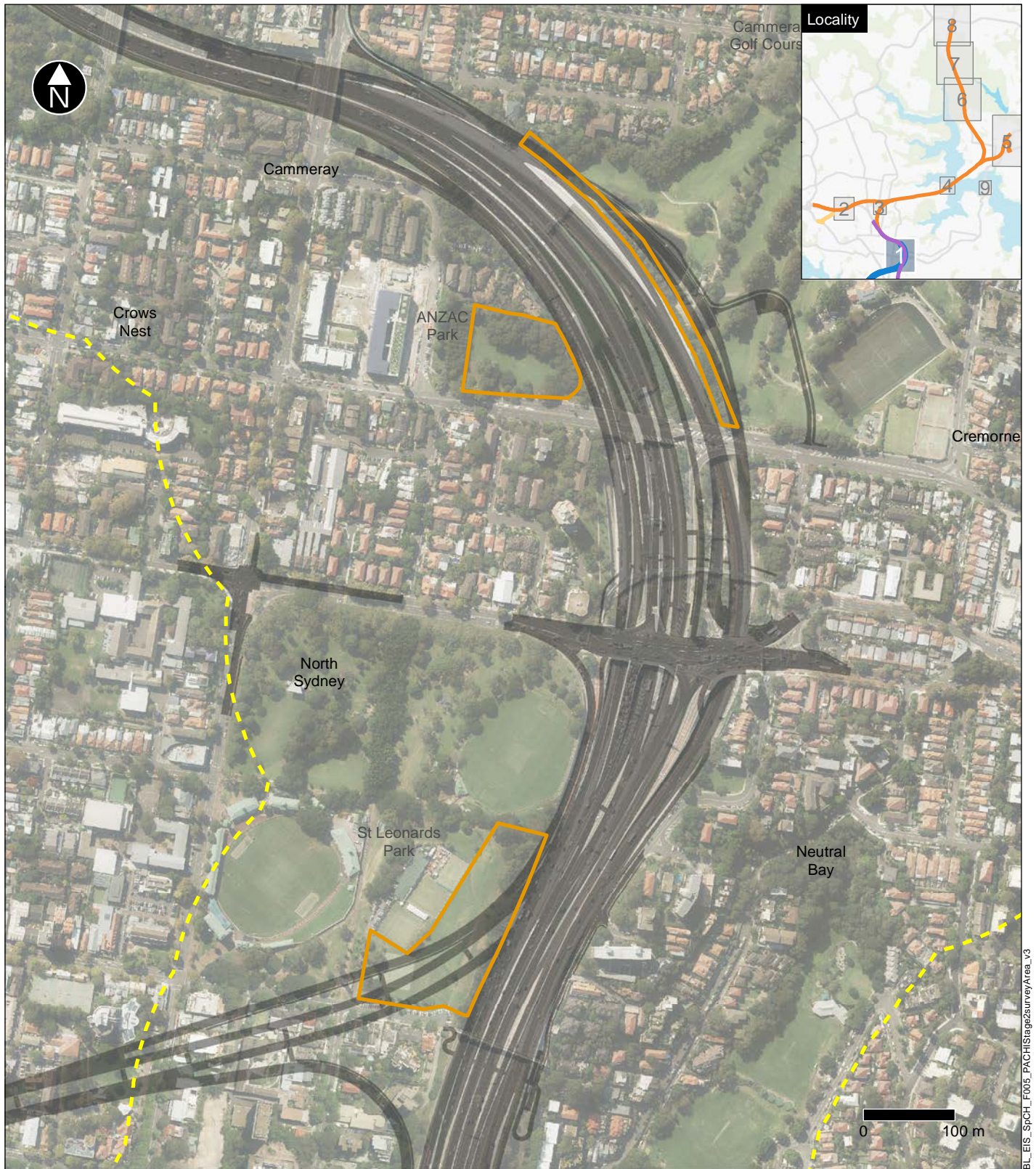
Legend

- 300 metre area around construction footprint
- Construction footprint
- Tunnel
- AHIMS site within 300 metres of the construction footprint
- AHIMS site over 300 metres from the construction footprint
- Potential Archaeological Deposit

Indicative only – subject to design development

Figure A. 1 AHIMS registered sites within 300 metres of the construction footprint

Attachment D Archaeological survey areas



Legend





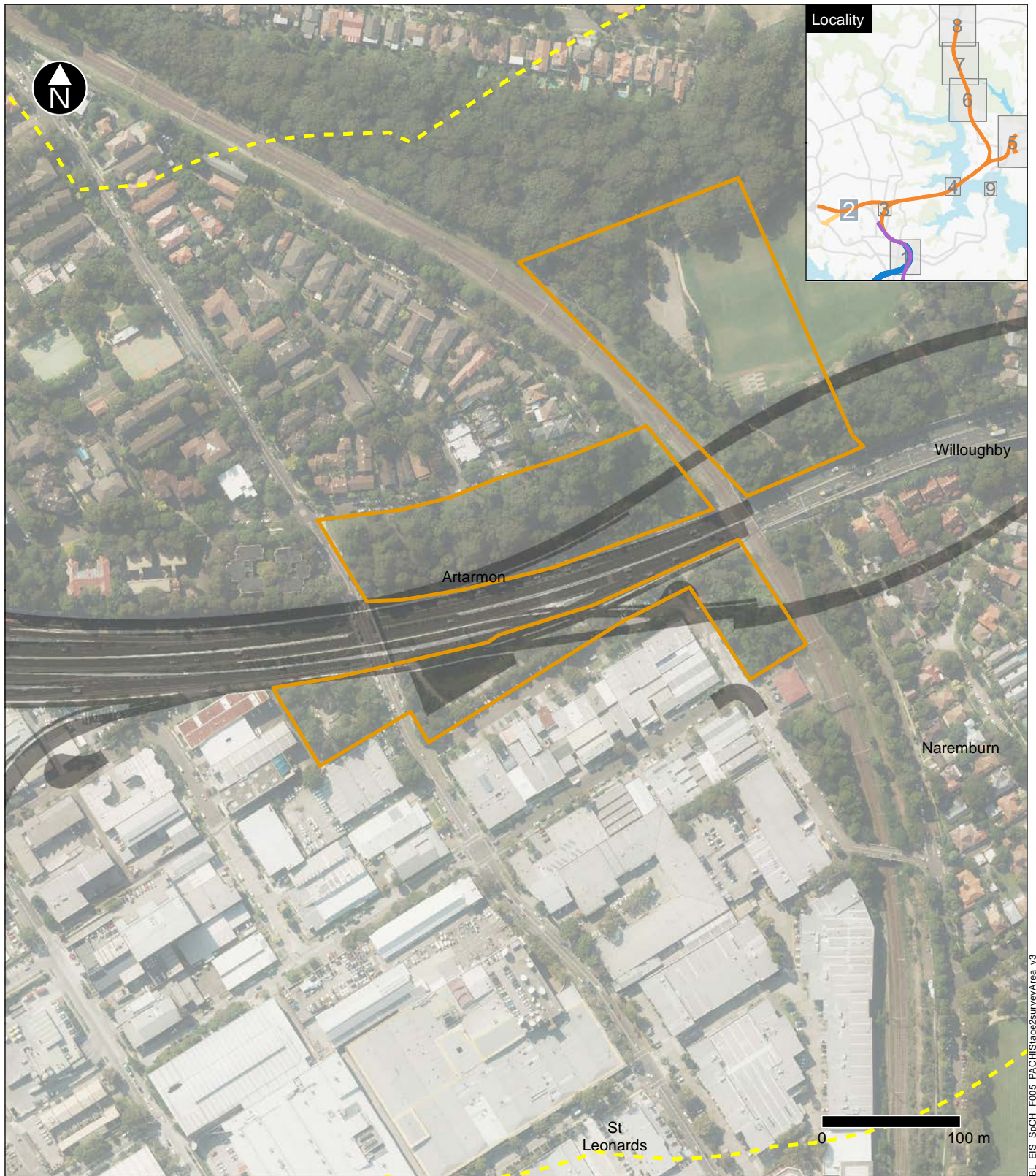
-  AHIMS (OEH)
-  PACHI stage 2 survey area
-  Study area (300 m buffer of the project area)
-  The project area

Figure A-1 Archaeological survey areas

BL_EIS_Spoch_F005_PACHIStage2surveyArea_v3



BL_EIS_Spoch_F005_PACHIstage2surveyArea_v3

Legend





-  AHIMS (OEH)
-  PACHI stage 2 survey area
-  Study area (300 m buffer of the project area)
-  The project area

Figure A-2 Archaeological survey areas



BL_EIS_Spoch_F005_PACHIStage2surveyArea_v3

Legend









-  AHIMS (OEH)
-  PACHI stage 2 survey area
-  Study area (300 m buffer of the project area)
-  The project area

Figure A-3 Archaeological survey areas



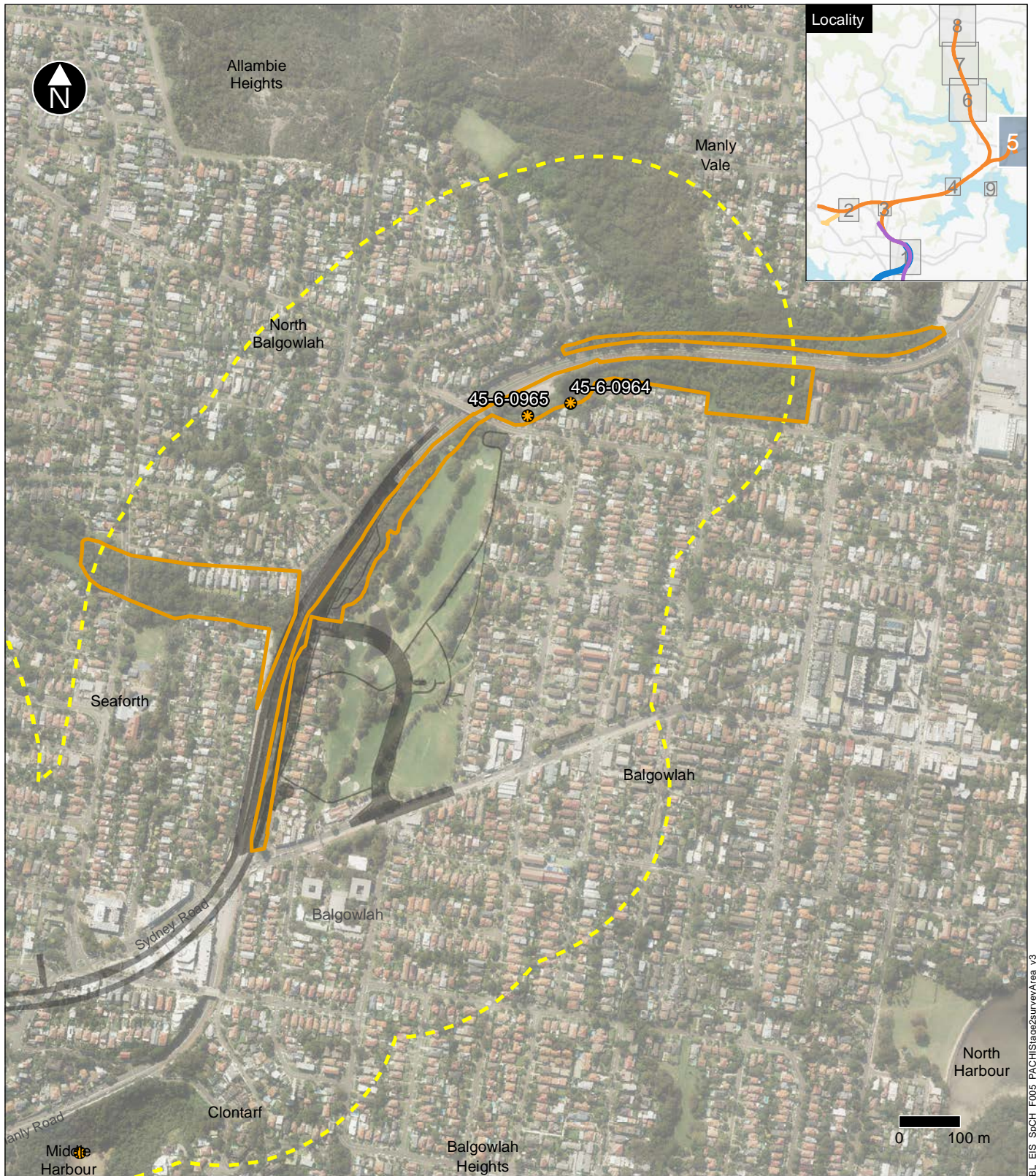
BL_EIS_Spoch_F005_PACHIStage2surveyArea_v3

Legend

-  AHIMS (OEH)
-  PACHI stage 2 survey area
-  Study area (300 m buffer of the project area)
-  The project area

*45-6-2222 is a terrestrial site with incorrect coordinates

Figure A-4 Archaeological survey areas



BL_EIS_Spoch_F005_PACHIstage2surveyArea_v3

Legend





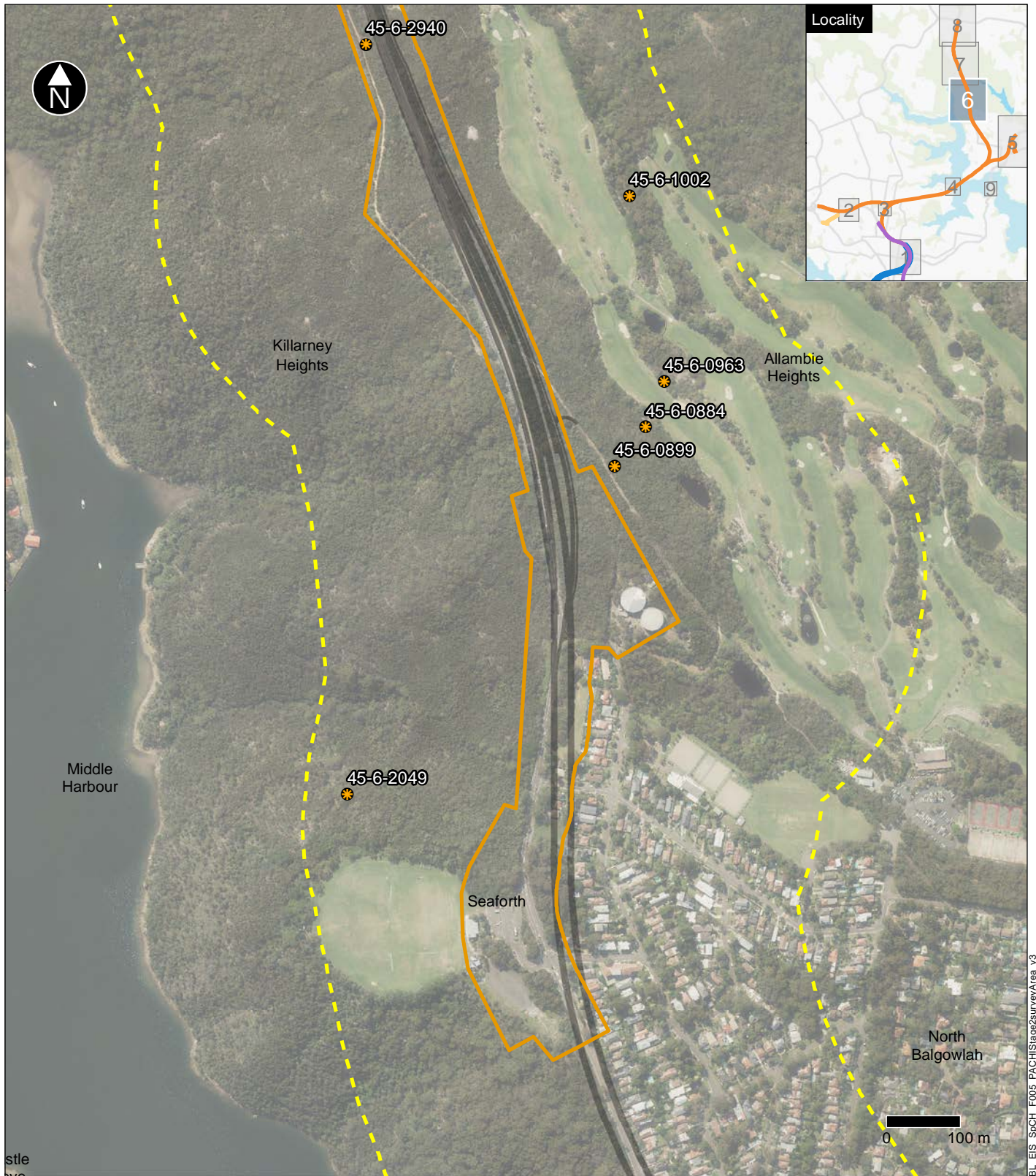
-  AHIMS (OEH)
-  PACHI stage 2 survey area
-  Study area (300 m buffer of the project area)
-  The project area

Figure A-5 Archaeological survey areas



Legend





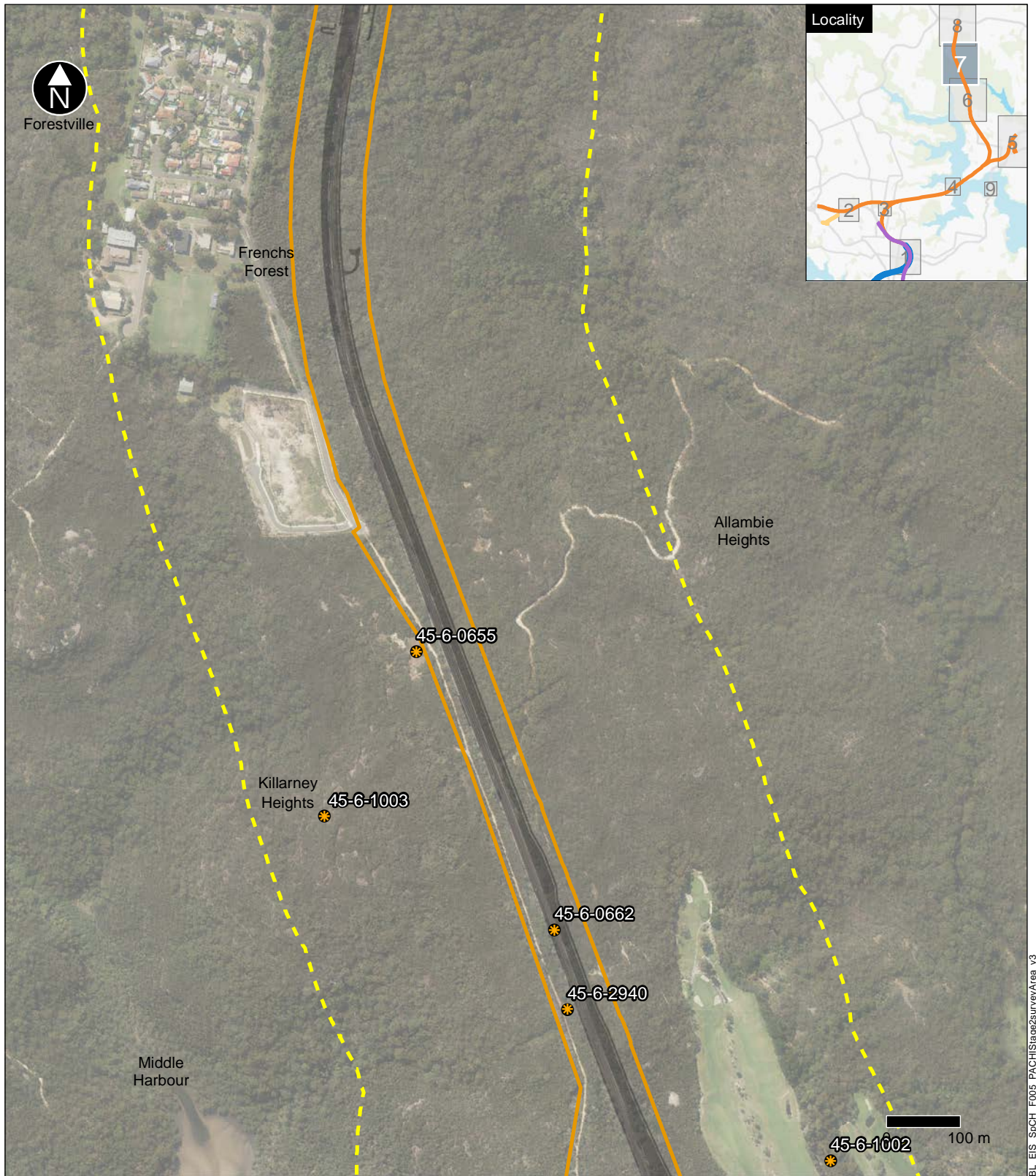
-  AHIMS (OEH)
-  PACHI stage 2 survey area
-  Study area (300 m buffer of the project area)
-  The project area

Figure A-6 Archaeological survey areas

BL_EIS_Spoch_F005_PACHIstage2surveyArea_v3



BL_EIS_Spoch_F005_PACHIStage2surveyArea_v3

Legend





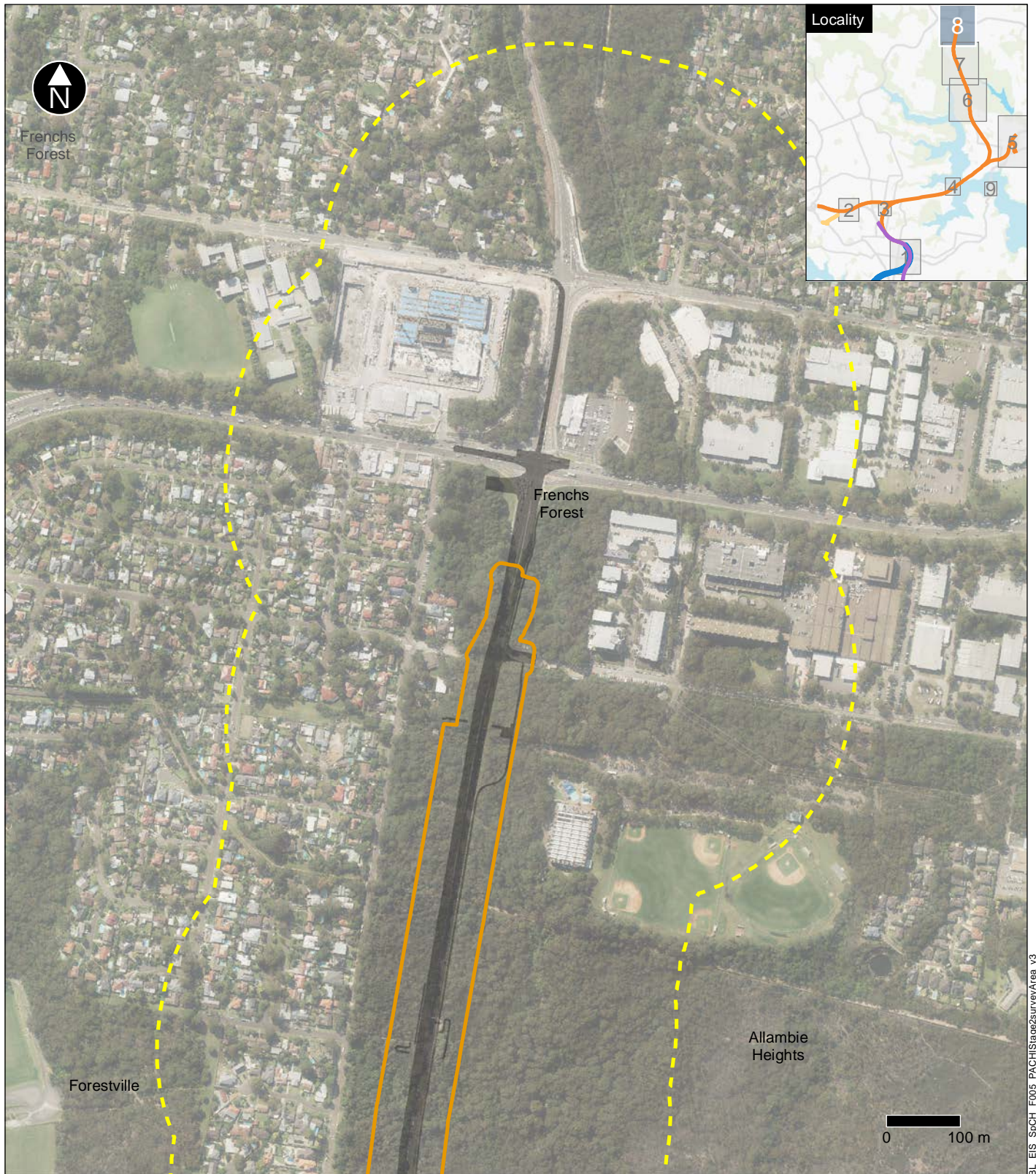
-  AHIMS (OEH)
-  PACHI stage 2 survey area
-  Study area (300 m buffer of the project area)
-  The project area

Figure A-7 Archaeological survey areas



BL_EIS_Spoch_F005_PACHIstage2survey/Area_v3

Legend





-  AHIMS (OEH)
-  PACHI stage 2 survey area
-  Study area (300 m buffer of the project area)
-  The project area

Figure A-8 Archaeological survey areas



BL_EIS_Spoch_F005_PACHIStage2surveyArea_v3

Legend











-  AHIMS (OEH)
-  PACHI stage 2 survey area
-  Study area (300 m buffer of the project area)
-  The project area



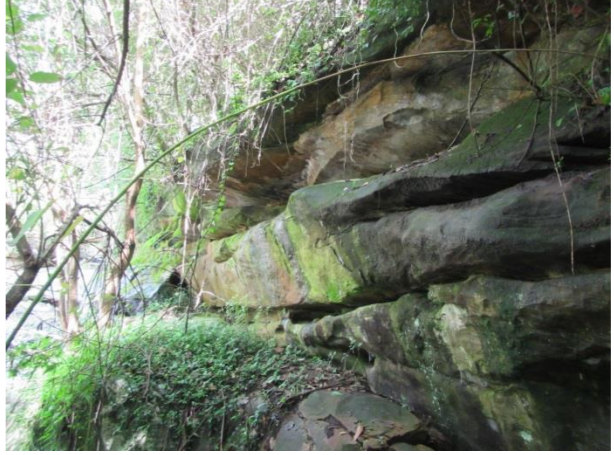
Figure A-9 Archaeological survey areas




Attachment E Archaeological survey results



Assessment area	Survey Date	Location	New PAD (AHIMS ID)	LALC site officers	Notes	LALC comment	Image
North Shore	17/5/17	ANZAC Park	N/A	Selina Timothy (Metro LALC) Mark Lester (RMS)	Some historic heritage considerations for the grove of trees, plaque and the valve outlet at western end. The area within Anzac Park has been heavily modified and there are no Aboriginal heritage constraints.		 <p>Photo by A Costello 17/5/17 looking south – S Timothy in foreground</p>
North Shore	17/5/17	Artarmon Park (Parkes Road)	PAD	Selina Timothy (Metro LALC) Mark Lester (RMS)	The sensitivity of Artarmon Park is associated with the sandstone outcrops and potential for archaeological deposit. Generally, the western end and eastern extreme ends have been heavily modified and there are no Aboriginal heritage constraints Where the soils and rock formations have been retained there is moderate potential for engravings, grinding grooves or Aboriginal artefacts. Difficult to determine if area has been modified/disturbed through landscaping/freeway construction. Further research, archival photographs would assist.		 <p>Photo by A Costello 17/5/17 looking east across PAD and thick bush</p>
North Shore	17/5/17	Punch Street	N/A	Selina Timothy (Metro LALC) Mark Lester (RMS)	The area within Punch Street has been heavily modified and there are no Aboriginal heritage constraints		 <p>Photo by A Costello 17/5/17 looking east across bike track</p>

Assessment area	Survey Date	Location	New PAD (AHIMS ID)	LALC site officers	Notes	LALC comment	Image
North Shore	17/5/17	Flat Rock Creek	PAD	Selina Timothy (Metro LALC) Mark Lester (RMS)	<p>Baseball diamond assessed as low significance.</p> <p>Areas of on raised terraces close to private property with sandstone outcrops have potential for PAD and over hangs with associated deposit.</p> <p>Area has high potential for rock engravings, grinding grooves and artefacts due to the large sections of flat terrace and outcropping sandstone.</p> <p>Henry Lawson Cave nearby but outside current study area.</p>		 <p>Photo by A Costello 17/5/17 looking south across bike track toward Henry Lawson Cave</p>  <p>Photo by A Costello 17/5/17 showing A Roberts looking at rock shelter above bike track at Flat Rock Creek Gully</p>
Middle Harbour	17/5/17	Clive Park	N/A	Selina Timothy (Metro LALC) Mark Lester (RMS)	<p>Clive Park is a high Aboriginal heritage sensitivity on the foreshore and littoral zone with highly significant Aboriginal cultural heritage sites close to the water. High risk is associated with impacts through shore-wash and vibration during construction.</p>		 <p>Photo by A Costello 17/5/17 looking west across rock shelter</p>

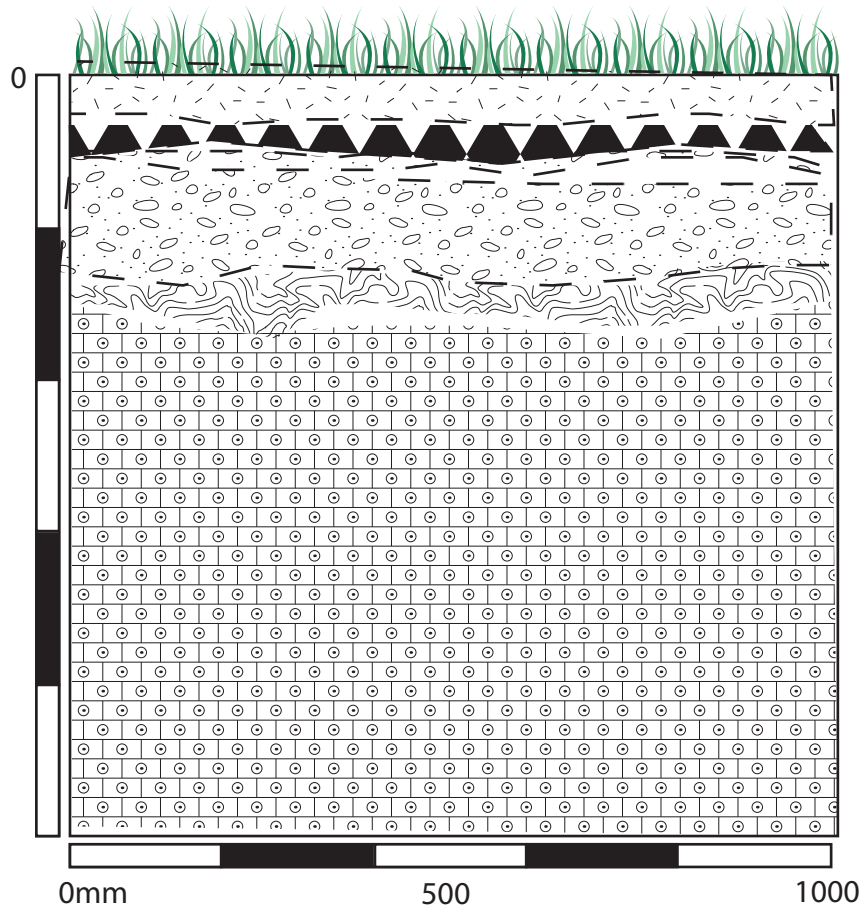
Assessment area	Survey Date	Location	New PAD (AHIMS ID)	LALC site officers	Notes	LALC comment	Image
							 <p>Photo by A Costello 17/5/17 showing shell eroding from midden at AHIMD ID: 45-6-0645</p>
Middle Harbour	18/5/17	Spit West Reserve	N/A	Mark Lester (RMS)	The area within Spit Reserve has been heavily modified and there are no Aboriginal heritage constraints		Photo not available
Middle Harbour	18/5/17	Seaforth	N/A	Mark Lester (RMS)	Did not visit sites on private property. The general area has been heavily modified and urbanised.		Photo not available
Middle Harbour	18/5/17	North Balgowlah	N/A	Mark Lester (RMS)	The area within North Balgowlah has been heavily modified through the construction of the freeway and there are no Aboriginal heritage constraints		 <p>Photo by A Costello 18/5/17 showing rock stabilisation work</p>
Balgowlah	18/5/17	Balgowlah Golf Course	N/A	Mark Lester (RMS)	No access to private property Public access areas are low sensitivity. No engravings sighted. Small overhang inspected but no art observed. The approximately 400 m of creek line represents an area of moderate potential for grinding grooves due to the large sections of outcropping bedrock in the creek.		 <p>Photo by A Costello 18/5/17 showing A Roberts in creek bed</p>

Assessment area	Survey Date	Location	New PAD (AHIMS ID)	LALC site officers	Notes	LALC comment	Image
							 <p>Photo by A Costello 18/5/17 photo across creek toward golf course</p>
Balgowlah	18/5/17	Burnt Bridge Creek		Mark Lester (RMS)	<p>No access to private property Public access areas are low sensitivity. No engravings sighted. Small overhang inspected but no art observed. Areas of low gradient terraces associated with creek have potential for PAD. Creek bed and sandstone outcrop may exhibit grinding grooves.</p>		 <p>Photo by A Costello 18/5/17 photo across creek showing waterfall</p>  <p>Photo by A Costello 18/5/17 photo toward shallow overhang</p>

Assessment area	Survey Date	Location	New PAD (AHIMS ID)	LALC site officers	Notes	LALC comment	Image
Balgowlah	18/5/17	Wakehurst Parkway	N/A	Mark Lester (RMS)	<p>The area has multiple sandstone outcrops and there is potential for intact soil profiles.</p> <p>Area is in a highly sensitive archaeological landform.</p> <p>An engravings walk is located immediately to the west of the road with multiple Aboriginal sites located on both sides of the road.</p>		 <p>Photo by A Costello 18/5/17 looking across engraving site</p>  <p>Photo by A Costello 18/5/17 showing bike track and sign on stone</p>
Wakehurst Parkway	18/5/17	Garigal National Park	N/A	Mark Lester (RMS)	<p>The area has multiple sandstone outcrops and there is potential for intact soil profiles.</p> <p>Area is in a highly sensitive archaeological landform.</p> <p>An engravings walk is located immediately to the west of the road with multiple Aboriginal sites located on both sides of the road.</p>	Area of engravings depicting shields may be a men's site (Mark Lester)	 <p>Photo by A Costello 18/5/17 showing engraving site at AHIMS 45-6-0655</p>

Assessment area	Survey Date	Location	New PAD (AHIMS ID)	LALC site officers	Notes	LALC comment	Image
Wakehurst Parkway	18/5/17 & 1/6/17	Manly Dam Reserve	N/A	Selina Timothy (Metro LALC) Mark Lester (RMS)	The area has multiple sandstone outcrops and there is potential for intact soil profiles. Area is in a highly sensitive archaeological landform. An engravings walk is located immediately to the west of the road with multiple Aboriginal sites located on both sides of the road.	Area of engravings depicting shields may be a men's site (Mark Lester).	 <p>Photo by A Costello 18/5/17 looking across sandstone bedrock</p>
Wakehurst Parkway	18/5/17 & 1/6/17	Warringah Road End	N/A	Mark Lester (RMS)	Some areas are heavily modified and there are no Aboriginal heritage constraints - where the actual roadway and verges are, where the development of the Northern beaches hospital has modified the landscape and where urban and industrial developments have removed the potential for Aboriginal heritage to be present.		 <p>Photo by A Costello 18/5/17 looking at thick vegetation</p>

Attachment F Artarmon Park PAD Stratigraphic Profile



Western Harbour Tunnel and Beaches Link

Site: Artarmon Park PAD

Stratigraphic profile: 1 by1m TP1

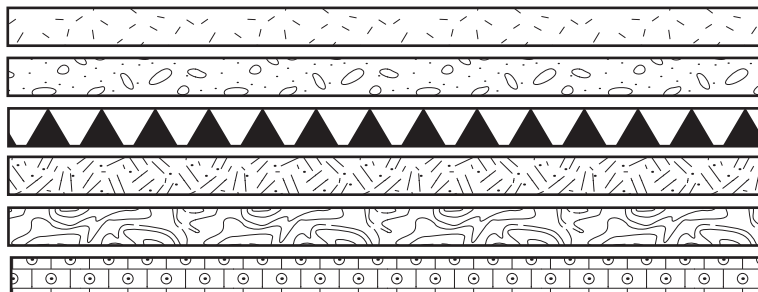
MGA zone: 56H

Excavation date:

Scale: 2cm=200mm

Stratigraphic Components

1	0-50mm: Silty loose humic soil. Munsell: 10 YR 5/2.
2	50-75mm: Thin layer of decomposing foliage
3	75-275mm: Compact grey/brown silt. Munsell: 10 YR 5/2.
4	275-300mm: Compact yellow orange clay. Munsell: 10YR 6/4.



Loose Silt

Clayey Silt

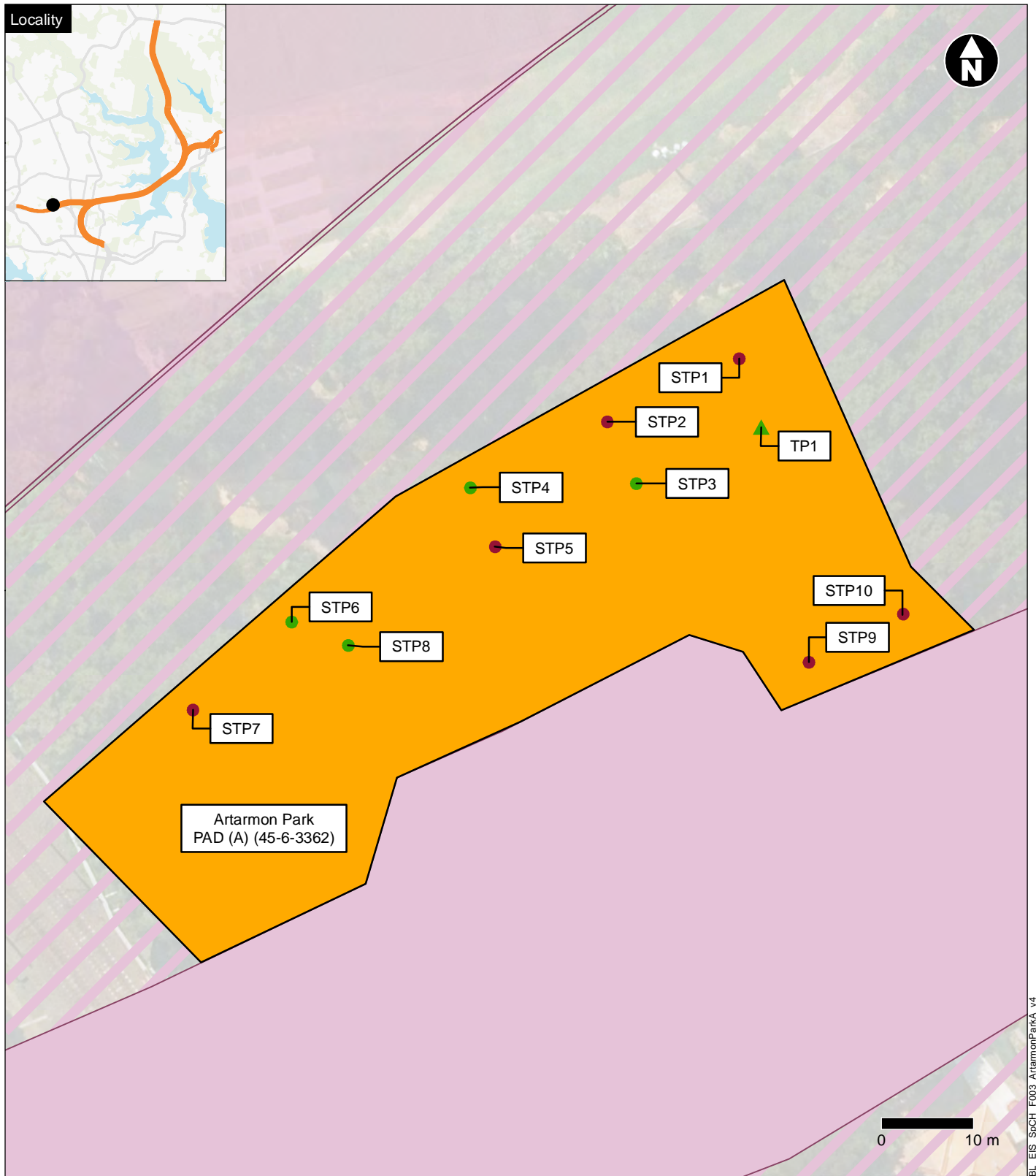
Decomposing foliage

Silty Clay

Clay




Unexcavated

Attachment G Test excavation mapping






BL_EIS_Spoch_F003_ArtarmonPark_v4

Legend

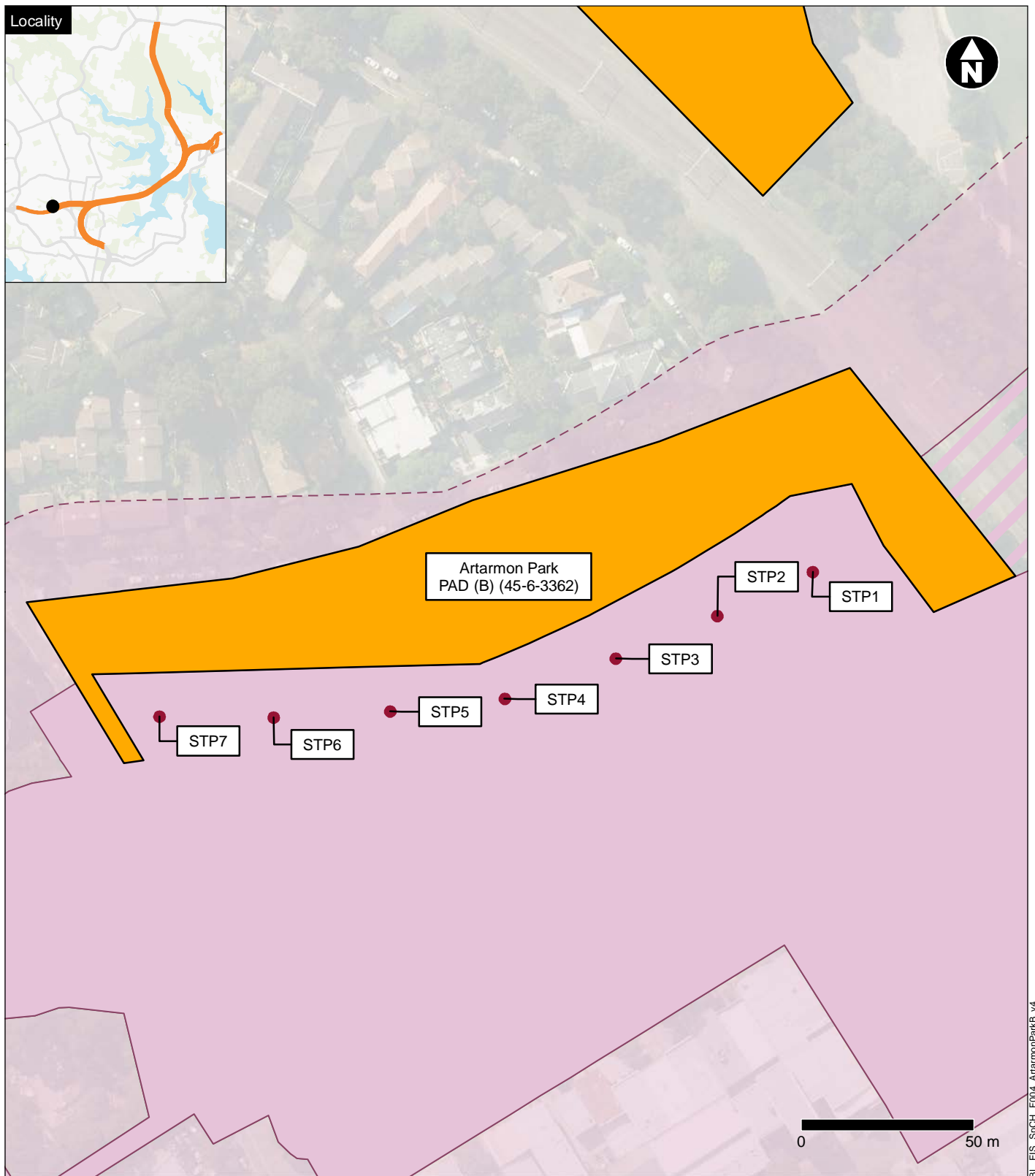
-  50 m buffer from project area boundary
-  Construction footprint
-  Tunnel

 Potential Archaeological Deposit

Test pit location




-  Negative shovel test pit (500 x 500 mm)
-  Positive shovel test pit (500 x 500 mm)
-  Positive test pit (1000 x 1000 mm)

Test pit locations for Artarmon Park PAD (A)




BL_EIS_Spoch_F1004_ArtarmonParkB_v4

Legend

-  50 metre area around construction footprint
-  Construction footprint
-  Tunnel

 Potential Archaeological Deposit

Test pit location

-  Negative shovel test pit (500 x 500 mm)

Test pit locations for Artarmon Park PAD (B)

Annexure E - Potential submerged sites assessment

Transport for NSW

Beaches Link and Gore Hill Freeway Connection

Potential submerged sites assessment

December 2020

Prepared for

Transport for NSW

Prepared by

Cosmos Archaeology Pty Ltd

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1 Introduction.....	3
1.1 Overview	3
1.2 Purpose of this report	3
2 Study area.....	4
3 Assessment process	5
3.1 Baseline review	5
3.1.1 Desktop study.....	5
3.2 Remote sensing data review.....	5
3.3 Field survey	8
3.4 Establishing archaeological potential and significance.....	8
3.5 Assessing impact and appropriate mitigation measures.....	8
4 Physical setting.....	9
4.1 Port Jackson overview.....	9
4.2 Evolution of the submerged landscape	9
5 Archaeological Background.....	11
5.1 Regional context – Port Jackson shoreline	11
5.2 Pleistocene Aboriginal occupation in the Sydney Basin	12
5.3 Potential survival of submerged Aboriginal archaeological sites	13
5.4 Predictive Model.....	14
6 Area A – Northbridge to Seaforth Bluff, Middle Harbour.....	16
6.1 Physical setting.....	16
6.2 Known Aboriginal archaeological sites near Area A.....	19
6.3 Potential submerged Aboriginal archaeological sites in Area A.....	21
6.4 Summary of submerged Aboriginal archaeological sites in Area A	27
7 Area B – Western side of The Spit, Pearl Bay.....	29
7.1 Physical setting.....	29
7.2 Known Aboriginal archaeological sites near Area B.....	32
7.3 Potential submerged Aboriginal archaeological sites	32
7.4 Summary of maritime heritage sites in Area B	33
8 Area C – Clive Park to Beauty Point, Middle Harbour.....	34
8.1 Physical setting.....	34
8.2 Known Aboriginal archaeological sites near Area C.....	34
8.3 Potential submerged Aboriginal archaeological sites	35
8.4 Summary of maritime heritage sites in Area C.....	35
9 Heritage significance	36
9.1 Significance criteria.....	36

9.2 Assessment of Aboriginal heritage significance 36

10 Potential impacts on submerged Aboriginal ARCHAEOLOGICAL sites
38

10.1 Proposed works 38

10.1.1 Area A 38

10.1.2 Area B 41

10.1.3 Area C 42

10.2 Approach to assessing impact 43

10.2.1 Area A 43

10.2.2 Area B 44

10.2.3 Area C 44

11 Recommended Management Measures **45**

References 51

EXECUTIVE SUMMARY

The Western Harbour Tunnel and Beaches Link is a New South Wales (NSW) Government initiative to provide additional road network capacity across Sydney Harbour and to improve connectivity with Sydney's Northern Beaches. This includes the Beaches Link and Gore Hill Freeway Connection project, part of which comprises a new tolled motorway tunnel connection across Middle Harbour.

Cosmos Archaeology Pty Ltd was engaged to satisfy the maritime heritage and underwater archaeological aspects of the Secretary's Environmental Assessment Requirements for this project. This included the assessment of potential submerged Aboriginal archaeological sites, with particular reference to possible terminal Pleistocene and early Holocene sites inundated by the last post-glacial global rise in sea levels and marine transgression that commenced 18,000 to 19,000 years ago.

This document addresses the potential for the presence of submerged Aboriginal archaeological sites within the project area and potential impacts to the resource arising from the construction phase of the project. It has been written as an Annexure to be appended to the Beaches link and Gore Hill Freeway Connection project Technical working paper: Aboriginal cultural heritage assessment report (Jacobs, 2020). Non-Aboriginal maritime heritage for this project has been addressed in a separate report by Cosmos Archaeology (Technical working paper: Maritime heritage).

The areas assessed in this study were the bed of the harbour between Seaforth and Northbridge (Area A), the western side of The Spit (Area B) and the entrance to Long Bay (Area C). During the Pleistocene period – ie. prior to the sea level rises that commenced around 12,000 years ago – the landscape and environment of these study areas would have been much like the Blue Mountains region of today. Middle Harbour would have been a meandering freshwater river passing through deeply incised sandstone gorges such as that between Seaforth and Northbridge as well as at The Spit, fed by numerous creeks and streams originating in areas such as Long Bay.

A predictive model for the study areas was prepared, identifying Aboriginal archaeological sites and deposits that may have occurred prior to inundation, and the likelihood of such sites surviving inundation. This model was built on research regarding the physical setting of the study areas, both during the terminal Pleistocene glacial period and the current Holocene interglacial, documented physical evidence of Aboriginal occupation and land use patterns along the Middle Harbour shoreline during the mid to late Holocene and the broader Sydney Basin during the terminal Pleistocene, and studies assessing the likelihood of archaeological sites and materials to survive inundation in an Australian context.

It was determined that Aboriginal archaeological site types that could have occurred along the edges of the river and creeks, which would have become inundated by the rises seas include rock shelters with occupation evidence and deposits, grinding grooves, stone artefact scatters, shell middens, and fish traps. The extent to which such sites may have survived inundation is very much dependant on the length and intensity of exposure to water movement and wave action. In the relatively enclosed waters of Middle Harbour the rate of survival can be expected to be greater than those sites which were situated in what would have been more open country eastwards of the current coastline.

The assessment of Aboriginal archaeological potential was augmented where possible by available geotechnical information obtained through seismic profiling and from borehole drilling as well as diving. In Area A, identified substantial sandstone rock ledges protruding from the marine sediments were inspected by divers and were assessed to have Moderate to High archaeological potential for the presence of rock shelters. Buried deep under marine sediments almost midway between Seaforth and Northbridge there are peat deposits which formed within the ancient Middle Harbour Creek prior to inundation. This stratum was assessed to have Moderate to High archaeological potential on the basis that it may contain well preserved organic archaeological objects and possibly the remains of fish traps. The remainder of Area A was assessed to have very low archaeological potential on the basis that geotechnical data indicated the presence of only very thin residual soils / palaeosols overlaying bedrock, diminishing the likelihood of artefacts being encountered within these layers. Areas B and C were assessed to have Moderate to High archaeological potential on account of their more protected locations.

Consultation conducted by Jacobs Group Pty Ltd (2018) with Aboriginal knowledge holders identified by Registered Aboriginal Parties indicate that the range of site types and resources that may occur in the project area as submerged Aboriginal archaeological sites are of cultural, social and spiritual significance. Submerged Aboriginal archaeological sites would also be of high scientific significance and research value.

By combining the predictive model, geophysical prospection, and Aboriginal knowledge holder consultation, a broad assessment of the potential for submerged Aboriginal archaeological sites to occur

has been carried out. Impacts upon locations potentially containing Aboriginal archaeological sites and their significance has then been considered. The proposed works that could most likely impact potential submerged Aboriginal archaeological sites is the dredging and construction of the two cofferdams in Area A. Without mitigation, the potential impacts could range from Negligible to Moderate. Other activities such as piling are assessed to have a Negligible to Minor impact on the potential submerged Aboriginal archaeological sites across the remainder of Area A as well as Areas B and C. This is because in Area A the piling will take place in areas of very low archaeological potential while piling in Area B and installation of a temporary mooring facility east of Clive Park in Middle Harbour in Area C will unlikely penetrate through the overlying marine sediments.

Measures presented to mitigate the potential impacts to submerged Aboriginal archaeological sites have been composed and recommended with the understanding that the presence of such sites have not been confirmed. Their survival would be difficult to confirm without further investigations on a relatively large scale due their submersion and depth of burial under marine sediments. Two forms of mitigation measures are presented. The first measure involves pre-construction investigation of prospective rock ledges at Seaforth located outside of the cofferdam footprint for potential rock shelters. Should physical evidence of Aboriginal occupation be identified these sites would be archaeologically excavated, where feasible, prior to the commencement of construction.

The second measure has been designed to utilise the opportunity afforded by large scale and deep excavations within Middle Harbour to capture information related to submerged Aboriginal archaeological sites during the course of the project. The documenting of such archaeological sites would be an acceptable form of mitigation as their identification would indicate that such sites could be widespread in Middle Harbour and that the information obtained in this project would be invaluable in managing this resource into the future. This measure would be in the area of the north and south cofferdams and would commence with pre-construction higher precision marine geophysical investigations to localise the areas of further interest. If geophysical surveys conclusively show there are no distinct rock overhangs of sufficient size, there would be no further work carried out. However if the geophysical survey is inconclusive or distinct rock overhangs are identified, visual monitoring of excavation within the cofferdams would be undertaken during the construction period after they have been dewatered. In consultation with a suitably experienced geomorphologist, a set of criteria would be established and if pre-inundation soil deposits become evident within the cofferdam then a controlled archaeological investigation to recover any artefacts would take place.

The extent of the archaeological investigation for both proposed measures would need to be determined in terms of what is feasible with consideration of the constraints of the bed rock conditions and safety constraints within the cofferdams, including safety protocols required for the handling of any contaminated sediment.

1 INTRODUCTION

1.1 Overview

The Greater Sydney Commission's *Greater Sydney Region Plan – A Metropolis of Three Cities* (Greater Sydney Commission, 2018) proposes a vision of three cities where most residents have convenient and easy access to jobs, education and health facilities and services. In addition to this plan, and to accommodate for Sydney's future growth the NSW Government is implementing the *Future Transport Strategy 2056* (Transport for NSW, 2018), that sets the 40 year vision, directions and outcomes framework for customer mobility in NSW. The Western Harbour Tunnel and Beaches Link program of works is proposed to provide additional road network capacity across Sydney Harbour and Middle Harbour and to improve transport connectivity with Sydney's Northern Beaches. The Western Harbour Tunnel and Beaches Link program of works include:

- The Western Harbour Tunnel and Warringah Freeway Upgrade project which comprises a new tolled motorway tunnel connection across Sydney Harbour, and an upgrade of the Warringah Freeway to integrate the new motorway infrastructure with the existing road network and to connect to the Beaches Link and Gore Hill Freeway Connection project
- The Beaches Link and Gore Hill Freeway Connection project which comprises a new tolled motorway tunnel connection across Middle Harbour from the Warringah Freeway and the Gore Hill Freeway to Balgowlah and Killarney Heights and including the surface upgrade of the Wakehurst Parkway from Seaforth to Frenchs Forest and upgrade and integration works to connect to the Gore Hill Freeway at Artarmon.

A combined delivery of the Western Harbour Tunnel and Beaches Link program of works would unlock a range of benefits for freight, public transport and private vehicle users. It would support faster travel times for journeys between the Northern Beaches and areas south, west and north-west of Sydney Harbour. Delivering the program of works would also improve the resilience of the motorway network, given that each project provides an alternative to heavily congested existing harbour crossings.

Transport for NSW is seeking approval under Part 5, Division 5.2 of the Environmental Planning and Assessment Act 1979 to construct and operate the Beaches Link and Gore Hill Freeway Connection project, which would comprise two components:

- Twin tolled motorway tunnels connecting the Warringah Freeway at Cammeray and the Gore Hill Freeway at Artarmon to the Burnt Bridge Creek Deviation at Balgowlah and the Wakehurst Parkway at Killarney Heights, and an upgrade of the Wakehurst Parkway (the Beaches Link)
- Connection and integration works along the existing Gore Hill Freeway and surrounding roads at Artarmon (the Gore Hill Freeway Connection).

1.2 Purpose of this report

This document has been prepared to support the environmental impact statement for the project. The environmental impact statement has been prepared to accompany the application for approval of the project, and address the environmental assessment required by the Secretary of the Department of Planning, Industry and Environment ('the Secretary's environmental assessment requirements') issued on the 15th December 2017 (Application number SSI 17_8862). The Secretary's environmental assessment requirements are presented in Technical working paper: Aboriginal cultural heritage assessment report (Jacobs, 2020).

Cosmos Archaeology Pty Ltd was engaged by Transport for NSW to satisfy the maritime heritage aspects of the Secretary's environmental assessment requirements. For that purpose, all aspects of underwater cultural heritage were examined including the potential for submerged Aboriginal archaeological sites. In consultation with Jacobs and Transport for NSW it was decided that the assessment of the potential for submerged Aboriginal archaeological sites would best placed as an Annexure to the Technical working paper: Aboriginal cultural heritage assessment report.

2 STUDY AREA

The study area for this potential submerged Aboriginal archaeological sites assessment is separated into three areas. These areas have been defined according to where construction activities related to the project will occur over water or over former bed of the harbour (Figure 1).

There are three primary areas where direct impacts will occur:

- Area A – the proposed tunnel alignment and cofferdams between Northbridge and Seaforth (Middle Harbour south cofferdam BL7 and Middle Harbour north cofferdam BL8)
- Area B – the proposed construction support site in Pearl Bay and the western side of The Spit (Spit West Reserve construction support site BL9)
- Area C – the proposed temporary mooring facility east of Clive Park in Middle Harbour.

Though the areas as defined above encapsulate portions of land, this assessment deals only with submerged Aboriginal archaeological sites, defined as all material culture associated with Aboriginal occupation that is situated on or under the bed of the harbour below the Highest Astronomical Tide, including the former bed of the harbour under reclamation (eg. Spit West Reserve, Pearl Bay Park). This definition includes physical evidence of Aboriginal occupation that has become inundated since the rise in sea levels that occurred during the post-glacial marine transgression around 12,000 to 7,000 years ago, as well as remains of maritime sites such as fish traps that could have been constructed since the stabilisation of sea levels around 8,000-7,500 years ago.



Figure 1: Study area separated into Area A – Northbridge to Seaforth; Area B – Pearl Bay, including the western side of The Spit and Area C at the entrance to Long Bay (Base image: Google Earth)

3 ASSESSMENT PROCESS

Cosmos Archaeology Pty Ltd (2017a, 2017b) prepared an Issues Paper and Desktop Assessment for the project in 2017. The assessment drew on the findings of past reports. From this information, two areas were identified in Middle Harbour that formed a focus for initial assessments. The areas in Middle Harbour were:

- Area A: Between Clive Park at Northbridge and Seaforth Bluff at Seaforth
- Area B: Western side of The Spit, including d’Albora Marina.

The study areas primarily cover the bed of the harbour but also include adequate buffers to account for areas of the foreshore that have been reclaimed as part of previous development. Area B is confined to the eastern portion of the proposed disturbance footprint for the project (see Figure 1).

The proposed temporary mooring facility east of Clive Park in Middle Harbour– Area C – was not included in the 2017 Issues Paper or Desktop Assessment, as information on the use of the area for the project was not available at the time.

This impact assessment report was carried out in four stages, as detailed below:

1. Baseline review
2. Field survey
3. Establishing maritime heritage potential, significance and sensitivity
4. Assessing impacts and appropriate mitigation measures.

3.1 Baseline review

The start of the assessment process involved reviewing available information to form a basic understanding of the potential extent, variety, condition and significance of submerged Aboriginal archaeological sites within the study area; often referred to as a predictive model. The information obtained during this baseline review guided the direction and conduct of field investigations, which in turn refined the understanding of the maritime heritage resource. This allowed more informed assessments to be prepared on the heritage significance of the resource, potential impacts on that resource, and the formulation of suitable mitigation measures.

The baseline review comprised two main components; a desktop literature and database review and an examination of remote sensing data.

3.1.1 Desktop study

The desktop study involved examination of the following resources:

- Published books and articles on the marine environment and geomorphology of Port Jackson
- Published books and articles, and unpublished reports, detailing previous Aboriginal archaeological investigations and studies relevant to Port Jackson
- Published books and articles, and unpublished reports, detailing previous archaeological investigations and studies relevant submerged Aboriginal archaeological sites
- Combined results of two searches of the NSW Office of Environment and Heritage (now known as the Department of Premier and Cabinet (Heritage)) Aboriginal Heritage Information Management System register, the first conducted in 2016 by Artefact Heritage Services (2016) and the second conducted in May 2017 by Jacobs Group Pty Ltd (2018)
- Results of Aboriginal archaeological surveys and test excavations conducted by Jacobs Group Pty Ltd (2018).

3.2 Remote sensing data review

The following remote sensing data was examined to identify areas with the potential for submerged Aboriginal archaeological sites to occur.

Side scan sonar data

A side scan sonar survey was carried out specifically for the project for the purpose of mapping “sea bed features and identify any significant features which could impact future drilling or near shore construction activities” (Earth Technology Solutions, 2017a). The survey covered most of the proposed extent of the

disturbance footprint for Area A apart from two northern projections of about 80 by 25 metres and the eastern nearshore portion of Area B. The side scan sonar survey did not cover Area C.

Apart from identifying anomalies such as shipwrecks, side scan sonar can identify natural features and landform units of Aboriginal archaeological potential, such as rock outcrops or protruding ledges. These could once have been rock overhangs on the slopes of a hill and as such the floors of such features may contain physical evidence of Aboriginal occupation (see Section 5.4 for a discussion of the Aboriginal archaeological predictive model devised for the study area).



Figure 2: Extent of side scan sonar survey in relation to proposed extent of disturbance footprint (in solid blue and solid orange) (Base image: Google Earth). Side scan sonar data provided as .shp files by Podnar, A. Geotechnical Engineer, Douglas Partners, 5 December 2017.

Seismic reflection profiling survey

Seismic reflection profiling surveys were carried out in Area A and Area B. Sub-bottom profiling is the marine equivalent of ground penetrating radar. This form of remote sensing technology is primarily used to record geological strata below the bed of the harbour to assist engineers in their design of marine structures as well as assist dredge contractors in understanding the material they will be encountering. Seismic profiling is used to identify submerged terrestrial landscapes. Within the context of the study areas, the Holocene marine sediments can be identified and isolated thereby revealing the Pleistocene landscape – and strata – prior to inundation. Seismic profiling may also be able to detect voids (that is spaces) in the sandstone interface with Holocene sediments suggesting possible large rock overhangs and thereby potential rock shelters.

The initial survey was carried out in May and June 2017 with the objective to ‘map subsurface layers across the site to assess geological conditions for tunnel alignment assessment including the depth to top of rock and significant sediment layers, and provide sufficient spatial coverage to allow production of contour plans of these layers’ (Figure 3) (Earth Technology Solution, 2017a). An additional survey was carried out in late October 2017 along the tunnel alignment next to Seaforth (Marine and Earth Sciences, 2017).

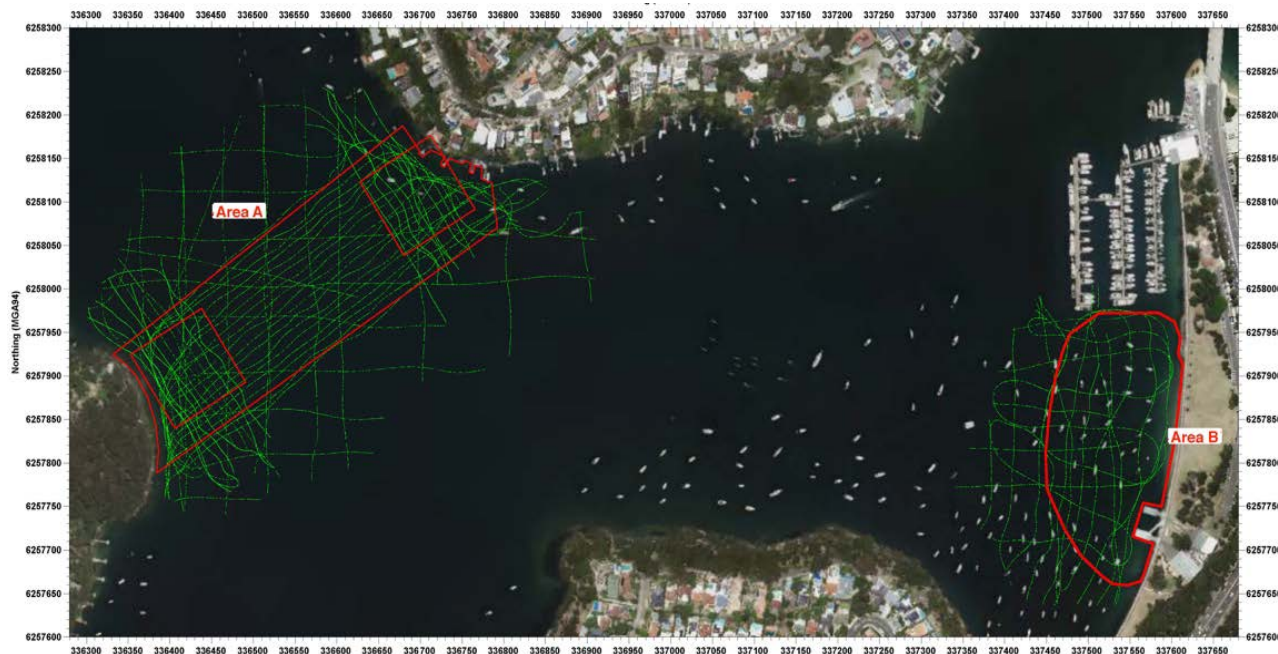


Figure 3 Vessel track plot showing extent of seismic reflection survey in Areas A and B (Earth Technology Solution Pty Ltd, July 2017a: Figure MH 4). The green lines show where the survey collected the data. The red boxes show the area of interest around the proposed cofferdams.

Because the seismic reflection surveys were intended to identify the top of the bedrock and significant sediment layers, the data is very useful for assessing the potential for submerged sites.

Core and non-core drilling

Geotechnical drilling took place within Area A throughout May and June 2017. A variety of techniques were deployed amounting to 74 locations where drilling took place (Figure 4). The data collected from the drilling is informative on the presence or otherwise of residual (ie pre-inundation) soil deposits which may contain evidence of Pleistocene Aboriginal occupation.



Figure 4 Drilling sites within Area A (Golder Associates and Douglas Partners, October 2017 Test Locations; Western Harbour Tunnel and Beaches Link; Middle Harbour. Drawing No. 2, Revision 1, drawn 19 October 2017).

3.3 Field survey

The purpose of the field survey was to test the predictive model formulated in the baseline review as well as to inspect anomalies of potential cultural heritage significance identified from the geophysical surveys. The field survey, in the form of a diving investigation, took place over five days between the 13 and 19 December 2017. The investigations were led by maritime archaeologists Cosmos Coroneos (Cosmos Archaeology Pty Ltd) and Matt Carter (archaeologist).

The dive investigation focused on identifying the nature of anomalies for the maritime heritage component of the project as well as natural features which could be associated with the surviving remnants of submerged Aboriginal archaeological sites. As such, diving took place along two locations where rock outcrops were visible on the side scan sonar and indicated the potential for the presence of rock overhangs that could have associations with past Aboriginal occupation.

The findings of the dive investigations are incorporated into Section 6.3 of this report. The conduct and the results of the dive investigation are presented in the Cosmos Archaeology January 2018 report *Western Harbour Tunnel and Beaches Link: Maritime Archaeological Dive Inspections December 2017*.

3.4 Establishing archaeological potential and significance

This document assesses the potential presence of Aboriginal cultural heritage, submerged or buried, within the study area. A very important component of this assessment is the geotechnical or remote sensing carried out for this project. The data collected to date has been extremely useful in focusing where diving investigations were needed, but it has its limitations especially with regards to how the survey parameters have been set and relying on subjective interpretations of anomalies, sediment/soil strata and level of detail provided in the geotechnical reporting.

The potential occurrence of submerged Aboriginal archaeological sites has been identified through predictive modelling based on an examination of the Pleistocene and Holocene environmental setting, current understanding and documented material evidence of Aboriginal land use patterns and examination of survival determinates associated with inundation, augmented with the findings of the geotechnical investigations carried out for this project as well as the Cosmos Archaeology (2017a) Maritime Archaeological Desktop Study. The level of maritime heritage potential has been rated according to the likelihood of it occurring, and is presented for Areas A, B and C in Sections 6.3, 7.3 and 8.3 respectively.

Understanding a site's Aboriginal cultural heritage significance is critical in determining a proportionate level of mitigation. This document follows the significance assessment criteria and approach presented in Section 7 of Technical working paper: Aboriginal cultural heritage assessment report.

3.5 Assessing impact and appropriate mitigation measures

The identified impacts of the project are assessed for Areas A, B and C in Section 10. Based on the findings of the impact assessments, proportionate mitigation measures are presented in Section 11.

4 PHYSICAL SETTING

4.1 Port Jackson overview

Port Jackson is an estuary comprising three main bodies of water – Middle Harbour, Lane Cove and Parramatta River (Harris & O'Brien 1998) The estuary is 30 kilometres long and two kilometres across at the widest point (Birch, 2007)

Port Jackson is a partially mixed estuary and occasionally stratified with an upper warmer fresh water plume after intense rainfall in the Parramatta River catchment (Harris & O'Brien, 1998) In such events the salinity in the upper water column could be reduced from an ambient 35 practical salinity units (Ocean equivalent) to 30 (Hedge, 2014).

Tidal range is considered micro tidal – one metre on neap tides and two metres on spring tides – and typical current speeds range from 0.3 to 0.5 metres per second (0.6–1 knot); where there are constricted channels such as at The Spit and between Balls Head and Birchgrove, current speeds can reach one metre per second (two knots) (Harris & O'Brien, 1998). The areas with the strongest tidal flow also has the highest turbidity, the sediments of which are derived from erosion and reworking. This suggests that the ebbing tide would be the most turbid.

The most frequent wind patterns are from the north-east (22 per cent of the time) and west (18 per cent of the time) though the strongest winds are from the south (17 per cent of the time) (Hedge, Ahyong & Booth, 2014).

There are five sedimentological units within the Port Jackson. In the shallow off-channel embayments of the central harbour the sediments are mud (Birch, 2007) The seabed from the upper reaches of the estuary is composed of muddy sand while the sand content increases towards the entrance to Port Jackson (Birch, 2007). Rocky outcrops appear on the seabed throughout.

There are several deep holes within Port Jackson, with the deepest, 46 metres, being off Blues Point, west of the Harbour Bridge (Harris & O'Brien 1998). Their formation is likely to be the result of tidal scouring. These holes, along with a number of rocky islands, shoals and basins are separated by sills.

The bed of the harbour within the project area is composed chiefly of fluvial sediments which are a mixture of muds and freshly weathered Hawkesbury sandstone with some shale siltstone and feldspar also present. The mud is mostly detrital but also contains a large organic component. Mud deposits close to the seabed surface are bioturbated and have shell layers.

4.2 Evolution of the submerged landscape

Port Jackson is a drowned valley type estuary comprised of three ancient valley systems through which Middle Harbour, Lane Cove River and Parramatta River currently flow (Harris & O'Brien 1998, Roy 1984). The configuration of the Port Jackson drainage system is controlled by the underlying geological structures of the Sydney Basin, formed as an uplifted coastal plain during the Permian-Triassic geologic period, 300–220 million years before present (BP). As fluvial creeks and rivers developed across the Sydney Basin, the waters began eroding pathways into the bedrock of Hawkesbury Sandstone, gradually creating deep and steep-sided river valleys – in some instances currently up to 85 metres deep (Birch 2007, Emerson & Phipps 1969, Roy 1984).

With the onset of the Quaternary ice age, 2.5 million years BP, large swings in global atmospheric and climatic conditions occurred every 40,000 – 100,000 years, resulting in cycles of prolonged cooling and glaciation, followed by a rapid shift to short interglacial periods of increased temperatures and glacial melting. During each glacial period, sea levels dropped as water became locked in ice sheets, draining the rivers, exposing continental shelves and creating extensive coastal plains. During the interglacial periods of milder climate, sea levels rose and the river valleys were flooded and partially infilled with sediment deposited by both marine and fluvial processes (Birch 2007, Harris & O'Brien 1998, Roy 1984).

The most recent glacial period commenced during the Pleistocene about 115,000 years BP, with maximal glaciation – termed the Last Glacial Maximum (LGM), reached between 24,000 to 18,000 years BP. Throughout the LGM, sea levels in the Australasian region were 100 to 130 metres below the current level and the eastern coastline of Australia was 25 to 30 kilometres further to the east (Hope 2005, Lewis *et al* 2013, Thom & Roy 1985). The Port Jackson catchment would have comprised a meandering river system running through deeply incised sandstone gorges, draining the sandstone plateaus to the west and north-west and fed by numerous creeks and streams – similar to the morphology of the Blue Mountains of today.

Sediment deposition within the river systems during the LGM would have been minimal, and the river beds would have been predominantly formed of eroded gravels (Birch 2007, Sale 2000, Thom & Roy 1985).

Between 19,000 to 18,000 years BP, a climate reversal ushered in the end of the last glacial period, causing deglaciation and a resultant rapid rise in global sea levels. About 11,700 years BP, the current interglacial period, the Holocene, commenced (Cohen *et al* 2013, Hope 2005). By about 10,000 years BP, sea levels along south-eastern Australia has risen to approximately 25 metres below current levels and the coastline was only three to five kilometres further east than present (Lewis *et al* 2013).

It was around this time that the Port Jackson embayment was flooded, drowning the ancient valley systems underlying the current Middle Harbour, Parramatta River, and its tributary Lane Cove River. The two ancient rivers joined, former ridges became promontories, valleys became inlets and some former hills became islands. As saline water was progressively flushed into the embayment the riverine ecosystems began altering as an estuarine environment gradually emerged. Marine sediments and tidal delta sands were also pushed landwards with the rising seas, infilling the mouth of Port Jackson whilst further sedimentation occurred in the middle and upper reaches via the deposition of estuarine muds and shelly sands (Birch 2007, Harris & O'Brien 1998, Roy 1984, Thom & Roy 1985).

Between about 7900 to 7700 years BP, the sea level along south-eastern Australia reached the present level, continuing to rise to a highstand of 1 to 1.5 metres above present level between 7700 to 7400 years BP. According to the majority of sea level data, the highstand remained stable along south-eastern Australia until about 2000 years BP, when the sea level gradually fell, with little if any oscillation, to the present position (Lewis *et al* 2013, Sloss, Murray-Wallace & Jones 2007).

5 ARCHAEOLOGICAL BACKGROUND

5.1 Regional context – Port Jackson shoreline

The most comprehensive regional study of the Aboriginal archaeological record in the Port Jackson catchment is the 'Port Jackson Archaeological Project' carried out by Val Attenbrow (1990, 1991, 1994, 2002, 2010), involving a combined analysis of previously recorded archaeological sites, oral histories, ethnographic accounts, archaeological survey and targeted archaeological excavation. The project study area extended along the coastline from Broken Bay in the north to the Royal National Park in the south, and west to the base of the Blue Mountains escarpment, and encompassed over 5000 identified Aboriginal archaeological sites (Attenbrow 1994, 2002, 2010).

The project revealed distinct patterning in the type and distribution of Aboriginal archaeological sites according to different landscapes, environments and resources in the catchment area, with an apparent occupational emphasis on coastal and estuarine environments. Of the hundreds of sites identified within coastal and estuarine zones, shell midden deposits were by far the most common, occurring along Middle Harbour, Lane Cove River, Vineyard Creek and Parramatta River / Sydney Harbour, from the river mouths to the inland extent of the estuarine reach. The second most prevalent site type was engraved rock art, followed by a small number of pigment (painted) art sites, stone artefact deposits, grinding grooves, and human burials. Dates were obtained from some of the estuarine sites, indicating occupation from the mid to late Holocene, about 4500 to 5000 years BP, onwards (Attenbrow 1991, 2002, 2010), i.e. when the sea level along the coast of south-eastern Australia had been within 1 to 1.5 metres of present levels for about 3000 years (Lewis et al 2013) and the estuarine environment would likely have been similar to what it is today.

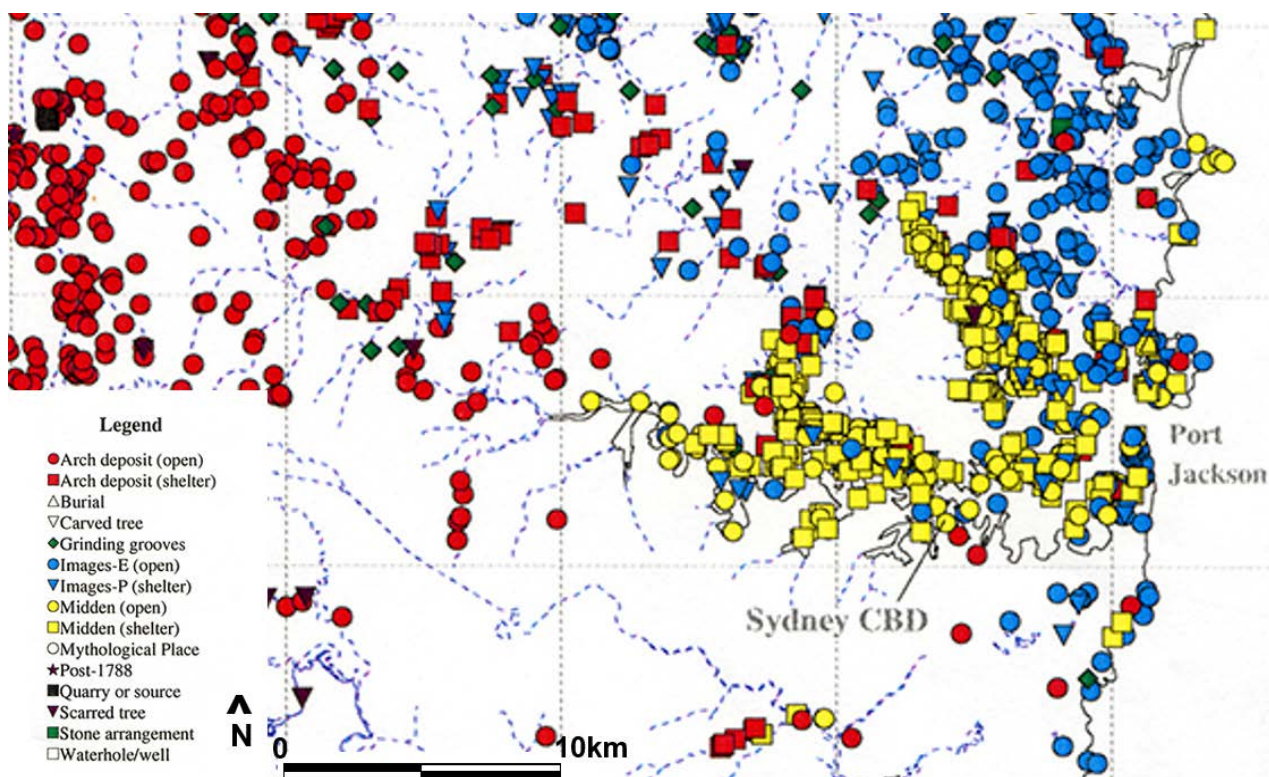


Figure 5: Distribution of identified Aboriginal archaeological sites in the Port Jackson catchment, centred on the coastal and estuarine zones (from Attenbrow, Baker & Martin, AMBS 2002)

Examination of the locational patterning of Aboriginal archaeological sites revealed that over 50 per cent of middens were situated in the immediate foreshore zone within 10 metres of the high tide mark, 15 per cent occurred on the edge of the foreshore zone and adjacent lower slopes, 25 per cent were situated on ridge-sides and the remainder (less than 10 per cent) were identified on upper slopes and ridge tops. Over 61 per cent of all middens occurred within rock shelters, with the remainder identified on a variety of open sandstone ledges and platforms. Rock engravings were found to occur primarily on open horizontal sandstone platforms, and occasionally on vertical sandstone faces or inside rock shelters, whilst pigment art was observed only in rock shelters – possibly due to the fact that pigment art is most likely to survive in weather-protected environments. Grinding grooves most commonly occurred on sandstone outcrops,

ledges and platforms directly adjacent to a water source, and human burials were primarily found in coastal shell middens and inside rock shelters (Attenbrow 1994, 2002, 2010).

Analysis of excavated midden deposits indicated that Aboriginal populations around Port Jackson subsisted on marine, estuarine and terrestrial resources. Documented middens were found to be dominated by shellfish (primarily Sydney rock oysters, hairy mussels, Sydney cockles and Hercules club mud whelks), and fish (most commonly snapper, bream, leatherjacket and wrasse), however, small numbers of shark, seal, turtle, crab and crayfish remains were also identified, as well as bird remains (including muttonbirds and little penguins). Midden contents were also shown to vary according to geographical context, with lower estuary middens containing higher amounts of fish remains and mid to upper estuary middens containing comparatively little fish and much more shell – likely reflecting the larger fish diversity and biomass available in the lower estuarine environments compared to the greater availability and accessibility of shellfish species in the mid to upper estuarine reaches (Attenbrow 2002, 2010). Finally, evidence in some middens of numerous small bones from juvenile fish indicated the use of mass retrieval methods, such as stationary fish traps or nets, although no physical evidence of surviving fish traps has yet been found in Port Jackson (Attenbrow & Steele 1995, Attenbrow 2002).

5.2 Pleistocene Aboriginal occupation in the Sydney Basin

Whilst the identified Aboriginal archaeological sites along the shores of Port Jackson appear to date to the mid to late Holocene only, Aboriginal populations are known to have occupied the greater Sydney Basin region for at least 36,000 years, well into the terminal Pleistocene glacial period and beyond the onset of the Last Glacial Maximum (LGM).

The earliest and most extensive evidence of Pleistocene Aboriginal occupation has been found in stone artefacts deposits within deep inland source-bordering sand dunes overlooking the Hawkesbury and Parramatta Rivers; notably the WBRP site, Windsor, dated to 27,000 years BP (Williams *et al* 2017), the RTA-G1 site, Parramatta, dated to 30,700 years BP (McDonald 2008), and the PT12 site, Pitt Town, dated to 36,000 years BP (Williams *et al* 2014). Several sites have yielded evidence of repeated occupation throughout the terminal Pleistocene, with PT12 in particular showing variable but uninterrupted occupation from 36,000 years BP until the early Holocene, with an actual increase in use at the onset and peak of the LGM (Williams *et al* 2014). Slightly older occupation dates have been obtained from artefacts found in Cranebrook Terrace gravels along the Nepean River (Nanson, Young & Stockton 1987). However, the stratigraphic association between these artefacts and dated sediments has since come under question, and these early dates remain disputed.

These sites identified within the Hawkesbury and Parramatta sand sheets provide strong indication of permanent regional Aboriginal populations within south-eastern Australia throughout the terminal Pleistocene. Occupation appears to have been largely confined to the major river corridors, with a focus on local resources and raw materials. The fact that the areas remained occupied, with use actually intensifying during the LGM, indicates that landscapes along the major rivers in the Sydney Basin served as refugia during this intensely cool and arid glacial period (Williams *et al* 2012, Williams *et al* 2014).

Whilst the Hawkesbury and Parramatta sand bodies have yielded the earliest occupation dates in the Sydney Basin, evidence of terminal Pleistocene Aboriginal occupation has also been found in the Kings Tableland rock shelter in the Blue Mountains, with cultural deposits dated to 22,000 years BP (Stockton & Holland 1974), a rock shelter at Burrill Lake, with deposits dated to 20,000 years BP (Lampert 1971) and an estuarine coastal midden site at Bass Point, Shell Cove, dated to 17,000 years BP (Bowdler 1970).

Ultimately, it is considered quite likely that Aboriginal populations occupied the Port Jackson catchment area throughout the terminal Pleistocene and the early Holocene utilising the sandstone escarpment landscape and freshwater resources of the ancient waterways prior to and during the arid LGM, and utilising the gradually emerging estuarine environment and associated food resources following the Holocene flooding of the embayment from around 10,000 years BP onwards. As the sea level along the south-eastern coast of Australia began to rise from about 18,000 years BP, reaching a highstand of 1 to 1.5 metres above current levels around 7700 to 7400 years BP, any physical evidence of terminal Pleistocene and early Holocene Aboriginal occupation along the valley floors and lower slopes of the Port Jackson embayment would have been progressively submerged.

5.3 Potential survival of submerged Aboriginal archaeological sites

Since the 1970s, thousands of submerged archaeological sites covering a timescale of up to 40,000 years BP have been identified and documented around the world; particularly throughout the North Sea region in Denmark, Netherlands, Germany, France and Great Britain, the Adriatic Sea and Anatolian Peninsula and the North Atlantic in Canada and North America. A wide body of archaeological research has subsequently developed regarding the potential for evidence of human occupation to occur in submerged environments and the factors that affect archaeological site survival during transgressive sea level changes (see Allen and Gardiner 2001, Bailey and Flemming 2008, Benjamin *et al* 2011, Fischer 2004, Koppel 2003, Masters 1983, Muche 1978, Stewart 1999 and Stright 1990).

Within an Australian context, archaeological investigation of submerged Aboriginal archaeological sites is largely theoretical as substantial conclusive physical evidence is yet to be found. Nonetheless, detailed studies have been carried out involving the adaptation of international studies and predictive models to Australian landscapes, environmental conditions and identified patterns of prehistoric Aboriginal land use and occupation. The most comprehensive and relevant investigation with regard to the current project is that conducted by Nutley (2006). Building on an adaptation of global archaeological and geomorphological research, combined with physical examinations of currently observable impacts of inundation on Holocene Aboriginal archaeological sites in Sydney Harbour, Nutley (2006) devised a predictive model regarding the potential for various Aboriginal archaeological site types to survive during periodic or permanent immersion in coastal, riverine and lacustrine Australian environments.

Nutley (2006) determined that estuarine systems formed from mature river systems, like Port Jackson, with low-energy backwaters, mudflats, swampland or marsh environments, are potentially capable of trapping and protecting cultural materials in increasing layers of sedimentation. Whilst contextual disturbance is likely to occur, artefacts that settle into such an anaerobic environment can avoid substantial damage. Archaeological sites that survive initial stages of inundation are likely to be subsequently buried and sealed in a gradual accumulation of overlying post-glacial marine and/or fluvial sediments. Ultimately, Nutley (2006) concluded that it is highly likely that a variety of Aboriginal occupation sites and artefacts have survived inundation in certain hydrodynamic and geological settings.

5.4 Predictive Model

Based on a consideration of the physical environment, both Holocene and Pleistocene, documented Aboriginal archaeological site types and land use patterning in Port Jackson and comparable Hawkesbury Sandstone landscapes, and the inundation survival determinants devised by Nutley (2006), the following broad predictive model of submerged Aboriginal archaeological potential for the study areas is provided:

Aboriginal archaeological site types that could occur in the Hawkesbury Sandstone landscape	Potential of survival following inundation (based on survival determinants outlined in Nutley 2006)
<p>Rock shelters in Hawkesbury Sandstone containing cultural evidence and deposits</p> <p>Rock shelters form through cavernous weathering and/or rock fall, and can occur in cliff faces, isolated outcrops and large fallen boulders. The size and configuration can vary greatly, however, various studies in Sydney Basin have shown that habitation shelters have a floor space of at least 2 m by 1 m and are at least 1.2 m in height (Attenbrow 2006).</p> <p>Cultural evidence inside a rock shelter could consist of midden deposits, stone artefact deposits, engraved art, pigment art, grinding grooves and human burials.</p>	<p>Rock shelters would be moderately resistant to the processes of inundation due to their bulk. Engraved art and grinding grooves within shelters may survive in hard sandstone settings, but are unlikely to survive long on soft sandstone as water movement gradually wears and abrades the rock surface. Pigment art is likely to be vulnerable to colonising marine organisms and chemical attack. Sandstone that absorbs pigment may retain that stain but may equally be susceptible to absorbing additional masking colouration from waterborne minerals. However, pigment art is known to have survived within air pockets in extensive inundated cave systems (such as Cosquer Cave, France).</p> <p>Cultural deposits may survive inside a rock shelter if the original depth of sediment and/or cultural deposit is considerable, or if the deposit is located in recessed floors, within fissures or under trapped boulders. Yet even in such conditions, survival is only likely during relatively rapid inundation in a low-energy environment.</p> <p>Stone artefacts are highly resistant to inundation due to their intrinsic hardness, however, may be vulnerable to abrasion and obscuring of diagnostic features in situations of slow inundation in a high-energy environment. Organic material, faunal remains (shell and bone), and human burials, however, are highly vulnerable to the processes of inundation. They may survive rapid inundation in a low-energy environment, or in situations where sites were already buried in consolidated sediments or peat prior to being submerged. All such sites, however, may also be subject to biological degradation <i>in situ</i>.</p>
<p>Engraved art and grinding grooves on exposed Hawkesbury Sandstone platforms, ledges and faces</p> <p>Exposed engraved art in Hawkesbury Sandstone landscapes usually occurs on smooth flat surfaces and occasionally vertical faces. Grinding grooves resulting from cultural activities, such as sharpening axes/hatchets or processing plant materials generally occur in close proximity to a water source (Attenbrow 2010).</p>	<p>As with engraved art and grinding grooves inside rock shelters, exposed engravings and grooves may survive inundation in hard sandstone settings but are particularly unlikely to survive long on soft sandstone, as water movement gradually wears and abrades the rock surface.</p>

Aboriginal archaeological site types that could occur in the Hawkesbury Sandstone landscape	Potential of survival following inundation (based on survival determinants outlined in Nutley 2006)
<p>Open archaeological deposits, including middens and stone artefact deposits</p> <p>Midden deposits and/or stone artefact deposits in Hawkesbury Sandstone landscapes can occur on exposed sandstone surfaces and platforms, alluvial or colluvial terraces adjacent to water sources, on lower slopes, ridge sides and ridge tops (Attenbrow 2010).</p>	<p>Archaeological deposits on exposed surfaces are vulnerable to disturbance and dispersal through the processes of wave and current action during inundation. Former topsoil layers containing such deposits may be removed altogether, especially in high-energy environments. However, archaeological deposits may survive rapid, low-energy inundation, particularly if cultural materials were already buried at the time of submersion.</p> <p>As above, stone artefacts are highly resistant to inundation, though may be vulnerable to abrasion in cases of slow inundation in a high-energy environment. Organic materials and faunal remains, however, are highly vulnerable to potential physical damage and biological degradation as a result of inundation, unless buried within an anaerobic environment prior to being submerged.</p>
<p>Fish traps</p> <p>Fish traps are generally comprised of low stone arrangements or organic/reed fencing and occur on shallow, wide and gently sloping rock platforms, particularly in closed estuarine and bay settings and the tidal mouths of creeks and streams.</p>	<p>Fish traps constructed with organic materials are highly vulnerable to the processes of inundation, including physical damage, dispersal of elements and biological degradation. However, such structures may survive rapid, low-energy inundation, especially if they were buried in consolidated sediments or peat prior to being submerged.</p> <p>Fish traps constructed from stone are less vulnerable to the processes of inundation due to their intrinsic hardness and are likely to survive relatively intact, except within a high-energy inundation environment.</p>

6 AREA A – NORTHBRIDGE TO SEAFORTH BLUFF, MIDDLE HARBOUR

6.1 Physical setting

Area A is characterised by a narrowing stretch of Middle Harbour, about 500 metres wide, between the Hawkesbury sandstone headlands of Seaforth Bluff to the north-east and Northbridge to the south-west. The foreshore on both headlands comprises exposed Hawkesbury sandstone, sloping quite steeply down to the water's edge, although minor levels of private reclamation have also occurred along the rocky foreshore of Seaforth Bluff.

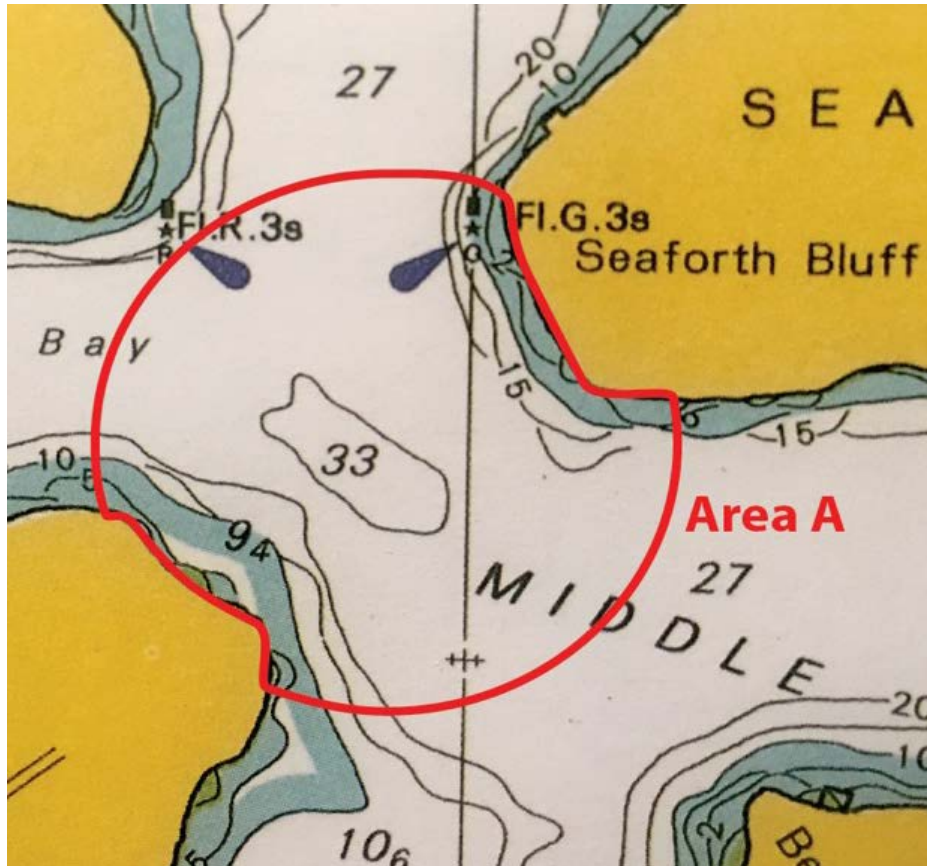


Figure 6 Portion of nautical chart showing Area A. Depths are in metres (Commonwealth of Australia / Crawford House Publishing, 1995, *Crawford's Mariners Atlas – Port Stephens to Jervis Bay (complete compendium of Royal Australian Navy Charts)*. Crawford Publishing House, Bathurst, NSW : Chart 15)

Bathymetric data shows that the bed of the harbour continues to slope downwards from both shorelines at a gradient similar to which is observed above water. At depths of around 10 metres below Lowest Astronomical Tide, about 60 metres from shore, the gradient becomes gentler, gradually levelling out to a depth of 31 metres below Australian Height Datum midway between the headlands (Figure 7). Based on this information, it may be expected that the steep bed of the harbour close to the shorelines on both headlands consists of exposed sandstone bedrock similar to that along the foreshore, gradually sloping down and becoming buried by marine sediments towards the centre of Middle Harbour.

The side scan sonar data obtained for this project showed several sandstone rock outcrops protruding from the steep bed of the harbour close to the shorelines on both headlands; similar to what can be seen above water (Figure 8). The most prominent is a near continuous sandstone rock ledge about 70 to 80 metres from the Seaforth Bluff shoreline. It is about 20 metres deep and runs parallel to the shoreline. The other less pronounced and continuous rock outcrop is within 25 metres of the Clive Park shoreline and is in less than 10 metres of water. A number of the smaller sandstone protrusions appear to be isolated boulders which have tumbled down the hillside into the water, though the apparent higher frequency of boulders on the Seaforth side could be a by-product of the building activity that has taken place on the slopes above. With depth, these rock outcrops have become gradually buried by eroded silty sand and naturally deposited shell, and the bed of the harbour becomes siltier as the gradient decreases and begins to level out. At the lowest point, midway between Northbridge and Seaforth, the bed of the harbour is composed of silty clay with shell and fibrous plant matter (Douglas Partners & Golders Associates, 2017).

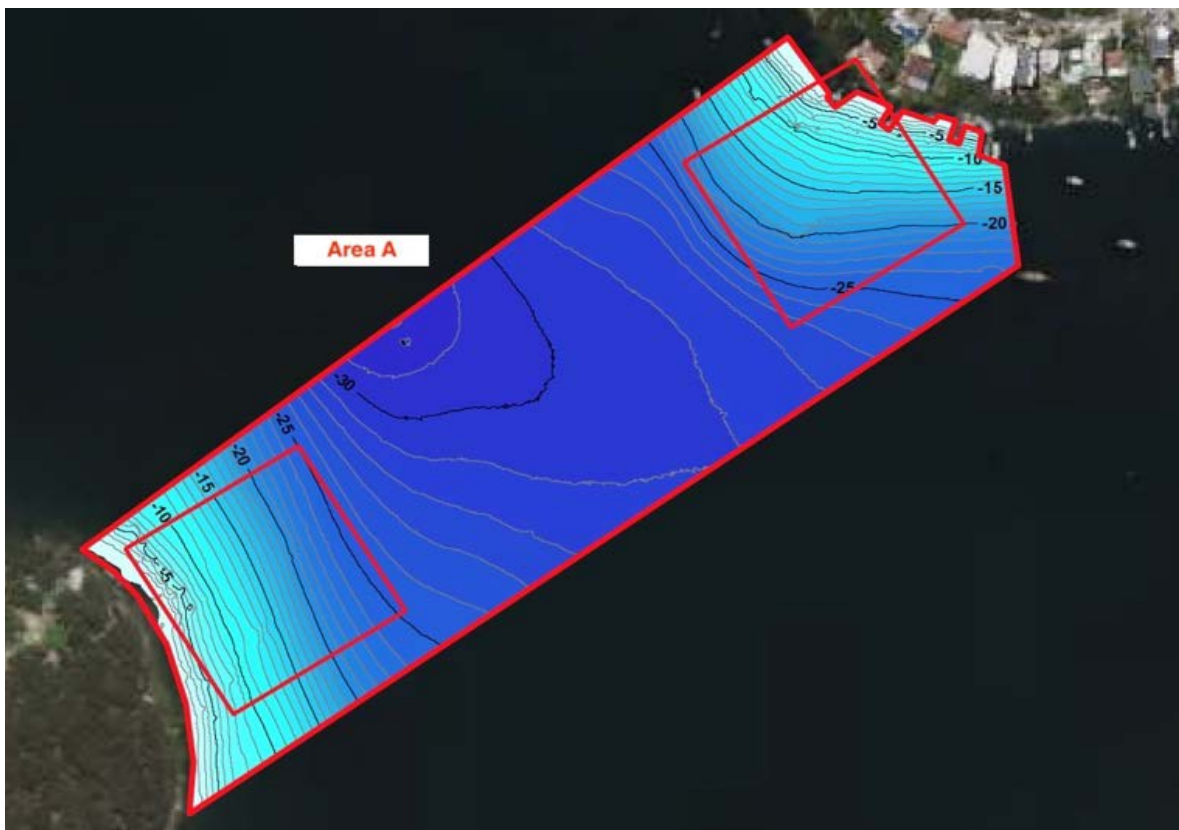


Figure 7: Bathymetric contour plan within Area A between Clive Park at Northbridge and Seaforth Bluff at Seaforth, Middle Harbour. The red boxes show the area of interest around the proposed cofferdams. Depths are in metres AHD (Earth Technology Solution Pty Ltd, July 2017a: Figure MH2)

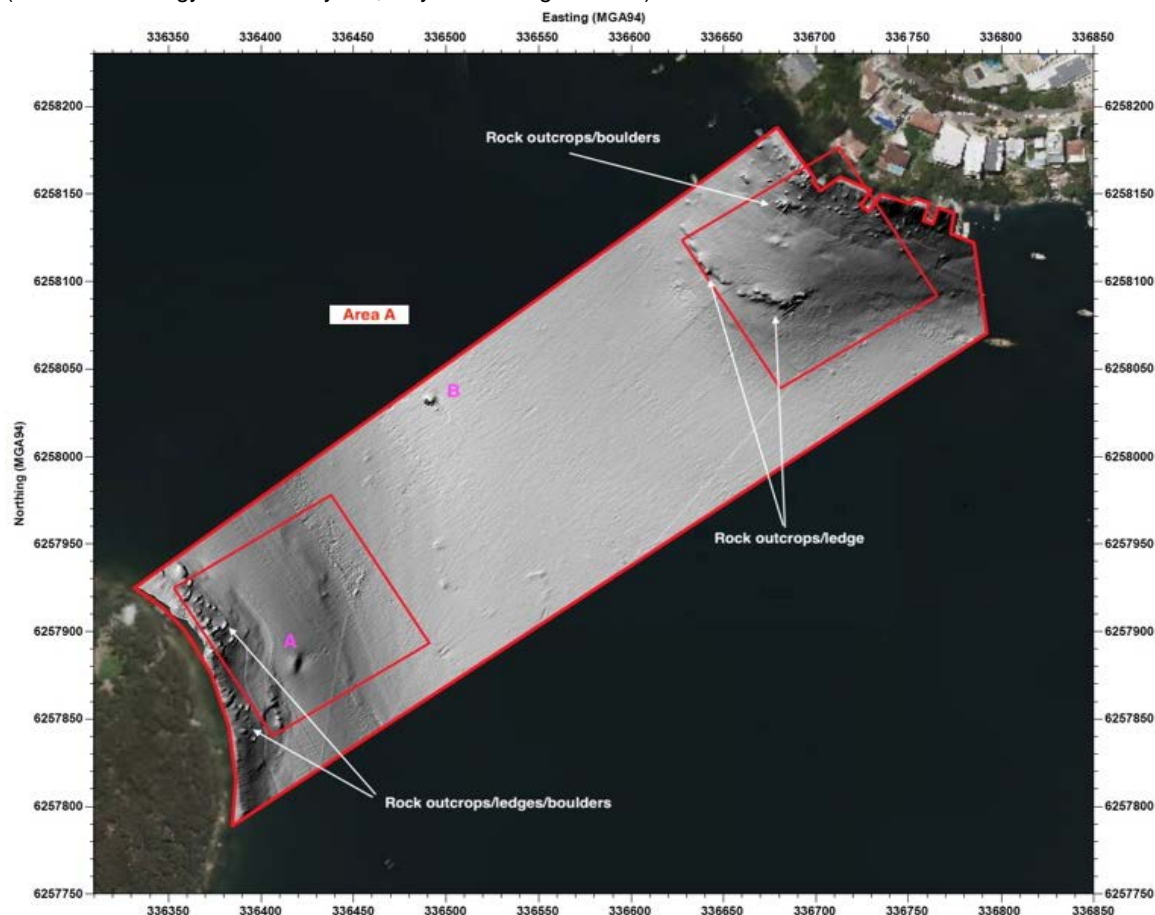


Figure 8: Bed of the harbour features within Area A showing rock ledges, outcrops and boulders. (Earth Technology Solution Pty Ltd, July 2017a: Figure MH2A). Feature A is a shipwreck and Feature B is an anthropogenic anomaly. The red boxes show the area of interest around the proposed cofferdams.

Seismic profiling carried out for this project shows the sandstone bedrock continuing to slope downwards towards a steep-sided channel running through the centre of this stretch of Middle Harbour – representing the ancient course of Lane Cove River as it was prior to the rise in sea level that occurred during the post-glacial marine transgression around 12,000 to 7,000 years ago (Figure 9 and Figure 10). During the glacial period of the late Pleistocene, this watercourse would have been a smaller, freshwater river running through a steep-sided sandstone valley. The climate and vegetation would also have been substantially different from the current landscape, likely resembling the Blue Mountains region of today.

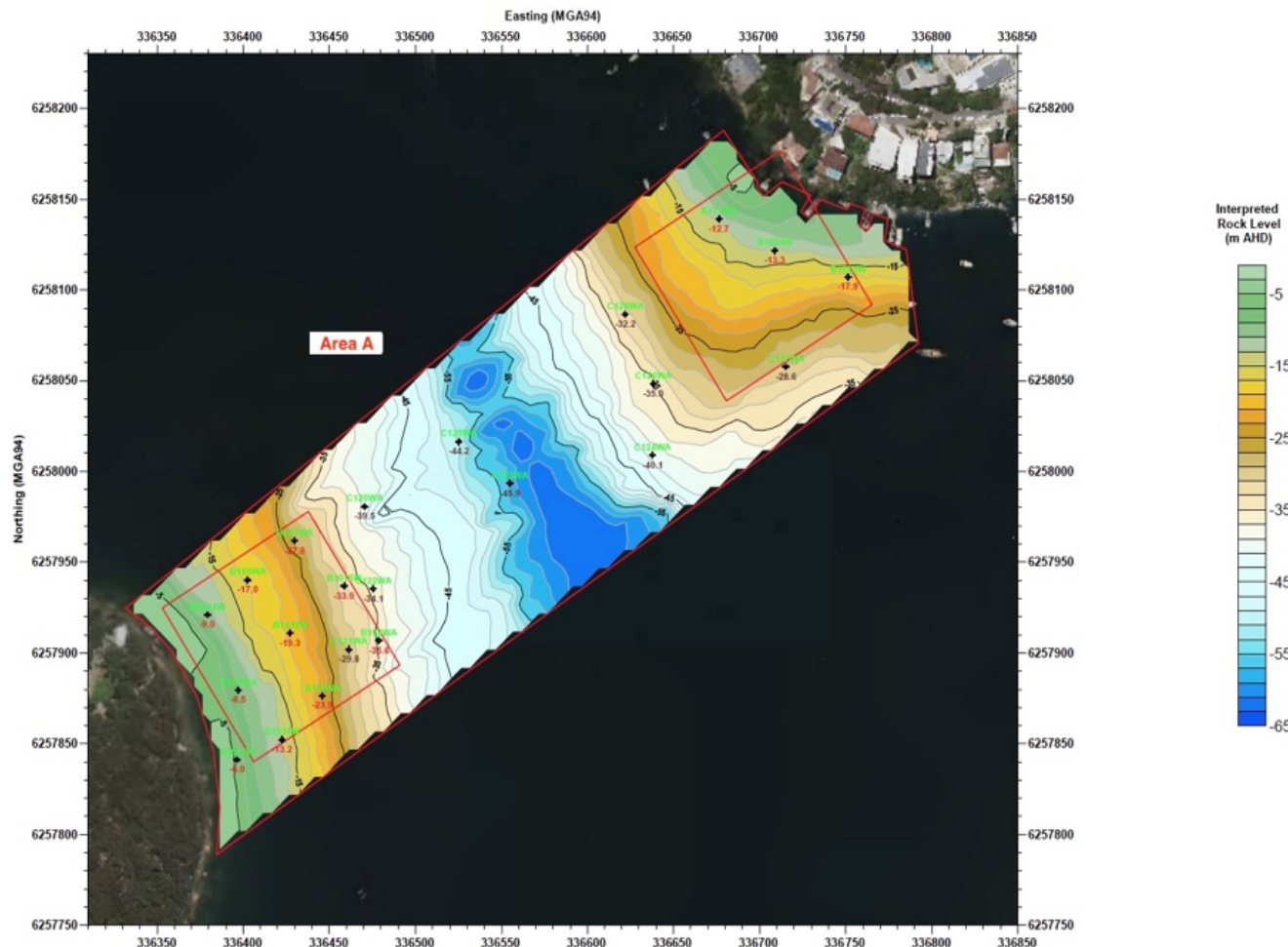


Figure 9: Interpreted rock level contour plan for Area A. (Earth Technology Solution Pty Ltd, July 2017a: Figure MH7). The red boxes show the area of interest around the proposed cofferdams.

A combination of the seismic profiling and borehole data acquired for this project further indicates that marine and estuarine sediments are up to 34 metres thick within the ancient river (Figure 10). The profile also shows what appears to be the distinction between coarser late Pleistocene alluvial deposits at the base of the valley and finer marine and estuarine sediments that have accumulated as the sea level rose. Item B120WA – located near the deepest part of Area A – broadly conforms with the seismic profiling as the stratigraphy shows 18 metres depth of estuarine sediments composed of clay, silty clay and sand strata which overlay estuarine/alluvium deposits – about seven metres thick – composed of gravels, sand, silty sand and peat (Douglas Parnters & Golder Associates, 2017).

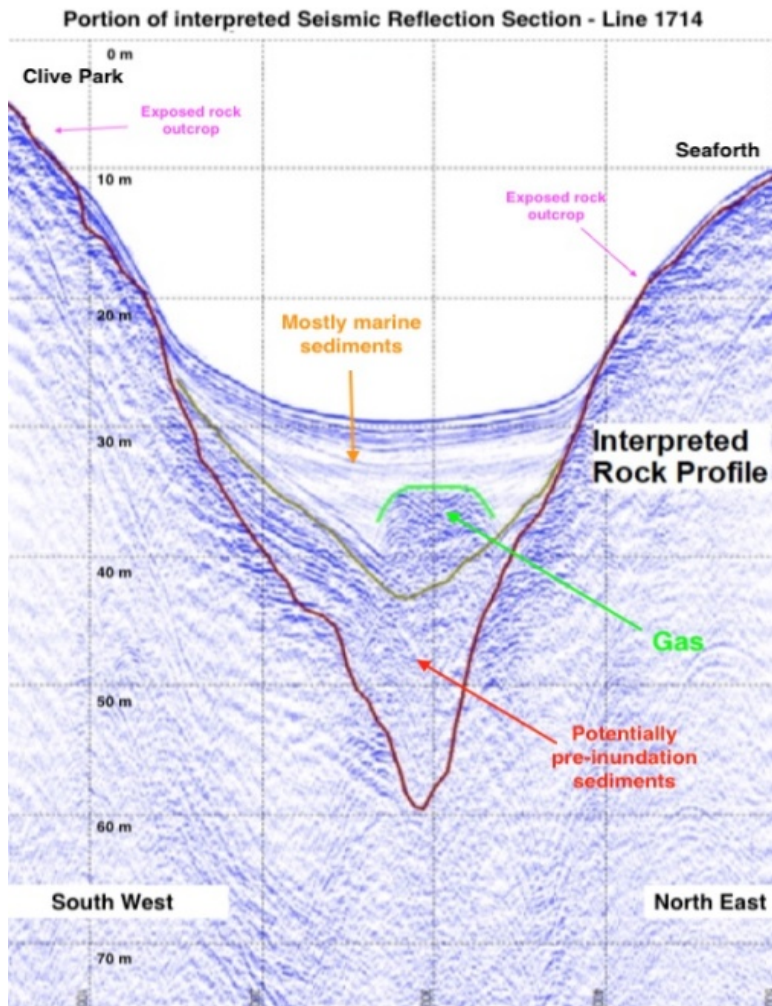


Figure 10: Seismic reflection profiles – Line 1714 (Earth Technology Solution, 2017a). The pink arrows point to locations on the profile where there is little or no sediment overlaying the sandstone bedrock and this corresponds to the areas where rock outcrops and ledges are protruding from the bed of the harbour (see Figure 8 and Figure 12). Interpretation of the sediments on the figure provided by authors of this report by correlating borehole data..

The rise in sea level that occurred during the post-glacial marine transgression (about 12,000 to 7000 years BP), gradually drowned Middle Harbour Creek and inundated the lower-middle slopes of the ancient river valley. The identification of potential gas deposits in the seismic profile (see Figure 10) is most likely emissions arising from relatively high concentration of organic matter within the pre-inundation sediments. This suggests that the flooding of the ancient river valley in the early Holocene may not have been erosive in regard to existing valley floor sediments and associated vegetation; possibly the opposite.

6.2 Known Aboriginal archaeological sites near Area A

Numerous Aboriginal archaeological sites have been identified on the Hawkesbury Sandstone headlands of Seaforth Bluff and Northbridge. This indicates that the varied ecological communities along the foreshore, immediate hinterland areas and the estuarine environment of Middle Harbour, combined with the sandstone rock outcrops, platforms and shelters, made these headlands important resources for Holocene Aboriginal populations. Investigations in the relatively undisturbed bushland areas of Clive Park in particular have revealed a rich diversity of Aboriginal archaeological sites, including shell middens, rock engravings on open ledges and platforms, rock shelters with occupation deposits, art (both engravings and pigment art), and human burials.

Two searches of the NSW Office of Environment and Heritage (now known as the Department of Premier and Cabinet (Heritage) Aboriginal Heritage Information Management Systems (AHIMS) register have been carried out as part of the broader HarbourLink Project – the first conducted by Artefact Heritage Services in 2016 (Artefact Heritage Services, 2016) and the second conducted in May 2017 by Jacobs Group (Australia) Pty Ltd. Jacobs Group (Australia) Pty Ltd also identified some

additional Aboriginal archaeological sites within the broader project area via Aboriginal archaeological survey and test excavation (Jacobs, 2018).

An examination of the two AHIMS searches and the recent findings by Jacobs Group (Australia) Pty Ltd identified six known Aboriginal archaeological sites along the foreshore near Area A, that are considered relevant to this study for predictive modelling purposes. These six sites comprise four rock shelters with cultural features and deposits, one rock engraving on an open rock ledge; and one open shell midden. All are situated within the exposed Hawkesbury sandstone landscape along the Clive Park foreshore (Table 1 and Figure 11).

Table 1: Known Terrestrial Aboriginal archaeological sites close to Area A.

Site Id. No.	Site name	Site type	Environment
45-6-0645	Northbridge, Mowbray Point	Art – rock engraving	Exposed Hawkesbury sandstone landscape along Clive Park foreshore.
45-6-0654	Clive Park 1, Northbridge	Rock shelter with art, shell midden and human burial	Exposed Hawkesbury sandstone landscape along Clive Park foreshore.
45-6-0996	Clive Park 2, Northbridge, Cicada Pupa Cave	Rock shelter with art, shell midden and human burial	Exposed Hawkesbury sandstone landscape along Clive Park foreshore.
45-6-2222	Clive Park 4, Northbridge	Rock shelter with shell midden	Exposed Hawkesbury sandstone landscape along foreshore.
45-6-3011	Clive Park Midden WILL 169	Shell midden	Exposed Hawkesbury sandstone landscape along Clive Park foreshore.
45-6-3012	Clive Park 8, Shelter Midden WILL 170	Rock shelter with shell midden	Exposed Hawkesbury sandstone landscape along Clive Park foreshore.

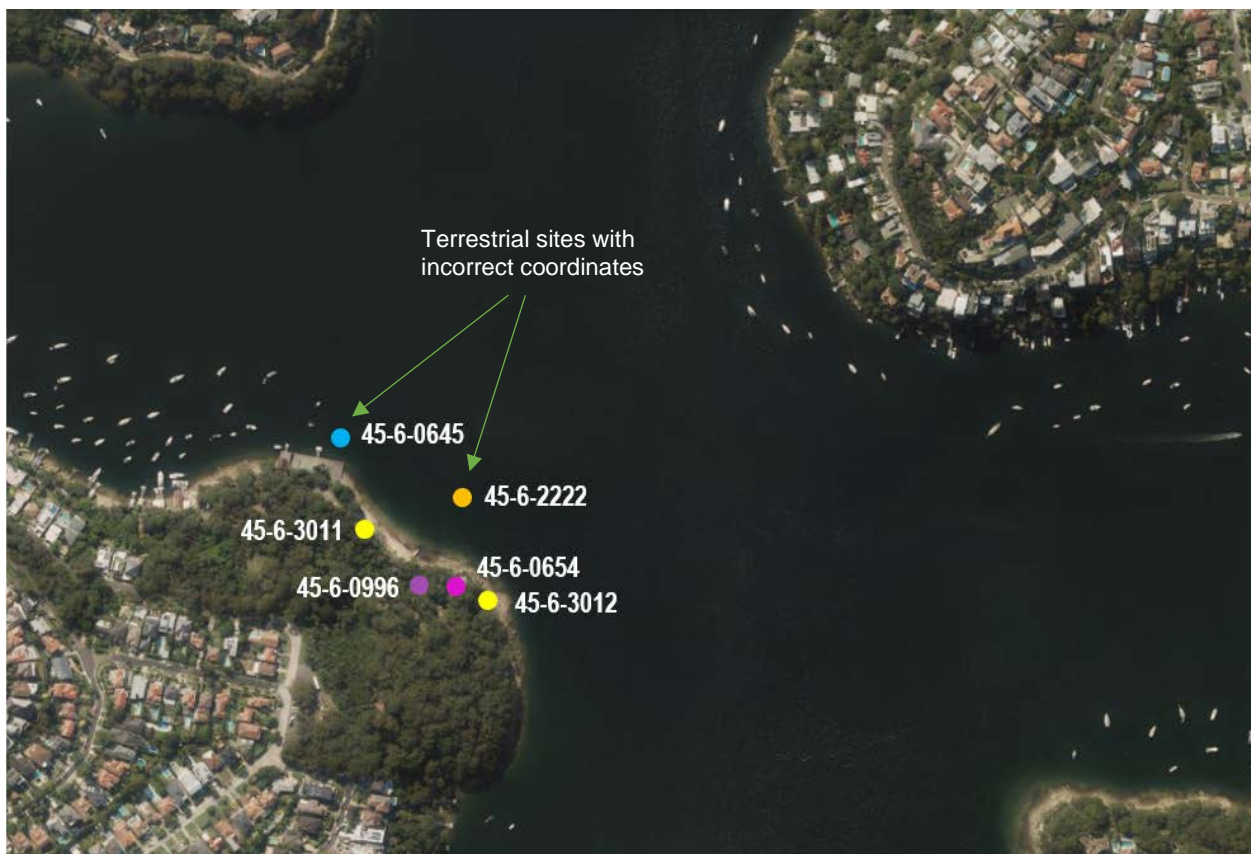


Figure 11: Location of registered Aboriginal archaeological sites close to Area A. Note that sites 45-6-0645 and 45-6-2222 are terrestrial sites with incorrect mapping coordinates – these sites are not submerged sites.

It should be noted that the provided co-ordinates of two sites, including a rock engraving and a rock shelter with midden deposit, (45-6-0645 and 45-6-2222), place them incorrectly between 20–60 metres north and north-east of the Clive Park foreshore – thus indicating that the data records for these two locations are not accurate. These two sites are not identified on the AHIMS register as submerged archaeological sites, and both appear to be terrestrial foreshore sites. No submerged Aboriginal archaeological sites have previously been identified in or near Area A.

6.3 Potential submerged Aboriginal archaeological sites in Area A

Based on archaeological evidence of late Pleistocene and Holocene Aboriginal land use patterns in the Greater Sydney Region, the most likely Aboriginal archaeological site types that could occur in the Port Jackson region include:

- rock shelters with occupation evidence and deposits (such as middens, stone artefacts, human burials)
- art and grinding groves on sandstone ledges and vertical faces
- archaeological deposits, such as middens and / or stone artefact scatters, on sandstone platforms and elevated areas
- fish traps on shallow, wide and gently sloping sandstone platforms.

The question of whether such sites would have survived inundation, however, is another matter.

The potential for each of the above listed Aboriginal archaeological site types to survive as submerged sites within Area A is as follows:

Rock shelters

The side scan sonar data obtained for this project showed two distinct lines of rock outcrop protruding from the marine sediment (Figure 12). The most prominent is a near continuous sandstone rock ledge about 70 to 80 metres from the Seaforth Bluff shoreline. It is about 20 metres deep and runs parallel to the shoreline. The other less pronounced and continuous rock outcrop is within 25 metres of the Clive Park shoreline and is in less than 10 metres of water.

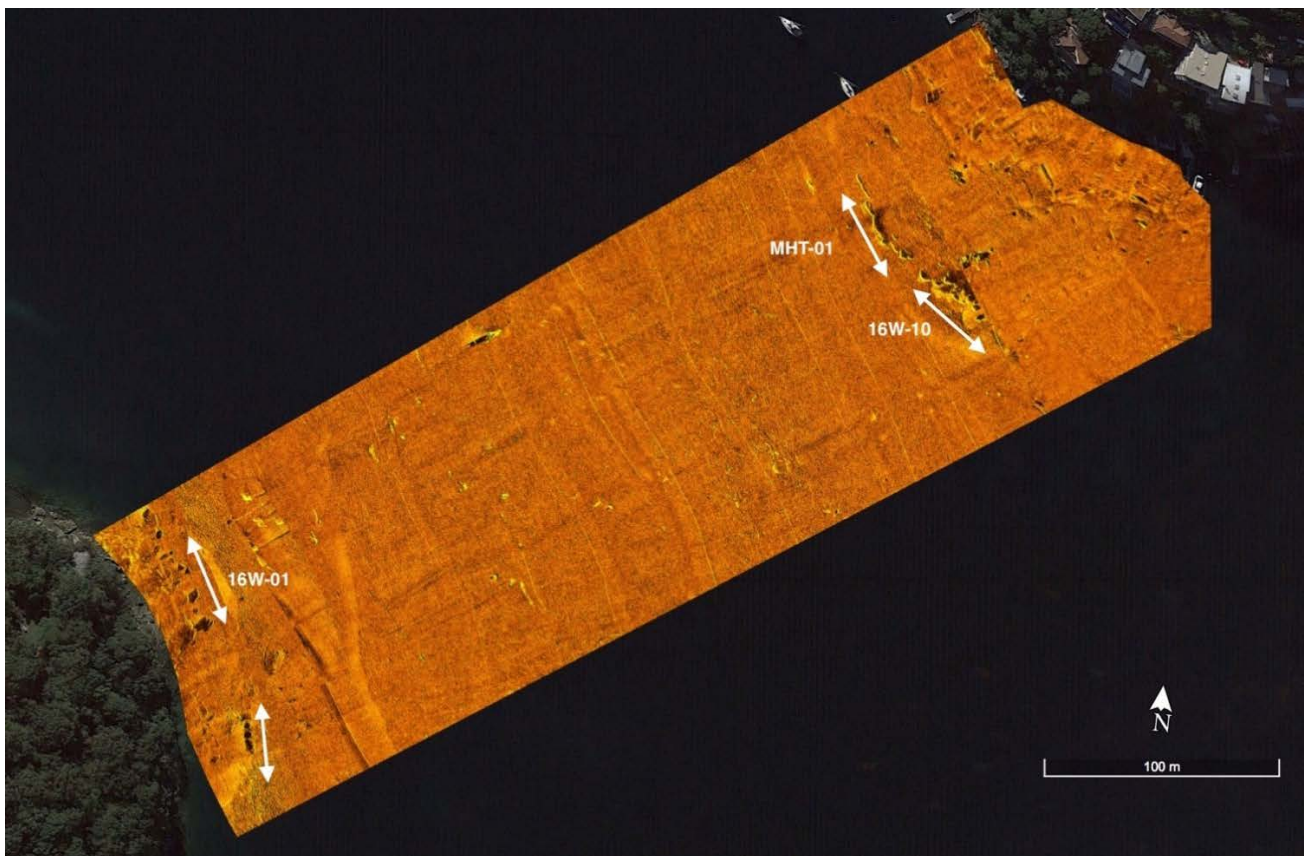


Figure 12: Side scan sonar image showing location of rock outcropping visible (blue arrows) above the marine sediments in Area A (Base image: Google Earth). Side scan sonar data provided as .shp file by Podnar, A. Geotechnical Engineer, Douglas Partners, 5 December 2017.

The nature of the Seaforth Bluff outcrop was investigated in the December 2017 diving inspection. Two locations were examined: MHT-01 where a 40 metre transect was run and 16W-10 where a 10 metre radius circular search was carried out. Further detail of these inspections can be found in the Cosmos Archaeology January 2018 report *Western Harbour Tunnel and Beaches Link: Maritime Archaeological Dive Inspections December 2017*.

The transect MHT-01 encountered a sandstone rock ledge protruding 1.3 metres from a silty bed of the harbour. An overhang was present with the roof 450 millimetres above the silt and extending back into the outcrop for distance of about 1.5 metres (Figure 13). Site 16W-10 was a large sandstone outcrop protruding from the silt up to three metres in height and extending for a distance of about 30 metres in a north-northwest direction. One small overhang was identified of about 300 millimetres high.

Site 16W-01 was identified as a rock ledge at a depth of about 4.5 metres which appeared to form the shape of an overhang. The clearance between the underside of the overhang and the marine sediments was about 250 millimetres and the void under the overhang extended inward for less than 500 millimetres (Figure 14).

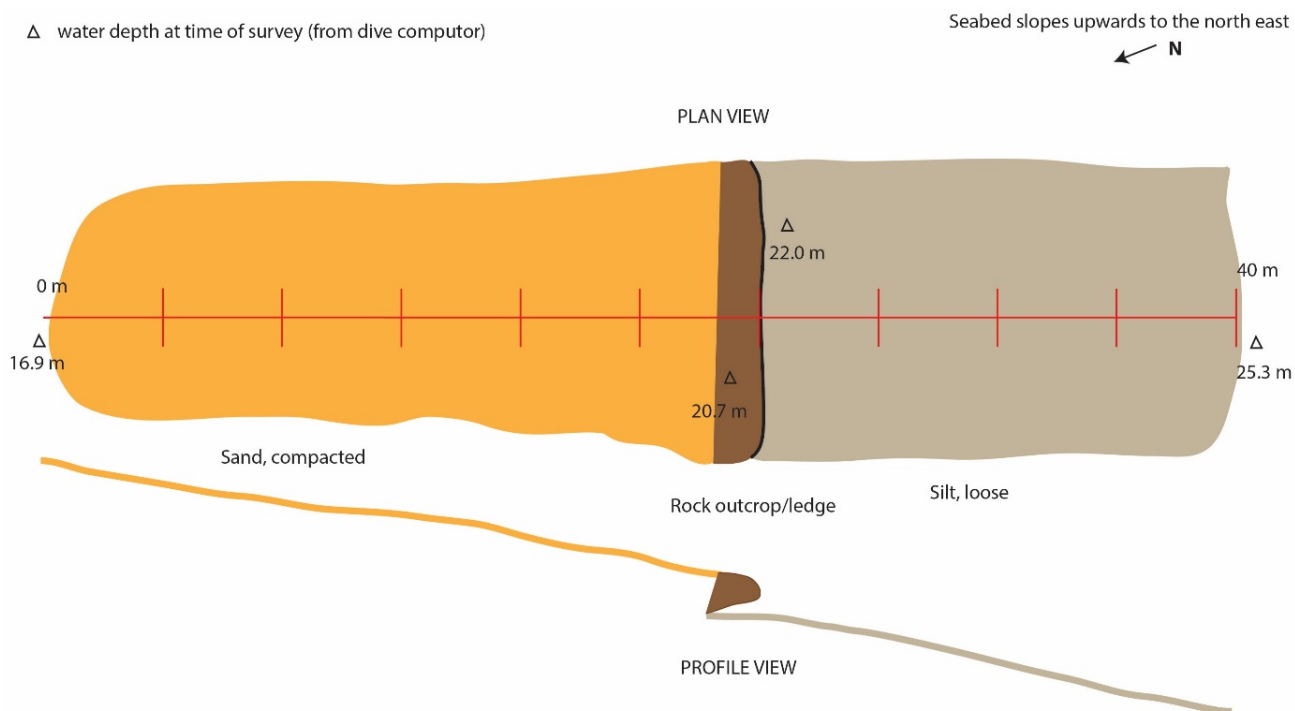


Figure 13: Plan and profile view of MHT-01 showing rock ledge and overhang



Figure 14: Sandstone outcrop observed at site 16W-10

There are potentially rock overhangs completely buried under marine sediments within Area A. The seismic refraction data available for this project does not have sufficient resolution to show voids within the bedrock at the interface with the marine sediments and there are noted difficulties using this technology to differentiate with certainty between geological units such as dense sediments and weathering rock (Earth Technology Solutions, 2017b).

Of the select survey lines that have been made available, some potential overhangs can possibly be discerned – shown in A and B in Figure 15 and Figure 16. Area A seems to correspond with the rock ledges and outcropping identified in Figure 12 in the vicinity of Site 16W-01.

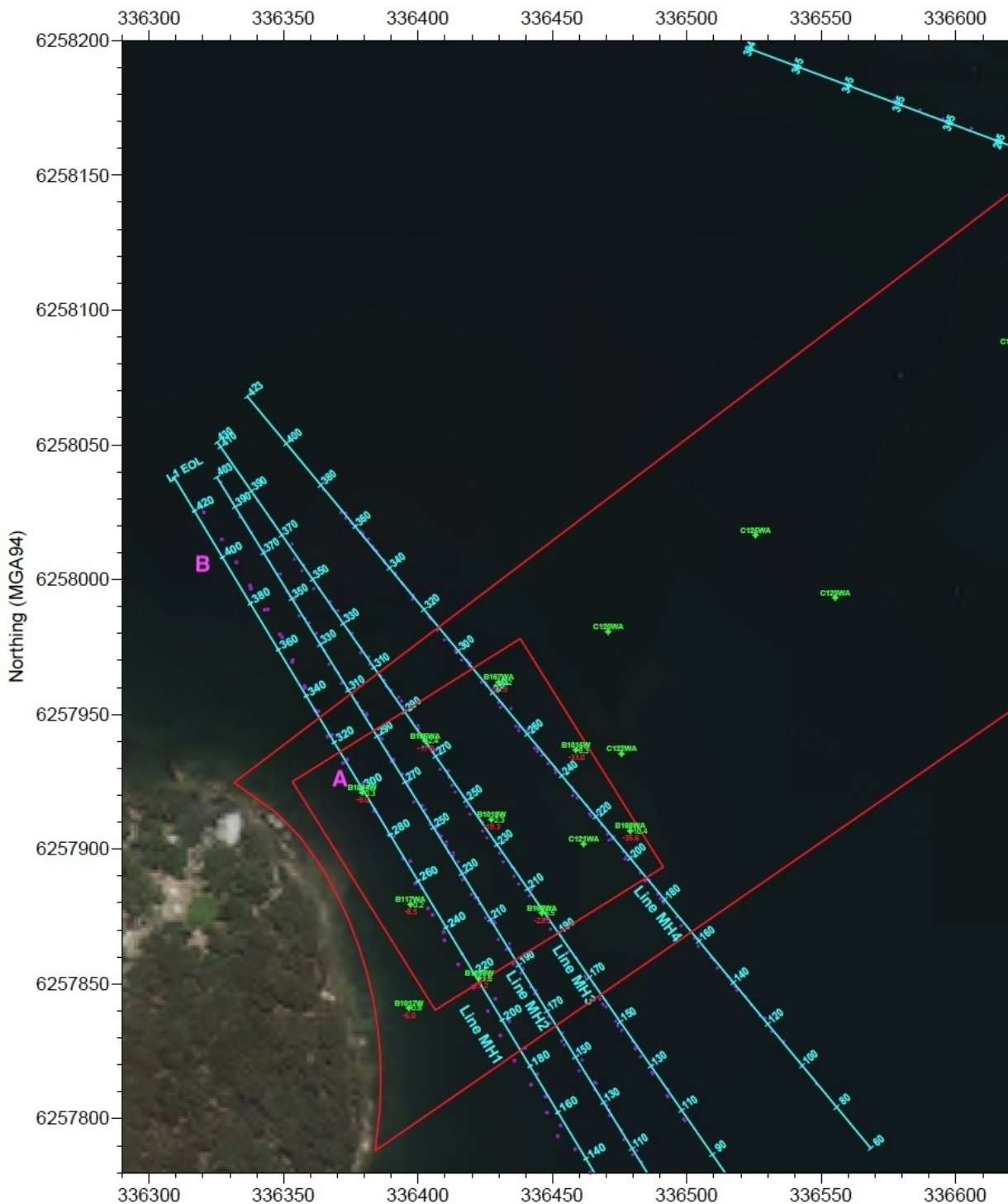


Figure 15: Seismic refraction lines off Clive Park (Earth Technology Solution, 2017b).

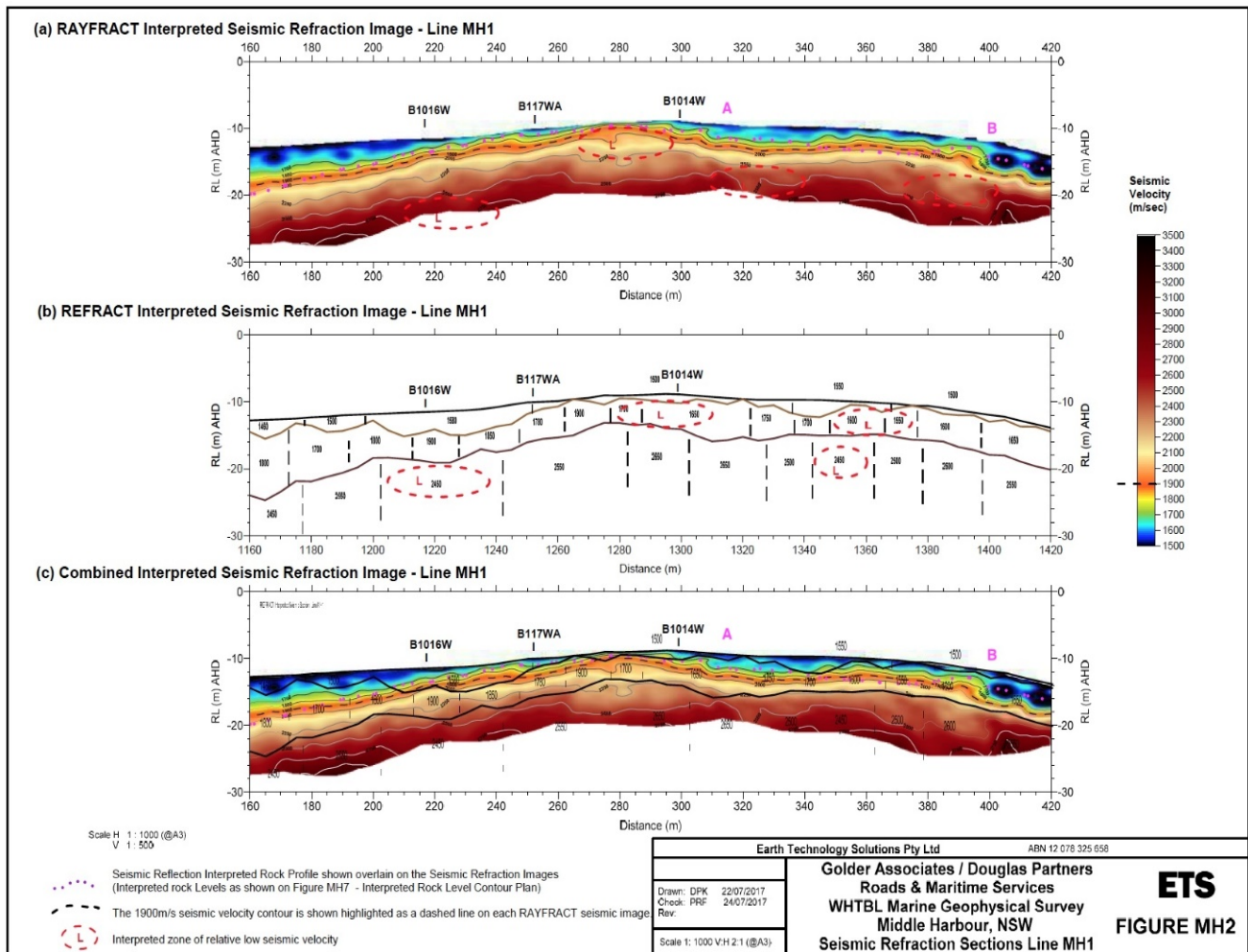


Figure 16: Seismic refraction sections line MH 1 (Earth Technology Solution, 2017b). This cross section – from the SE (left of image) to NW – taken close to Clive Park shows the varying density of bedrock (brown hues) overlain by marine sediments (blue to green hues)

At this stage of the assessment, and without further physical investigation, it is not possible to state with confidence whether the voids under the ‘overhangs’ observed in the dive inspections would be of sufficient dimensions to have served as rock shelters. However, the size and extent of the rock ledges in the areas inspected provide confidence that relatively larger voids would be more likely to exist in the vicinity of these locations than elsewhere in Area A. As such, there is a higher likelihood that overhangs were available for use as rock shelters in this vicinity.

Art and grinding grooves on sandstone ledges and faces

Rock engravings and grinding grooves may survive in hard sandstone settings but are unlikely to survive long on soft sandstone as water movement gradually wears and abrades the rock surface. It is possible that such engravings could have survived on the underside of the roof of a rock shelter.

Pigment rock art is likely to be vulnerable to colonising marine organisms and chemical attack. Sandstone that absorbs pigment may retain that stain but may equally be susceptible to absorbing additional masking colouration from waterborne minerals. Pigment rock art is known to have survived in extensive inundated cave systems within air pockets. There is a remote possibility of such sites being present within the study area.

Middens and / or stone artefact scatters on former open elevated areas

The borehole data collected for this project identified areas where residual soil matrices have survived under marine sediments. It is unclear whether the residual soils noted in the borehole testing are subsoils which would be largely sterile with respect to artefacts or also include ‘A’ horizon type soils – soils at or just below the original ground surface – where there is higher potential for the presence of artefacts. The locations within Area A where residual soils have been identified, are shown in Figure 17 and described in Table 2.

As can be seen in Table 2, the residual soil deposits are relatively thin and patchy as can be expected in a pre-inundation landscape which would have been a steep-sided valley of mostly exposed sandstone bedrock. The exception to this is borehole B166WA where the residual soil matrix is around 1.5 metres thick. The description of the matrix, however, appears to be consistent with decomposing bedrock or “B” horizon subsoils, which generally have a much lower frequency of artefacts in terrestrial Aboriginal archaeological sites compared to upper “A” horizon soils. As such these locales have been assessed as having Low archaeological potential.

Midden deposits could also be contained within these residual soils; however, organic material is much more vulnerable to the processes of inundation and biological degradation and has a lower likelihood of survival compared to stone artefacts.

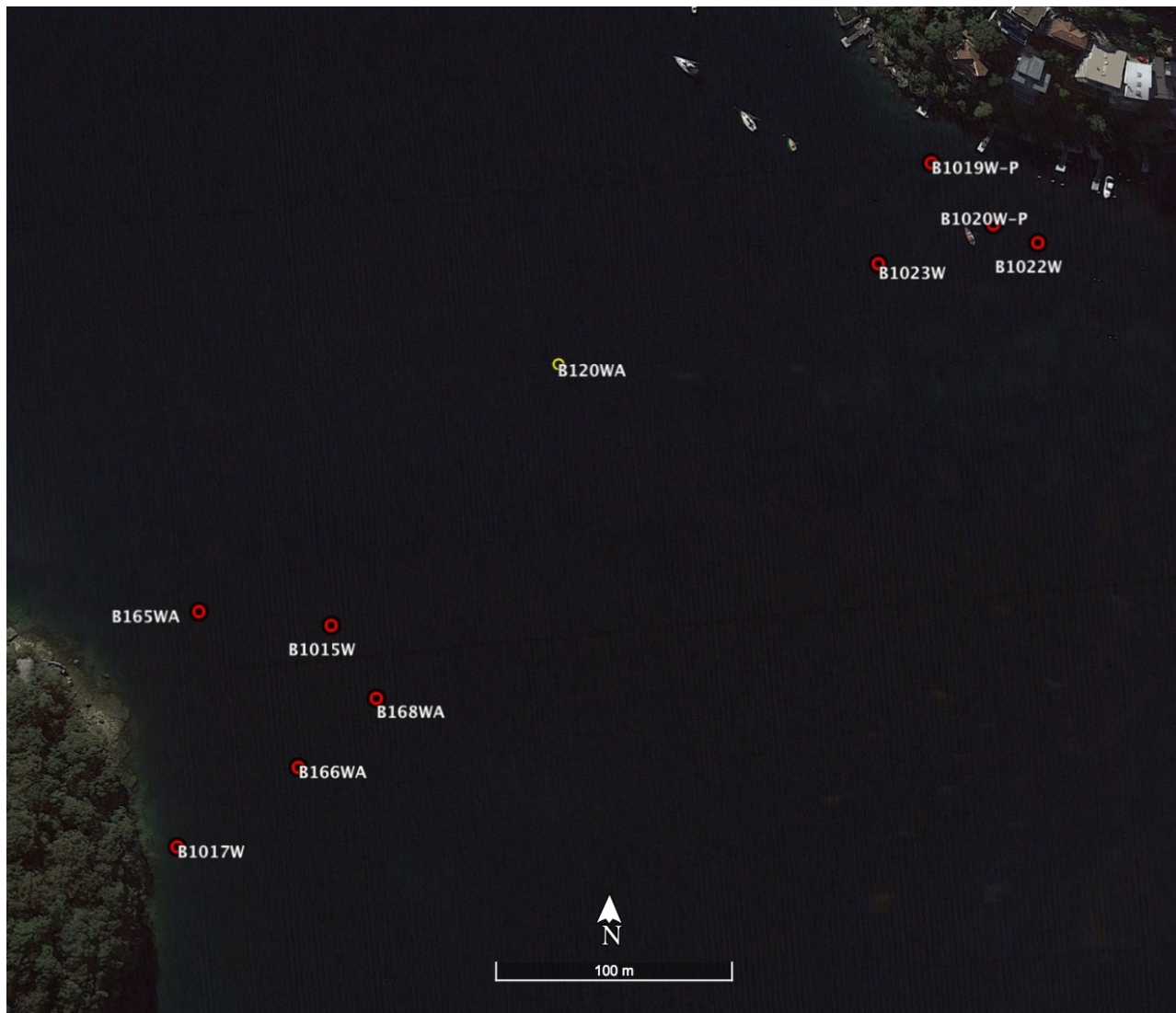


Figure 17: Location of boreholes in Area A where residual soils (red) and peat (yellow symbol) were identified. (Base image: Google Earth)

Table 2: Description of residual soils (in italics) with preceding stratum found in boreholes from Area A (Douglas Partners & Golder Associates, 2017).

Borehole	R.L. at top (m)	Thickness (m)	Description of residual soil
B1017W	-5.2	0.50	<i>SILTY SAND: grey, fine grained sand, with angular shell fragments to 5 mm diameter (interpreted as Marine Deposits)</i>
	- 5.7	0.01	<i>SILTY CLAY: Off white and grey, medium to high plasticity, with fine grained sand</i>

Borehole	R.L. at top (m)	Thickness (m)	Description of residual soil
B165WA	-14.6	2.20	SILTY SAND: grey, fine grained sand, poorly graded, with fine to coarse angular shell fragments to 5m diameter (interpreted as Marine Deposits).
	-15.8	0.15	CLAYEY SAND: Red brown, orange brown and brown, fine grained sand, trace fine to medium sub-rounded to angular iron-cemented sandstone and rounded quartz gravel.
B166WA	-18.5	4.00	SILTY SAND: grey, fine grained sand, with angular shell fragments between 1 to 10 mm diameter, trace clay (interpreted as Marine Deposits)
	-22.5	1.50	SILTY SAND: Off white and grey with dark grey bands, fine to medium grained sand (Possibly bedrock)
B168WA	-33.7	2.6	SILTY CLAYEY SAND: grey brown and brown, fine to medium grained sand, well graded (interpreted as Alluvium)
	-35.3	0.35	SANDY GRAVEL: Red-brown, dark grey and orange-brown, fine to coarse gravel, well graded, sub-rounded to sub-angular, quartz, sandstone and mudstone, fine to coarse grained sand, trace silt
B1015W	-31.2	1.5	CLAYEY SAND: grey brown, fine grained sand, poorly graded, trace gravel. Also grey with grey brown bands, with fine to medium angular sandstone gravel (interpreted as Alluvium)
	-32.7	0.26	CLAYEY SAND: Orange brown, white grey and red brown, fine grained sand, poorly graded, intermediate plasticity clay, with silt
B1023W	-19.8	0.90	SILTY SAND: Grey brown, fine to medium grained sand, poorly graded, with fine to medium, angular, low to medium strength sandstone gravel, trace low plasticity clay (interpreted as Estuarine Deposits)
	-20.9	0.35	GRAVELLY SILTY SAND: Orange brown, brown and pale grey, gap graded (Possibly weathered bedrock)
B1019W-P	-8.00	0.50	SILTY SAND: dark grey, fine grained sand, poorly graded, with angular shell fragments to 5 mm diameter, trace low plastic clay (interpreted as Estuarine Deposits)
	-8.50	0.63	CLAYEY SAND: Grey brown, grey and yellow brown, fine grained sand, poorly graded, medium plasticity clay
B1020W-P	-13.6	2.50	SILTY SAND: dark grey brown, fine grained sand, poorly graded, with angular shell fragments up to 20 mm diameter (interpreted as Estuarine Deposits).
	-16.1	0.06	SILTY SAND: Orange brown, red brown and grey, fine grained sand, poorly Graded (Possibly weathered bedrock)
B1022W	-15.3	2.40	SILTY SAND: grey brown, fine grained sand, with fine grained angular shell fragments, trace low plasticity clay (interpreted as Marine Deposits)
	-17.7	0.20	SILTY SAND: Orange brown and brown, fine grained sand, with dark brown iron-stained lenses (<3 mm thickness), trace low plasticity clay

Potential cultural material within peat deposits

Borehole B120WA (Table 1 and Figure 17) identified a deposit of silty grey sand with peat above bedrock. The seismic refraction survey data indicates – through the presence of gas, most likely generated from decaying organic matter – this matrix could be extensive along the lowest point of the former river valley. At present it is not certain that these peat deposits were formed during the time of Aboriginal occupation. If they were, they could potentially contain physical evidence of Aboriginal occupation in the form of fish traps and cultural material that washed down the slopes.

Table 3 : Description of peat (in italics) with preceding stratum found in boreholes from Area A (Douglas Partners & Golder Associates, 2017)

Borehole	R.L. at top (m)	Thickness (m)	Description of residual soil
B120WA	-48.9	2.90	SAND: grey, fine to coarse grained sand, poorly graded, with up to 10 mm (interpreted as Estuarine Deposits or Alluvium).
	-52.8	2.83	SILTY SAND: dark grey, with peat, sulphurous odour

Fish traps

Fish traps constructed with organic materials such as saplings or woven materials are highly vulnerable to the processes of inundation and likely only to survive rapid, low-energy inundation unless deeply buried in consolidated sediments or peat before inundation within a high-energy environment. However, fish traps constructed from stone are only moderately vulnerable to the processes of inundation and are likely to survive relatively intact except within a high-energy environment.

The peat deposits identified in the borehole samples could contain physical evidence of Aboriginal occupation in the form of fish traps. There may be a higher likelihood of such site types having survived in Middle Harbour as this area would have been protected from wind generated waves coming up the ancient Parramatta River from the expanding body of water that eventually becomes the entrance to Sydney Harbour.

6.4 Summary of submerged Aboriginal archaeological sites in Area A

Area A has areas that have the potential to contain Aboriginal cultural heritage associated with submerged archaeological sites. It should be noted that the assessment is confined to where geophysical information is available. This is sufficient as proposed bed of the harbour impacts relevant to this assessment are located within the limits of where geophysical surveys have been conducted (See Section 10.1.1).

Based on the predictive model for Area A, as outlined in the preceding section, the areas where submerged Aboriginal archaeological sites could occur within Area A have been separated by a rating of archaeological potential as defined in Table 4. It is important to note that the information available at present allows only for assessments to be made which indicate the likelihood of submerged archaeological sites being present, with this likelihood being a combination of a site having been present prior to inundation, and the likelihood of it surviving inundation.

Table 4 Defining archaeological potential.

<i>Archaeological Potential</i>	<i>Likelihood of presence</i>
Moderate to High	50–100%
Low	25–49%
Very Low	2–24%
Remote	>0–1%

The pronounced rock outcrops at the -20 m depth interval close Seaforth Bluff are considered to have Moderate to High potential for the presence and survival of inundated rock shelters; more so than the seemingly submerged smaller rock overhangs closer to Clive Park which have been assessed as having Low potential (Figure 18 and Table 5). At 30 metres below the current bed of the harbour peat deposits present along the ancient watercourse that formed the Middle Harbour River have better potential to contain well preserved cultural material. Elsewhere within the area where geotechnical data is available the archaeological potential is much reduced on account of the seemingly thin residual soils and the absence of detectable substantial rock overhangs buried under marine sediments.



Figure 18: Likelihood for presence of Aboriginal cultural heritage associated with submerged archaeological sites

Table 5 Archaeological potential for site types in Area A

Archaeological potential level	Aboriginal archaeological site type	Predicted potential location within Area A
Moderate to High	Stone artefacts, midden deposits and fish traps	Formed along the ancient watercourse in about the centre of Area A, as shown in borehole B120WA
Moderate to High	Rock shelters	Along the sloping bed of the harbour on the Seaforth side of the study area
Low	Rock shelters	Along the sloping bed of the harbour on the Clive Park side of the study area
Very Low	Rock shelters, art, grinding grooves, middens, stone artefact scatters and fish traps	Across the remainder of the study area – within the limits of the geophysical surveys.

7 AREA B – WESTERN SIDE OF THE SPIT, PEARL BAY

7.1 Physical setting

Area B is situated in Pearl Bay on the western side of a The Spit, large sandbar projecting north-northeast from Beauty Point across Middle Harbour (Figure 19).

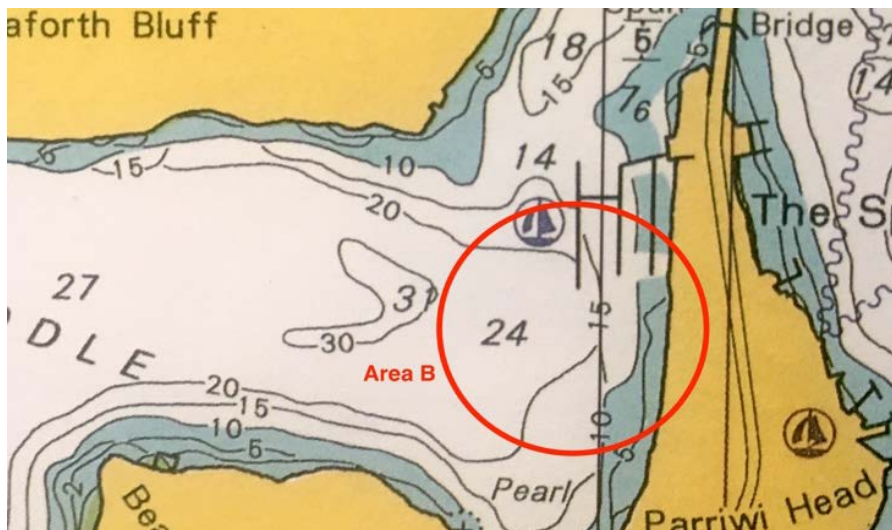


Figure 19 Portion of nautical chart showing Area B (Commonwealth of Australia / Crawford House Publishing, 1995: Chart 15). Depths are in metres.

The Spit originally developed as a result of Pleistocene erosion of the surrounding and upstream Hawkesbury sandstones, episodes of marine flooding and aeolian sedimentation, and the rising sea levels commencing around 17,000 years BP. The bed of the harbour that composes most of the study area was also created during this period. The natural width of The Spit has been progressively expanded since European settlement through sequential programs of reclamation. The eastern edge of the study area was reclaimed throughout the early to mid 20th century. The bed of the harbour on the western side of The Spit drops away from the shoreline to a depth of 10 metres Australian Height Datum about 50 to 60 metres from the shore, sloping more gradually to a depth of 22 metres about 150 metres from shore (Figure 20).

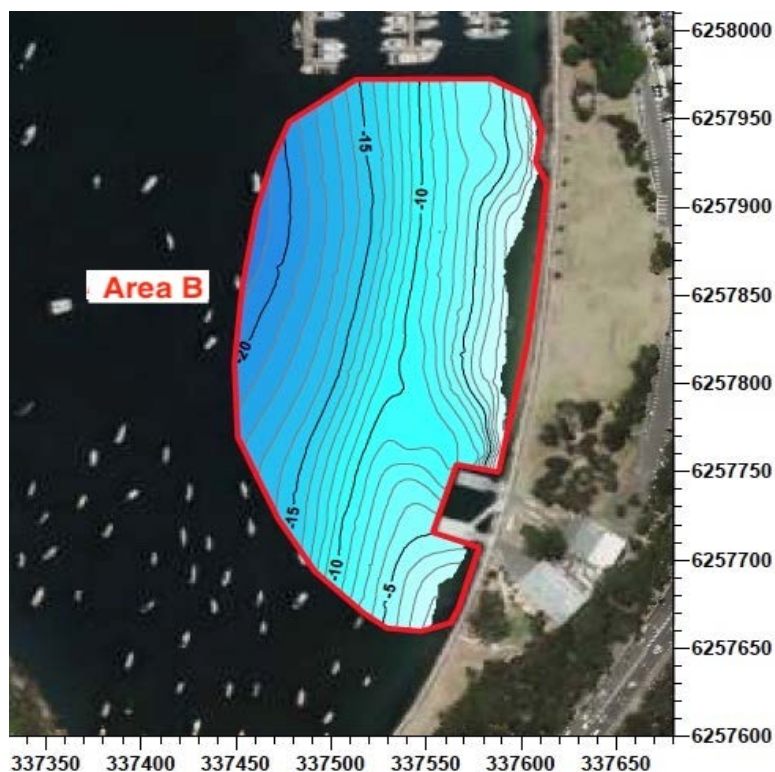


Figure 20: Area B – the western side of The Spit, Middle Harbour (Earth Technology Solution Pty Ltd, July 2017a: Figure MH2). Depths are in metres.

Based on the nature of the development of The Spit, it is expected that the bed of the harbour sediments within Area B would predominantly comprise a sloping landscape of Holocene marine sediments comprising of gravels and fluvial sands and fluvial silt/mud and sand (eroded sandstone) derived from fluvial downstream tidal flows (Manly Council and Clontarf/Bantry Bay Estuary Management Working Group, 2007).

There are numerous moorings across the bed of the harbour south of the existing marina (Figure 21). Some of these moorings are located at water depths of about 20 metres.

Seismic reflection data from within Area B shows the thickness of the Holocene marine sediments ranging from 10 metres at the southern end to over 50 metres towards the north (Figure 21).



Figure 21 (left): Bed of the harbour features derived from bathymetric survey within Area B (Earth Technology Solution Pty Ltd, July 2017a: Figure MH2A). Low circular mounds are moorings for recreational craft.

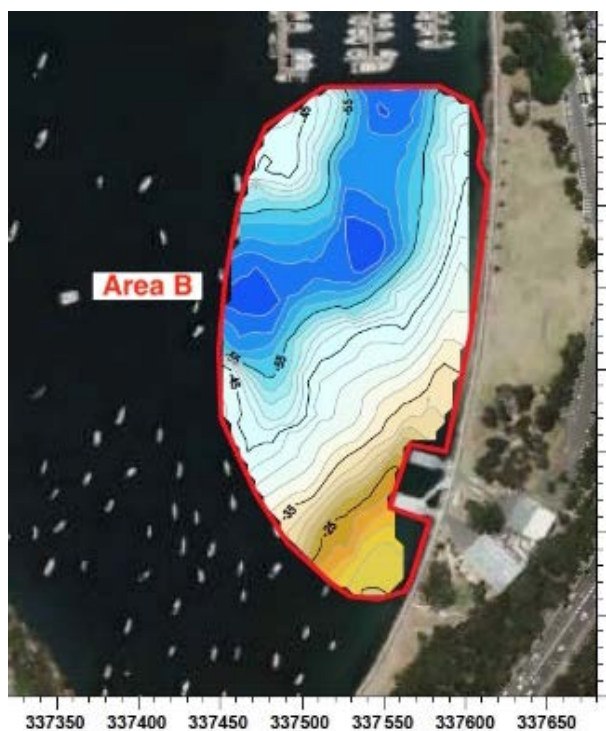


Figure 22 (right): Interpreted sediment isopach at Area B (Earth Technology Solution, July 2017a). The contours show thickness of sediment in metres

During the glacial period of the late Pleistocene, Area B would have been situated on the southern bank and slopes overlooking the ancient freshwater river system of Middle Harbour Creek cutting through a relatively steep-sided valley of exposed Hawkesbury sandstone. The seismic reflection data shows the channel of the ancient Middle Harbour Creek entering Area B from the west before turning north to run parallel to The Spit (Figure 23). The ancient valley profile can be clearly seen in Figure 24 as can the thickness of the marine sediments.

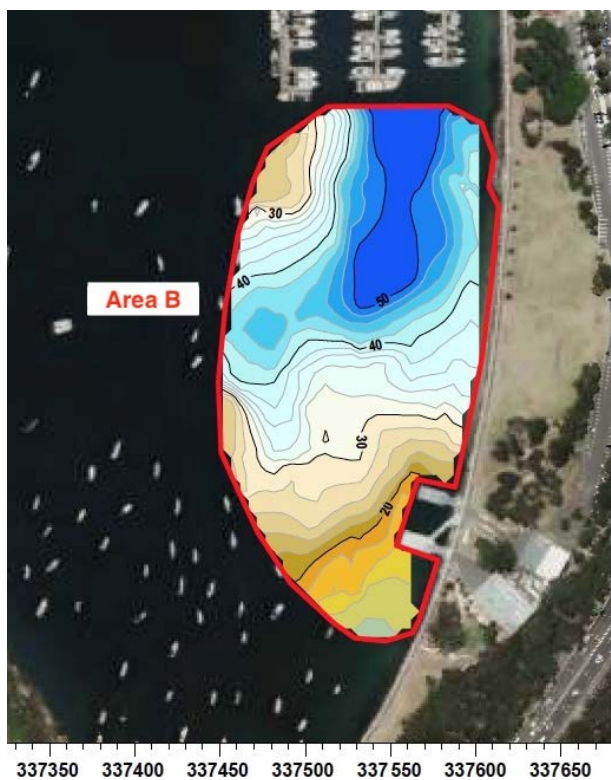


Figure 23: Interpreted rock level contour plan (Earth Technology Solution, 2017a: MH7). Contours are in metres.

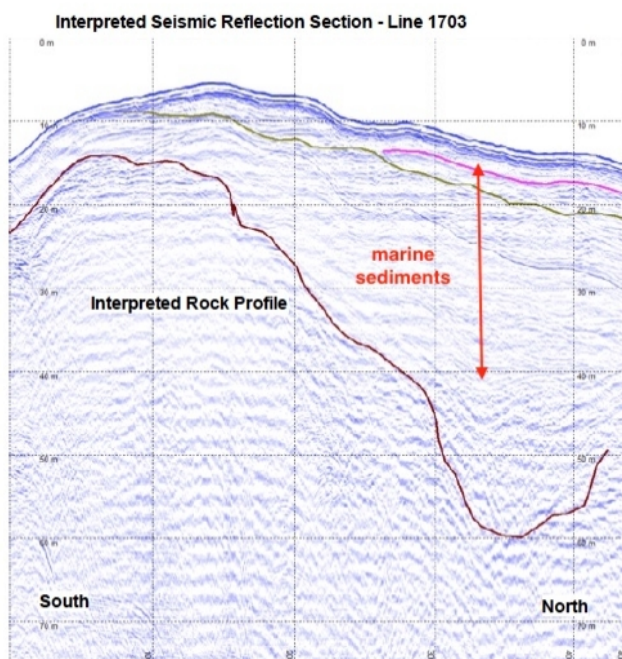


Figure 24: Seismic reflection profiles – Line 1703. Interpretation of the sediments on the figure provided by authors of this report. (Earth Technology Solution, 2017a: Figure B-MH4).

7.2 Known Aboriginal archaeological sites near Area B

While numerous Aboriginal archaeological sites have been identified along the shores of Middle Harbour in the broader region of Area B, only two Aboriginal archaeological sites on or near The Spit were identified in the two searches of the NSW Office of Environment and Heritage AHIMS register conducted for the project. Both sites comprise shell midden deposits: one on an open sandstone platform and the other within a rock shelter. Both are within the exposed Hawkesbury sandstone landscapes at the western base of The Spit (Table 6 and Figure 25).

Table 6: Aboriginal archaeological sites on AHIMS register close to Area B

Site Id. No.	Site name	Site type	Environment
45-6-1978	Pearl Bay 1, Beauty Point	Shell midden	Exposed Hawkesbury sandstone landscape above the southern shore of Pearl Bay / eastern base of The Spit
45-6-1979	Pearl Bay 2, Beauty Point	Rock shelter with shell midden	Exposed Hawkesbury sandstone landscape above the southern shore of Pearl Bay / eastern base of The Spit

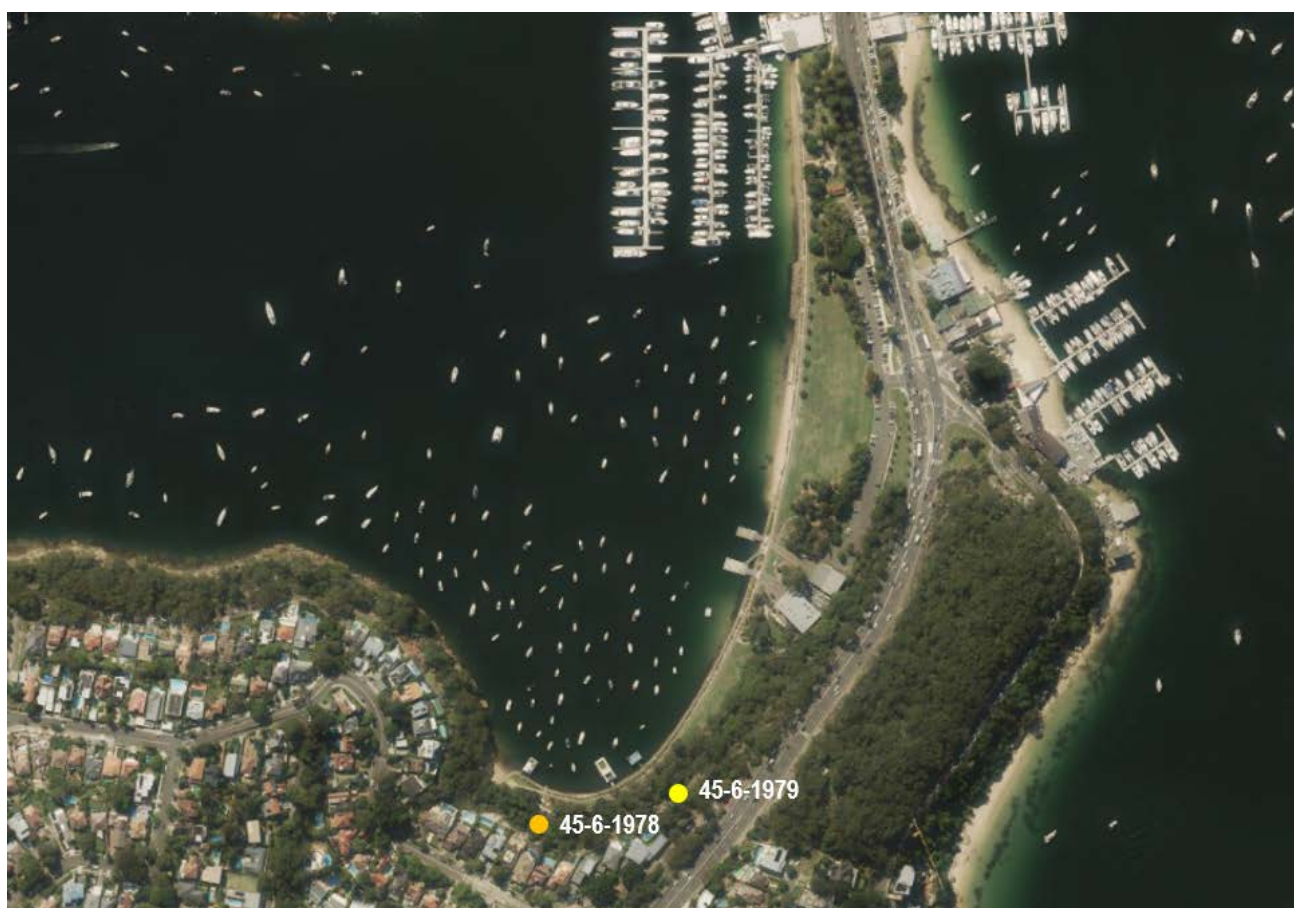


Figure 25: Registered Aboriginal archaeological sites near Area B

7.3 Potential submerged Aboriginal archaeological sites

Based on archaeological evidence of late Pleistocene and Holocene Aboriginal land use patterns in the Greater Sydney Region, the most likely Aboriginal archaeological site types that could occur in the Port Jackson region includes rock shelters with occupation evidence, art and grinding grooves on exposed sandstone ledges and vertical faces, midden deposits and / or stone artefact scatters on exposed sandstone platforms and former open elevated areas along the ancient creeklines, and fish traps on shallow, wide and gently sloping sandstone platforms.

The question of whether such sites would have survived inundation, however, is another matter – particularly with regard to the location of Area B, situated adjacent to The Spit.

The Spit began to form toward the latter part of the post-glacial marine transgression, about 10,000 years BP. Oceanic swells following a littoral drift, or longshore movement, northwards up Australia’s east coast

refracted through the heads of Port Jackson and began reaching the beaches of Shell Cove, west of Beauty Point. These waves carried marine sands and sediment into Middle Harbour, which gradually accumulated in the calmer waters behind the Beauty Point headland forming a narrow sand bar following the general direction of the northerly longshore current. At the same time, the waters flowing downstream from Middle Harbour Creek carried fluvial mud and eroded sand downstream, which subsequently accumulated in the calmer water on the western side of the developing sand bar. The Spit thus evolved as a naturally dynamic landform exposed to sedimentation via both marine- and riverine processes (Harris, P. and P. O'Brien, 1998; Roy, P.S., 1981).

The formation of The Spit in the past 10,000 years has buried the late glacial Pleistocene landscape – and any potential associated Aboriginal archaeological sites – under Holocene deposits many metres thick within the area of Area B. The landscape of Area B towards the end of the post-glacial marine transgression would have been similar to today with an unstable sand bar sloping down to the water's edge. Based on patterns identified in the Holocene archaeological record along Middle Harbour, such a landform is of low Aboriginal archaeological potential; indeed, no Aboriginal archaeological sites have been identified on any low-lying, sandy beaches on either side of Middle Harbour in the stretches surrounding The Spit.

There is no borehole data from the project that is available for Area B and the side scan sonar imagery – as borne out by the seismic profiling – shows no sandstone bedrock outcropping. As such, no further assessment can be made other than to state that archaeological evidence associated with Aboriginal occupation during the glacial period of the late Pleistocene may potentially occur within Area B, other than it is likely to be overlain by up to 30 metres of Holocene marine sediments. Based on the nature of the landscape from the post-glacial marine transgression through to the Holocene, it is considered very unlikely that Aboriginal archaeological sites or deposits would occur in the upper sediment levels within Area B.

7.4 Summary of maritime heritage sites in Area B

Area B has potential to contain Aboriginal cultural heritage associated with submerged archaeological sites. It should be noted that the assessment is confined to where geophysical information is available. This is sufficient as proposed relatively minor bed of the harbour impacts are located within the limits of the where geophysical surveys have been conducted (See Section 3.2).

Using the definition of archaeological potential as defined in Table 4, there is Moderate to High archaeological potential for all identified site types across the study area (Table 7). It is important to note however that the information available at present allows only for assessments to be made which indicate the likelihood of submerged archaeological sites being present, with this likelihood being a combination of a site having been present prior to inundation, and the likelihood of it surviving inundation.

Table 7: Archaeological potential for site types in Area B

Site Type	Archaeological potential	Predicted potential locations
All forms identified - rock shelters, grinding groves, middens and / or stone artefact scatters, fish traps.	Moderate to High	In potential residual soils and / or sandstone overhangs / ledges, creek lines that may occur buried beneath Holocene marine sediments, up to up 30 metres thick below the current bed of the harbour.

8 AREA C – CLIVE PARK TO BEAUTY POINT, MIDDLE HARBOUR

8.1 Physical setting

Area C is situated at the entrance to Long Bay, Middle Harbour between Clive Park at Northbridge and Beauty Point at Mosman (Figure 26). Located closer to the western shore, Area C overlays what appears to be an underwater ridge sloping down towards the east.

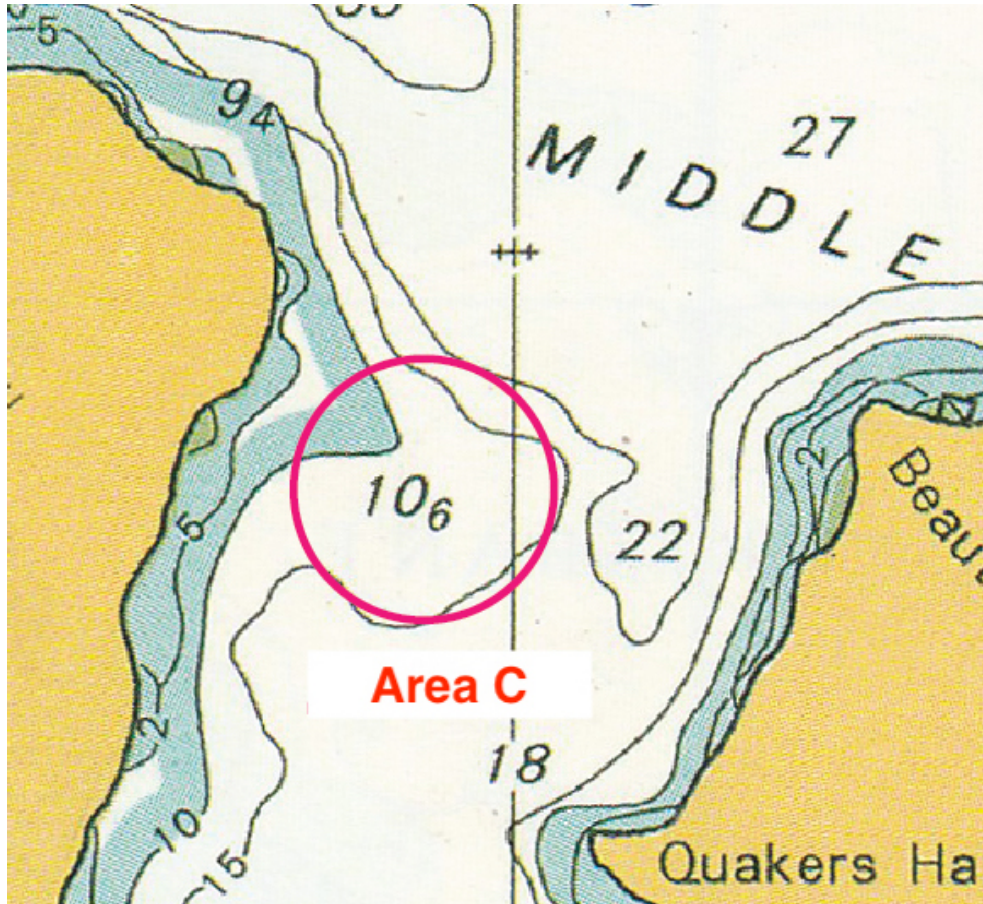


Figure 26: Bed of the harbour topography within Area C (pink circle). (Commonwealth of Australia/Crawford House Publishing, 1995: Map 15)

Water depth ranges from about 10 metres Australian Height Datum at the western end of the area to 20 metres towards the northern and eastern edges. For the most part water depth ranges between 10 to 15 metres across most of the area.

The bed of the harbour is expected to be composed of silty sand with shell as has been observed at similar depths in Area A. There may be some rock outcropping at the western fringes of Area C.

No seismic profiling or side scan sonar survey was carried out for Area C.

During the glacial period of the late Pleistocene, the area within Area C would have had similar valley profile to that interpreted from the geophysical data for Area C. The valley sides would have been relatively steep with a creek flowing in a northerly direction joining the ancient Middle Harbour River. As with Area A, the valley would have progressively filled in with alluvium, estuarine and finally marine deposits as sea levels rose. It can be expected that the thickness of marine sediments would increase towards the eastern portion of the study area. The climate and vegetation would have been significantly different from the current coastal landscape, more likely resembling the Blue Mountains region of today.

8.2 Known Aboriginal archaeological sites near Area C

Numerous Aboriginal archaeological sites have been identified on the Hawkesbury Sandstone headlands of Northbridge, Beauty Point and Quakers Hat, surrounding Area C. This indicates that the varied ecological communities along the foreshore, immediate hinterland areas and the estuarine environment of Middle Harbour, combined with the sandstone rock outcrops, platforms and shelters, made these

headlands important resources for Holocene Aboriginal populations. Investigations in the relatively undisturbed bushland areas of Clive Park in particular have revealed a rich diversity of Aboriginal archaeological sites, including shell middens, rock engravings on open ledges and platforms, rock shelters with occupation deposits, art (both engravings and pigment art), and human burials.

No submerged Aboriginal archaeological sites were identified in or near Area C during the two searches of the NSW Office of Environment and Heritage AHIMS register carried out for the project. The closest registered Aboriginal archaeological sites are the six sites situated along the Clive Park foreshore – including four rock shelters with cultural features and deposits, one rock engraving on an open rock ledge; and one open shell midden – discussed in Section 6.2.

8.3 Potential submerged Aboriginal archaeological sites

Based on archaeological evidence of late Pleistocene and Holocene Aboriginal land use patterns in the Greater Sydney Region, the most likely Aboriginal archaeological site types that could occur in the Port Jackson region includes rock shelters with occupation evidence, art and grinding grooves on exposed sandstone ledges and vertical faces, midden deposits and / or stone artefact scatters on exposed sandstone platforms and former open elevated areas along the ancient creeklines, and fish traps on shallow, wide and gently sloping sandstone platforms.

The question of whether such sites would have survived inundation, however, is difficult to assess with the available information. The study area is situated in a relatively enclosed being protected from wind and wave action compared to Area A. For this reason, archaeological sites becoming inundated within the study area would have been relatively less affected by wave action than Area A.

8.4 Summary of maritime heritage sites in Area C

Area C has potential to contain Aboriginal cultural heritage associated with submerged archaeological sites. It should be noted that the assessment is confined to making comparisons with Area A nearby where geophysical data is available. This is sufficient given the relatively minor bed of the harbour impacts that are proposed (See Section 10.1.3).

Using the definition of archaeological potential as defined in Table 4, there is Moderate to High archaeological potential for all identified site types across the study area (Table 8). It is important to note however that the information available at present allows only for assessments to be made which indicate the likelihood of submerged archaeological sites being present, with this likelihood being a combination of a site being present prior to inundation, and the likelihood of it surviving inundation.

Table 8 Archaeological potential for site types in Area C.

Site Type	Archaeological potential	Predicted potential locations
All forms identified - rock shelters, grinding grooves, middens and / or stone artefact scatters, fish traps.	Moderate to High	In potential residual soils and / or sandstone overhangs / ledges, creek lines that may occur buried beneath Holocene marine sediments which are assumed to comprise at least the first few metres of the current bed of the harbour.

9 HERITAGE SIGNIFICANCE

9.1 Significance criteria

An assessment of cultural heritage significance seeks to understand and establish the importance or value that a site, place or landscape may have to the community at large. The concept of cultural significance is intrinsically connected to the physical components of a site, its location, setting and relationship with its surrounds; as well as the traditional, spiritual, historical and social meaning attached to the site. The assessment of cultural significance is ideally a holistic approach that draws upon the response all these factors evoke from the community.

The Australia ICOMOS *Charter for the conservation of places of cultural significance 2013* – the Burra Charter – divides heritage significance into four main categories for the purpose of assessment; social, historical, scientific and aesthetic values. These principles have been adapted by the NSW Office of Environment and Heritage to specifically address the identification and assessment of Aboriginal cultural heritage (NSW Office of Environment & Heritage, 2011)

Social value

Social value refers to the spiritual, traditional, historical or contemporary associations and attachments which the place or area has for the Aboriginal community. Places of social significance have associations with contemporary community identity, and social or cultural value is seen as the way in which people express their connection with a place and the meaning that place has for them. These places can have associations with tragic or warmly remembered experiences, periods, or events. Communities can experience a sense of loss should a place of social significance be damaged or destroyed. These aspects of heritage significance can only be identified through consultation with relevant Aboriginal communities.

Historic value

Historic value refers to the associations of a place with a person, event, phase, or activity of importance to the history of an Aboriginal community. Places of historic value may or may not have physical evidence of their historical importance (such as structures, planted vegetation or landscape modifications). These places may also have 'shared' historic values with other (non-Aboriginal) communities – such as places of post-contact Aboriginal history.

Scientific value

Scientific value refers to the importance of a landscape, area, place, or object because of its archaeological and/or other technical aspects. Assessment of scientific value is often based on the likely research potential of the area, place, or object and would consider the importance of the data involved, its rarity, quality or representativeness, and the degree to which it may contribute further substantial information.

Aesthetic value

Aesthetic value refers to the sensory, scenic, architectural, and creative aspects of the place. It is often closely linked with social values and may include consideration of form, scale, colour, texture, and material of the fabric or landscape, and the smell and sounds associated with the place and its use.

9.2 Assessment of Aboriginal heritage significance

An assessment of Aboriginal cultural heritage significance cannot be conducted without the input of Aboriginal stakeholders and communities – particularly with regard to social and historical values. As recognised by the Department of Premier and Cabinet (Heritage), Aboriginal people are the primary determinants of the cultural significance of their heritage.

Jacobs Group Pty Ltd (2018) consulted with several Aboriginal knowledge holders as identified by the Registered Aboriginal Parties (RAPs) for the Western Harbour Tunnel and Beaches Link program of works with regards to cultural values within the project area. No specific knowledge holders for the study area were identified during the consultation process. However, the information provided by the RAPs contributed to an understanding of the cultural value of the broader landscape within which the project would be located. Table 9 provides a summary of the Aboriginal cultural values identified by knowledge holders during this consultation process, with regards to site types that might be present as submerged archaeological sites within the project area.

Site type	Cultural values identified by Registered Aboriginal Parties
Rock shelters	The RAPs identified rock shelters as culturally significant as they provide a link between occupation of the region, the gathering of resources, land care rejuvenation and communication between other groups. In the course of the fieldwork, the identified rock shelter site locations containing stone artefact scatters or middens were noted as having these types of cultural significance.
Middens	The RAPs identified middens as culturally significant as they provide a link between occupation of the region, the gathering of resources, land care rejuvenation and were important terrestrial, territorial markers on the landscape, facilitating communication between other groups. In the course of the fieldwork, the identified midden site locations were noted as having these types of cultural significance.
Watercourses, bays, water holes or springs	Permanent water bodies are culturally significant as a central location for gathering of people, resource collection and camping. During field work RAPs indicated certain water courses and bays within the harbour as important sources of food as well as significant for ceremonial practices. Watercourses, tides, islands and bays are often associated with spiritual beings. The length of the Parramatta River, to its mouth in the harbour was considered to represent an important spiritual creature, an eel whose eye was Goat Island.
Engraving sites and areas of spiritual significance	The RAPs referred to rock engravings as highly important areas. These sites were often connected to pathways which link spiritual and ceremonial sites, as well as travel corridors throughout the landscape between the coast and higher ground. During the recording of the engravings, RAPs expressed a profound sense of wonder and feeling of belonging and continuation of cultural practice. Several cultural protocols were observed whilst carrying out recording of the rock engravings: no whistling or singing at night, observance of men and women's sites and acknowledgment of elders and country at each site to ensure safe passage.
Burial sites	Burial sites are of great importance and are generally of high concern to Aboriginal people as the locations of burials are rarely documented. RAPs identified the landscape features chosen for burial sites as being areas near campsites and on sandy rises near the shoreline of the harbour and within rock shelters near Berrys Bay.

Table 9: Cultural values for terrestrial sites identified by Registered Aboriginal Parties during consultation with Jacobs Group Pty Ltd (Jacobs Group, 2018)

With regard to scientific significance, any surviving submerged Aboriginal archaeological sites would likely have very high scientific significance via the potential to yield information that would contribute to an understanding of the NSW's natural and cultural history. Maritime Aboriginal archaeological sites and Pleistocene Aboriginal archaeological sites are both, on their own, rare site types within a NSW context; and the identification of submerged Pleistocene landscapes and associated Aboriginal archaeological resources would be a unique discovery within Australia (Nutley 2014; Nutley, Coroneos, Wheeler 2016; Ward, Larcombe and Veth 2015). An examination and analysis of such archaeological landscapes could contribute substantial information about Aboriginal technologies, land use strategies and exploitation of natural resources during the Pleistocene era; as well as important information about post-depositional processes and survival rates of Aboriginal archaeological sites and landscapes after sea level rise and inundation.

10 POTENTIAL IMPACTS ON SUBMERGED ABORIGINAL ARCHAEOLOGICAL SITES

10.1 Proposed works

All project information detailed in this chapter was obtained from Chapter 5 (project description) and Chapter 6 (Construction work) of the environmental impact statement.

There are three areas where construction activities may impact the bed of the harbour and foreshore:

- Immersed tube tunnel crossing between Northbridge and Seaforth and temporary cofferdams BL 7 and BL 8 used during construction (Area A)
- Casting facility in Pearl Bay (Spit West Reserve construction support site BL9), on the western side of The Spit (Area B)
- Temporary mooring facility east of Clive Park in Middle Harbour (Area C).

Only those construction activities that could impact all identified areas of known and potential maritime heritage are described in the following sections.

10.1.1 Area A

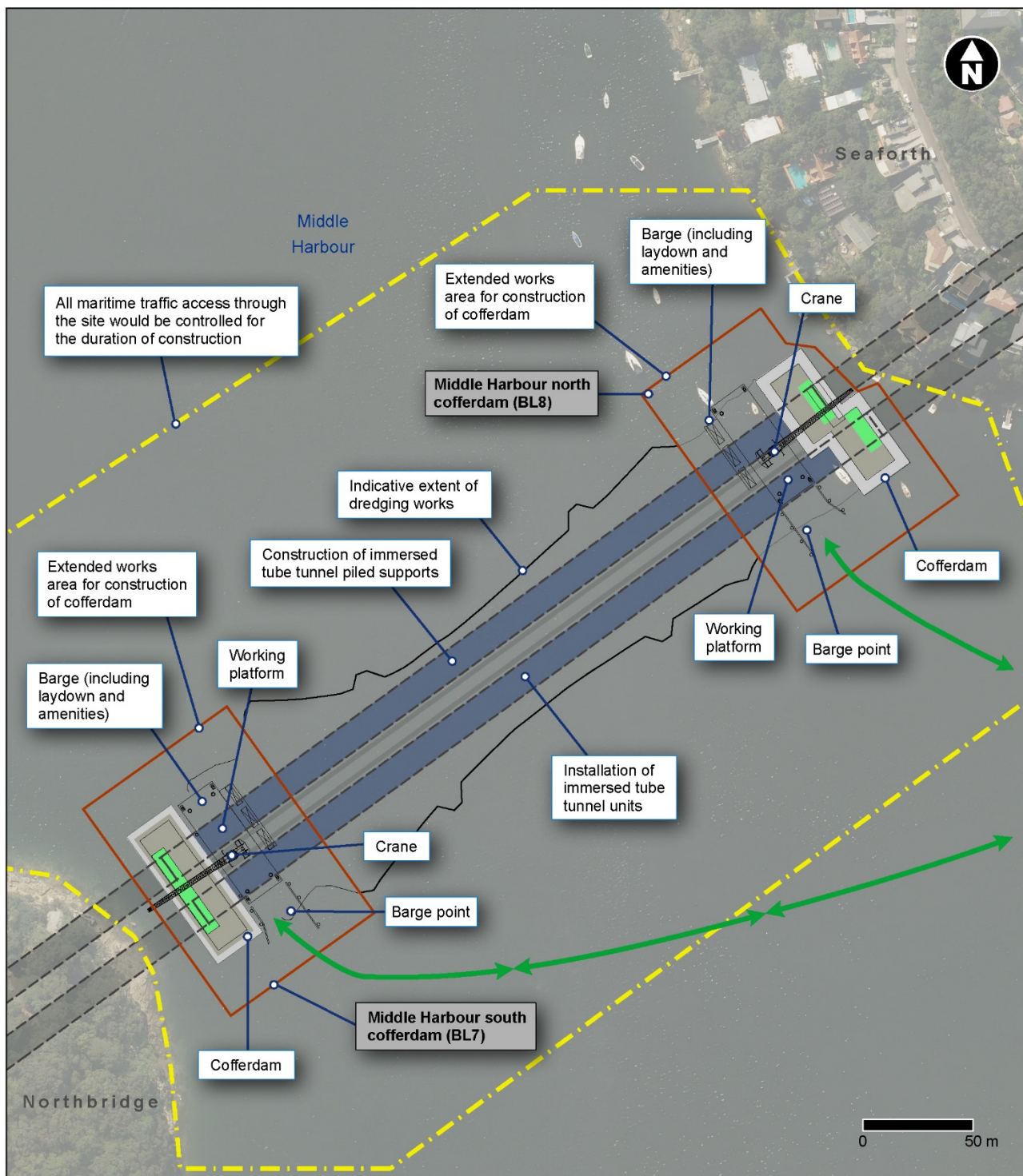
An immersed tube tunnel, about 340 metres long, is proposed within Area A. Construction activities in Area A would include:

- Construction of two cofferdams (south cofferdam BL7 and north cofferdam BL8)
- Excavation of sediment and rock within cofferdams
- Construction of two concrete interface structures to provide a connection between the bored tunnels in work Areas 2 and 4 and the immersed tube tunnel
- Dredging of a trench for the immersed tube tunnel
- Fit out of steel immersed tube tunnel units (these would be fabricated elsewhere and transported by barge)
- Installation of eight piled foundations and concrete headstocks
- Installation of immersed tube tunnel units.

The cofferdams are designed and physically located so as to suit the complex geotechnical conditions which will be encountered on the bed of the harbour and where the interface structures to be constructed are most appropriately located from an engineering perspective. Subject to these requirements, and within reasonable and feasible limitations, the cofferdams would be located an appropriate distance away from the shoreline at both Northbridge and Seaforth Bluff (Figure 27) to best avoid impacting these areas.

As described in Chapter 6 of the environmental impact statement, before the construction of the cofferdam can occur, the upper layer of the bed of the harbour would be injected with a permanent grouting material to improve its strength and water-tightness. Ground treatment would be carried out by drilling holes into the bed of the harbour. These holes would then be injected by a grouting machine located on a flat top barge, with either cement or chemical-based grouting.

The cofferdam structure would be made up of a series of interlocking, tubular piles. Each pile would be driven into the underlying sandstone within the areas that were subject to ground treatment. Piling would take place from a flat top barge (or similar barge) using a crane fitted with a hydraulic vibrating hammer, offshore pile driving hammer and/or a similar piece of construction equipment.



BL_EIS_CH06_M009_BLOBLO7_MHC_Y13

Indicative only – subject to design development

Legend

- Construction footprint
- Construction support site
- Beaches Link driven tunnel
- Immersed tube tunnel
- Indicative Marine traffic control zone
- Construction support from Spit West Reserve (BL9)
- Interface structure

Figure 27: Plan showing proposed dredging extent and cofferdams BL7 and BL8

Once all piles have been installed, dewatering of the cofferdam would occur and the water level would be progressively lowered. Structural steel support would be installed within the cofferdams from a flat top barge so the cofferdams remain structurally sound.

The base of the immersed tube tunnel would be approximately -30 metres AHD (Figure 28). As the immersed tube tunnel units would rest on a series of uniformly graded gravel beds, the construction depth of the dredging is likely to be one to two metres deeper than this.

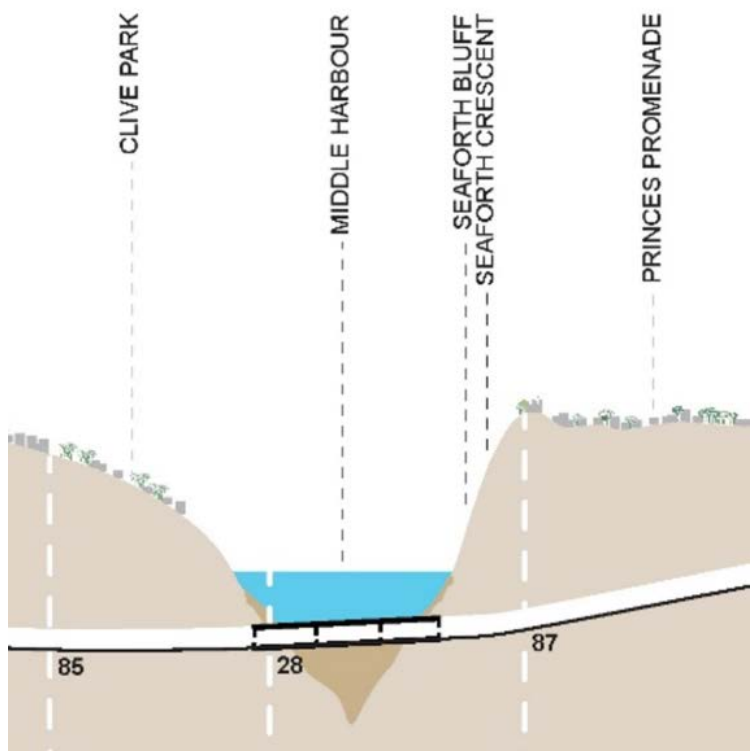


Figure 28: Indicative vertical alignment of the mainline tunnel crossing of Middle Harbour

Once all preparations have been finalised, the tunnel element and immersion pontoons would be transported from the temporary mooring facility east of Clive Park in Middle Harbour to the immersion location by tug boats. At the immersion location, the immersion pontoon would be connected to the pre-installed anchors (Figure 29).

Once the work is completed, the cofferdams would be removed and there would be no visual evidence of the crossing of Middle Harbour above water.

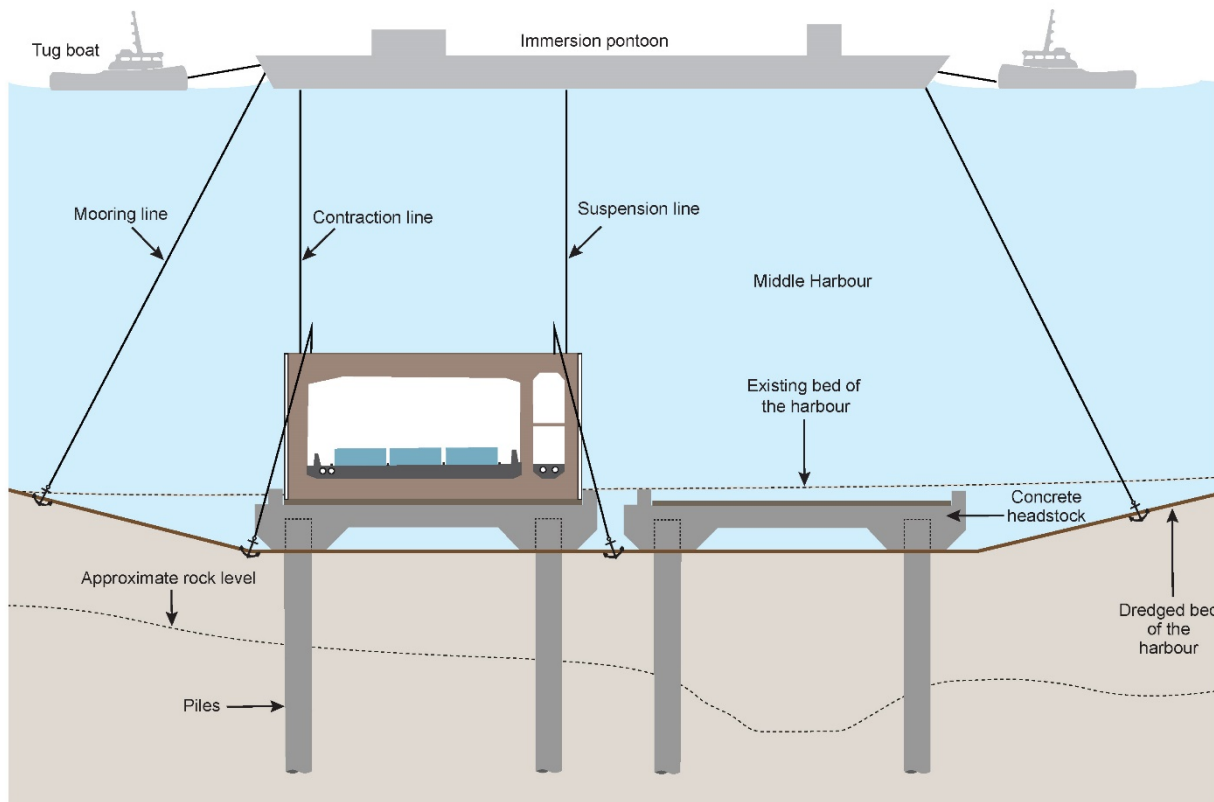
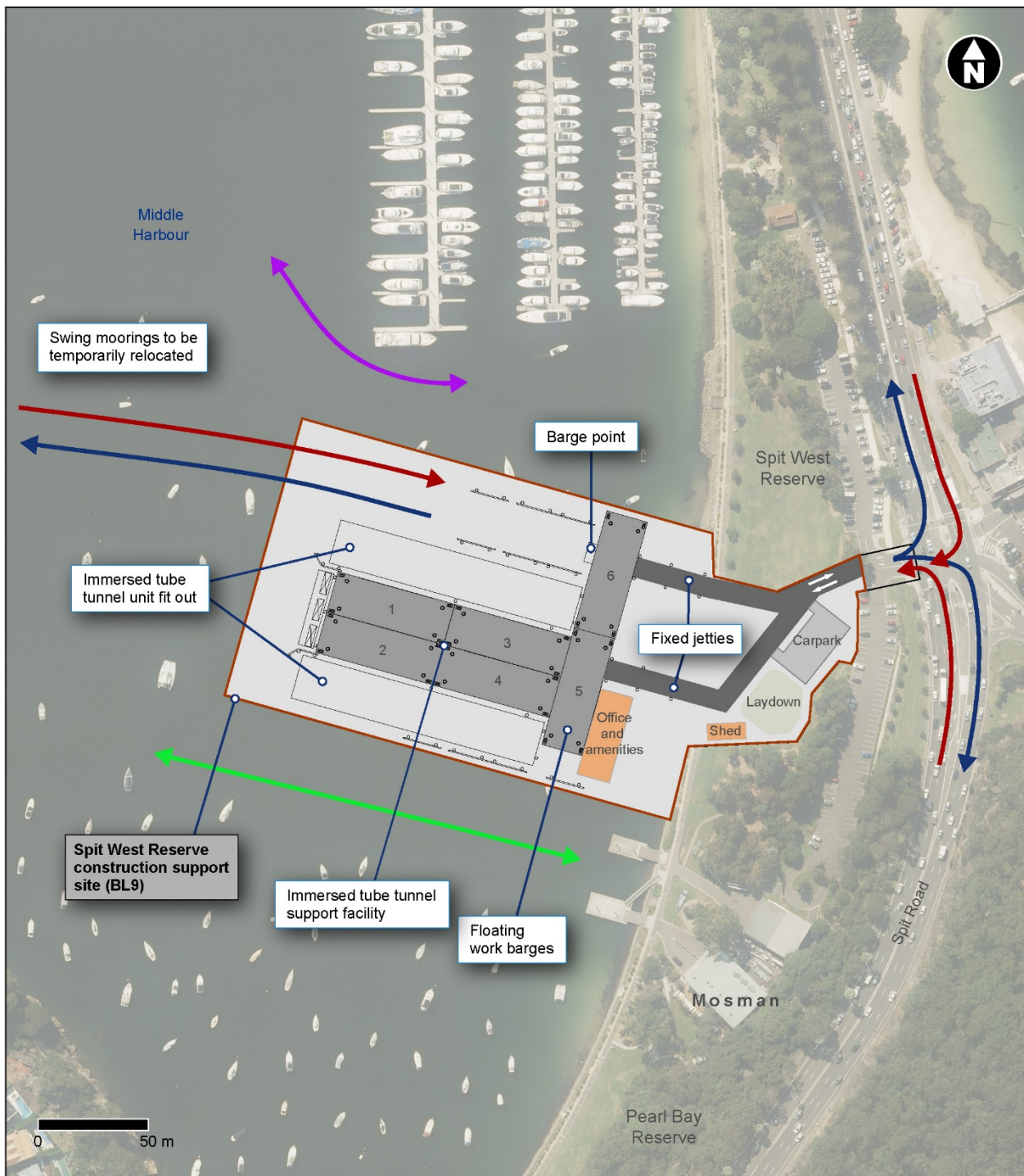


Figure 29: Typical immersion configuration – immersion pontoon

10.1.2 Area B

Spit Reserve construction support site (BL9) is located primarily in the water west of Spit West Reserve, with a small adjoining land-based site. The proposed construction works at the site would include a temporary floating immersed tube tunnel casting facility that would be connected to Spit West Reserve by two temporary fixed jetties. The casting facility at the Spit West Reserve within Area B would require temporary piles to be driven for the wharf structure, along with dolphins (which typically consist of a number of piles vibrated into the marine bed and connected above the water level to provide a platform or fixing point) to steady and tie up the barges (Figure 30). It is understood that the wharf and associated facilities would be temporary, and that the Spit West Reserve would be rehabilitated to its original condition after construction is completed.



BL_EIS_CH06_1007_BLOG_SR_LY10

Indicative only – subject to design development

Legend

- Construction footprint
- Construction support site
- Temporary site access
- Construction support site buildings
- ➔ Site access - in
- ➔ Site access - out
- ➔ Marina access
- ➔ Mosman rowing club access

Figure 30: Indicative layout – Spit West Reserve construction support site (BL9)

10.1.3 Area C

A temporary mooring facility east of Clive Park in Middle Harbour would be established in Area C to temporarily store constructed elements before they were immersed.

About 45 swing moorings near the Spit Reserve construction support site (BL9) and 10 at Seaforth Bluff near the Middle Harbour north cofferdam (BL8) would need to be established in an area about 160 metres long and 120 metres wide.

10.2 Approach to assessing impact

There are no known submerged Aboriginal archaeological sites within the study area, but it has been possible to attribute archaeological potential based on available geophysical information, predictive modelling and an understanding of site formation processes. Without further investigation, more definitive statements regarding archaeological potential cannot be made, including the survival and integrity of sites.

The types and scale of potential impacts on the bed of the harbour associated with the project are described in detail in the supporting studies on maritime heritage in Technical working paper: Maritime heritage (Cosmos Archaeology, 2020).

For Areas A, B and C assessed in this report, the types of project activities that could impact submerged Aboriginal archaeological sites are:

- Dredging
- Piling (for temporary wharves, immersed tube tunnel piled supports and cofferdams)
- Excavation within the cofferdam

These activities are considered to be direct impacts.

The following table has been developed by Jacobs Group Pty Ltd (Jacobs, 2018) to assess the level of potential impact and associated significance for Aboriginal archaeological sites within the project area. The significance of impact ratings corresponds with the damage classification model used for the project (CIRCA 1996).

Table 10 Significance of potential impacts (note that for the purposes of this study all Aboriginal heritage is considered to be of high significance)

Impact rating	Scale	Intensity	Duration/frequency
Major	Medium – large	Moderate – high	Permanent/irreversible
Moderate	Small – medium	Moderate	Medium – long term
Minor	Small/localised	Low	Short term/reversible
Negligible	Little or no potential physical impact to an Aboriginal site.		

10.2.1 Area A

Zones of High and Moderate submerged Aboriginal archaeological potential are shown in Figure 31 and Table 11.

Impacts from dredging within these zones is rated as Moderate. This assessed impact reflects that dredging would be relatively localised, even though any evidence surviving can be considered as being of high heritage significance, due to its rarity and ability to reveal more about submerged sites and Aboriginal occupation in the Sydney region during the Late Pleistocene. At the same time comparable terrain to Area A is extensively represented elsewhere within Port Jackson.

Dredging, including excavation within the cofferdams, would also impact areas which have Very Low archaeological potential and as such the potential impacts could range from Negligible to Moderate.

The crossing of Middle Harbour would pass over peat deposits that have formed within the ancient watercourse. However, dredging would not impact these deposits and the piling to support the immersed tube tunnel units appears to be situated higher up the ancient river valley slopes where there are no documented peat deposits.

Piling would also occur in areas which have been assessed to be of Very Low archaeological potential. Any impacts arising from piling would be expected to be localised and therefore Minor.

Indirect impacts such as vibration would have a negligible impact on account that submerged Aboriginal archaeological sites are buried and as such movement of individual artefacts would be minimal.

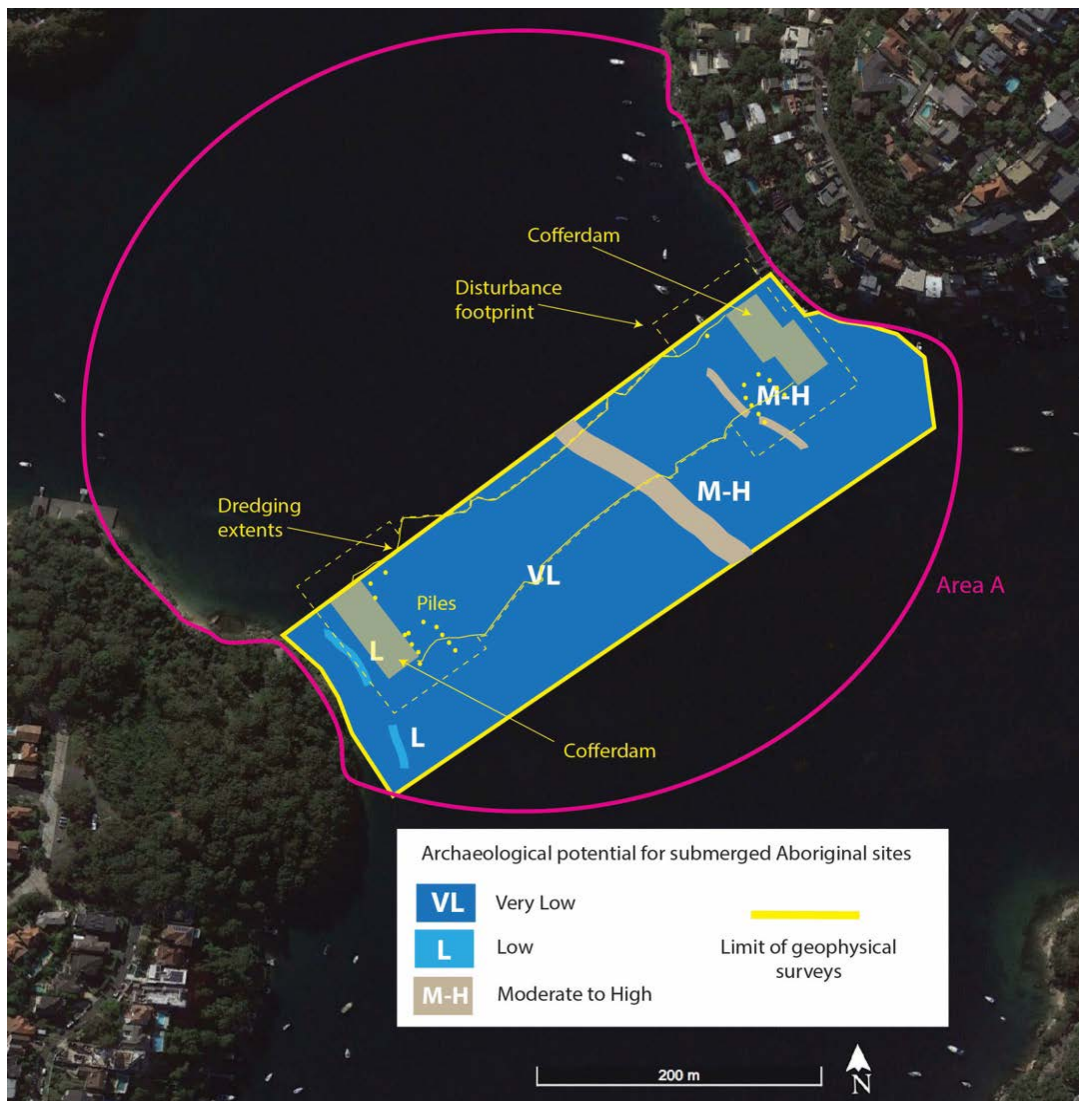


Figure 31: Potential impact on submerged Aboriginal archaeological sites in Area A

Table 11: Assessment of potential impacts on potential submerged Aboriginal archaeological sites in Area A

Archaeological potential	Significance	Dredging (Direct)	Excavation (Direct)	Piling (Direct)	Vibration (Indirect)
Moderate to High (potential rock shelter)	High	Moderate to Major (without mitigation)	N/A	N/A	Negligible
Moderate to High (peat deposits)	High	N/A (stratum below construction depth)	N/A	N/A	N/A
Low	High	N/A	N/A	N/A	Negligible
Very Low	High	Negligible to Moderate (without mitigation)	Negligible to Moderate (without mitigation)	Minor	Negligible

10.2.2 Area B

The only potential impacts to potential submerged Aboriginal archaeological sites within this study area is piling for the temporary wharf. The depth of piling would unlikely penetrate to sub-bed of the harbour strata containing Aboriginal archaeological sites and should this occur the impacts can be considered to be Negligible to Minor.

10.2.3 Area C

The only potential impacts to potential submerged Aboriginal archaeological sites within this study area is the installation of the temporary mooring facility. The temporary mooring facility would very unlikely penetrate to sub-bed of the harbour strata containing Aboriginal archaeological sites and should this occur the impacts can be considered to be Negligible.

11 RECOMMENDED MANAGEMENT MEASURES

Appropriate forms of mitigation are presented in this section based on the consideration of a number of factors such as:

- Heritage significance
- Relevant heritage policies
- Best practice
- The consultant experience in forming and implementing mitigation measures in a marine environment.

The underlying principle in safeguarding the cultural heritage significance of maritime heritage is to avoid or minimise any direct, indirect and long-term impacts to a site. This approach is nuanced depending on the level of cultural heritage significance of an item or site, the risk of impact and the scale of impact. The scale or consequence of impact relates to the degree of loss – immediate or gradual – of cultural heritage significance.

Generally in heritage assessments, the appropriate mitigation measure for a site of high significance, if impacts are assessed to be moderate or higher, would be to avoid the site, modify the design where feasible or undertake archaeological investigations where redesign is not feasible.

The present state of knowledge for submerged Aboriginal archaeological sites within the study area is that there is a moderate to high potential for their presence in a localised area with diminishing archaeological potential elsewhere. The proposed management measures reduce the overall extent of impact to any submerged Aboriginal archaeological sites and their heritage significance. This is achieved by targeted pre-construction phase marine geophysical investigation in selected areas to confirm the presence of sites, followed by archaeological recording and recovery during the construction phase to realise the information value of any surviving site as best as possible.

Given the current limited knowledge we have of submerged archaeological sites in eastern Australia all information has value, including presence-absence data, the relationship between geophysical records and actual formations and the condition of any submerged Aboriginal archaeological sites.

The extent of the archaeological investigation for both proposed management measures would need to be determined by the constraints of the bed rock conditions and safety constraints within the cofferdams, including safety protocols required for the handling of contaminated sediment.

There are two mitigation measures recommended for this study area:

Mitigation measure 1 *Pre-construction investigation of potential rock shelter(s) at Seaforth outside of cofferdam footprint but within the dredge footprint*

Mitigation measure 2 *Pre-construction investigation and monitoring of excavation within the cofferdam footprint during construction*

These measures along with associated flow diagrams are presented below. A process flow chart is also provided at the end of this section describing how the mitigation of potential impacts to potential submerged Aboriginal archaeological sites can be managed throughout the various stages of the project.

Mitigation Measure 1 – Pre-construction investigation of potential rock shelter(s) at Seaforth outside of Cofferdam footprint but within the dredge footprint

This mitigation measure should commence during the detailed design and construction planning phase (pre-construction phase) and would seek to mitigate the impact of dredging on potential rock shelters located outside of the cofferdam footprint. Such areas of potential have been identified only in Middle Harbour close to the Clive Park and Seaforth shorelines. A line of rock outcropping has been identified within the dredge footprint close to Seaforth Bluff. This feature would be the subject of the investigation for this measure.

Mitigation measure 1 should be carried out before construction begins (Figure 32). The first stage for this measure would be to investigate whether a high resolution geophysical survey may be of assistance in identifying rock overhangs concealed by marine sediments. This could ultimately save time. The seismic

reflection/refraction surveys done to date for the project are useful but of limited value for assessing potential submerged sites in the form of rock shelters.

If it is determined that a high resolution geophysical survey could produce the desired results, then the survey should be carried out.

If the geophysical survey conclusively shows that there are no rock overhangs measuring at least 1.5 metres in height (from the rock base to the rock ceiling), there would be no further work carried out. The 1.5 metre threshold has been set on the basis that archaeological deposits within smaller shelters are very unlikely to have survived inundation because of greater susceptibility to scouring and would be very difficult to identify in a marine environment. Any residual risk should be managed through an unexpected finds procedure.

However, if the geophysical survey is inconclusive or distinct rock overhangs are identified an archaeological dive investigation should be implemented. This would be a progressive sequence of probing through the sediments underneath the overhang with a thin rod to determine the size of any voids. A 1.5 m probe would be used as this is seen as the minimum feasible size for a rock shelter and is of a size that a diver can comfortably handle. Much of this diving work at this stage would be done in near zero visibility and will therefore be limited to what a diver can feasibly and safely do.

Where suitably large voids are identified underneath rock overhangs, the overlying Holocene marine sediments should be carefully excavated and removed using a diver-operated airlift (dredging device). At a pre-determined depth or an identified change in sediment type, divers would cease excavating and use a corer to take a controlled series of underlying sediment/rock samples; preferably where possible as continuous cores. These core samples would subsequently be examined for evidence of pre-inundation soil deposits.

If evidence of pre-inundation soils is identified in the core samples, then the feasibility of carrying out a controlled archaeological dive excavation should be assessed. Excavation methodologies would be directed towards achieving the highest amount of spatial and stratigraphic control possible – ie. excavating in grids and spits. However, physical environmental factors such as operating space within an overhang and water visibility would undoubtedly have an influence on how the excavation is carried out especially with respect to diver safety.

The above described geophysical survey, dive and possible archaeological dive investigation should all be carried out during the detailed design and construction planning phase.

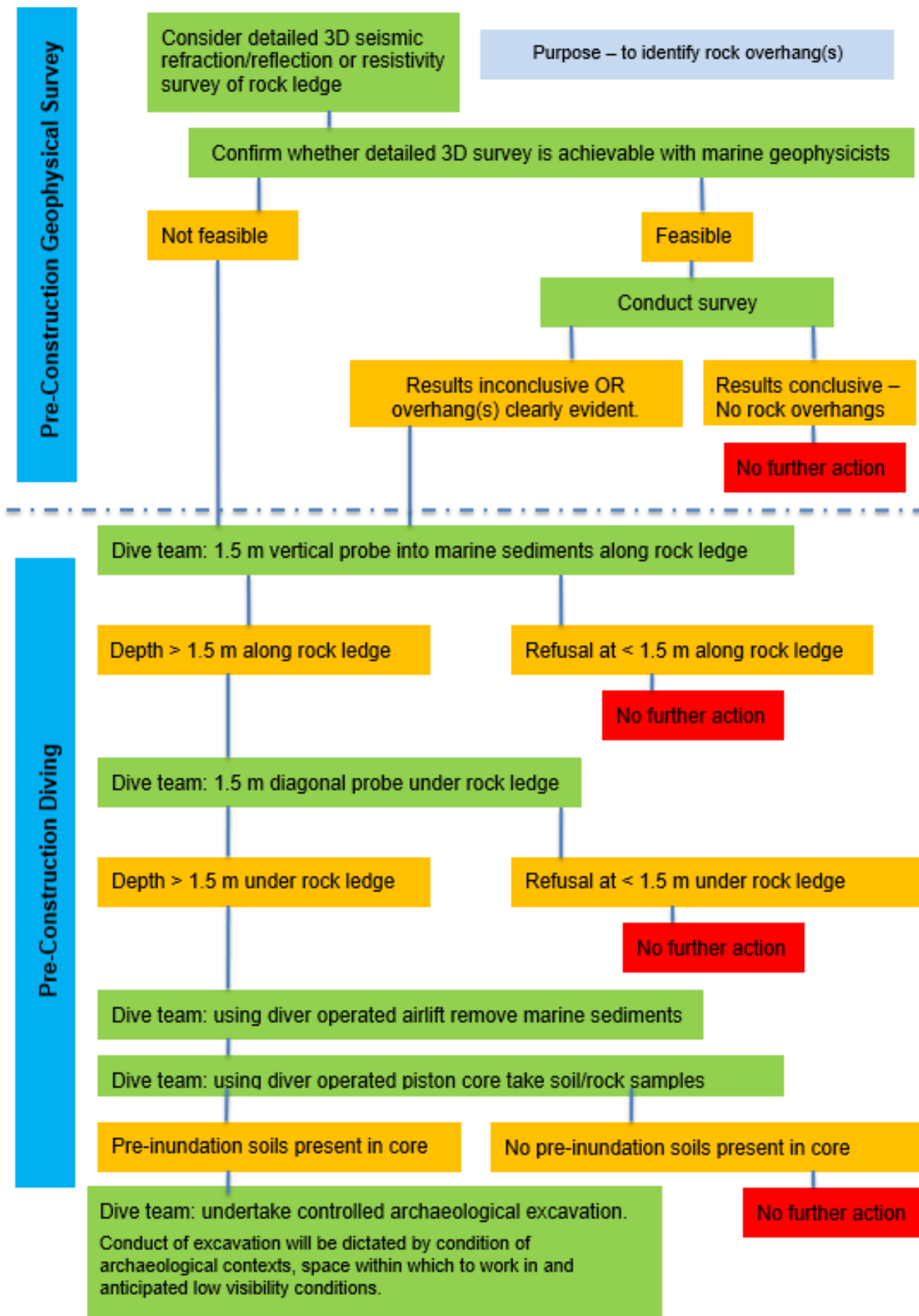


Figure 32: Flow chart of actions for Mitigation Measure 1 – Rock ledges outside of cofferdams but within the dredge footprint

Mitigation Measure 2 – Pre-construction investigation and monitoring of excavation within the cofferdam footprint during construction

Mitigation measure 2 should commence before the construction phase with the investigation into whether a high resolution geophysical survey may be of assistance in identifying rock overhangs concealed by marine sediments within the cofferdam footprint (Figure 33).

If it is determined that a high resolution geophysical survey could produce the desired results, then the survey should be carried out during the pre-construction period.

If the geophysical survey conclusively shows there are no rock overhangs that are sufficiently large enough to have served as shelters for occupation purposes – ie. at least 1.5 metres floor to ceiling height, there would be no further work carried out. Any residual risk should be managed through an unexpected finds procedure.

However, if the geophysical survey is inconclusive or there are distinct rock overhangs identified, then onsite visual monitoring of excavation within the cofferdam would be carried out during the construction period, after the cofferdam has been de-watered. The aim of the monitoring would be to identify voids within the bedrock close to the interface with marine sediments. It is understood that voids and fissures in the bedrock are of interest for engineering purposes, and so the excavation would always be primarily monitored as part of this process.

In the event that a void in the bedrock appears that displays the characteristics of a potential rock shelter, then the marine sediments should be removed by pump. Should the marine sediments bottom out onto the rock no further action would be taken. If the characteristics of the marine sediments change or if fissures are evident, then samples of the sediments should be taken, preferably as an intact core sample.

In consultation with a suitably experienced geomorphologist a set of criteria should be established for the identification of pre-inundation soil deposits (peat, charcoal, roots, etc). If pre-inundation soil deposits are evident within samples, a controlled archaeological investigation to recover any artefacts should take place. However, the extent of the archaeological investigation would need to be determined by the constraints of the bed rock conditions and safety constraints within the cofferdams, including workplace health and safety protocols for handling of potentially contaminated sediment. Environmental, engineering and workplace health and safety factors such as operating space within an overhang, viscosity of the pre-inundation soil and elevated contamination levels would have an influence on the method of archaeological investigation, which should nonetheless aim to retain spatial and stratigraphic control if at all feasible.

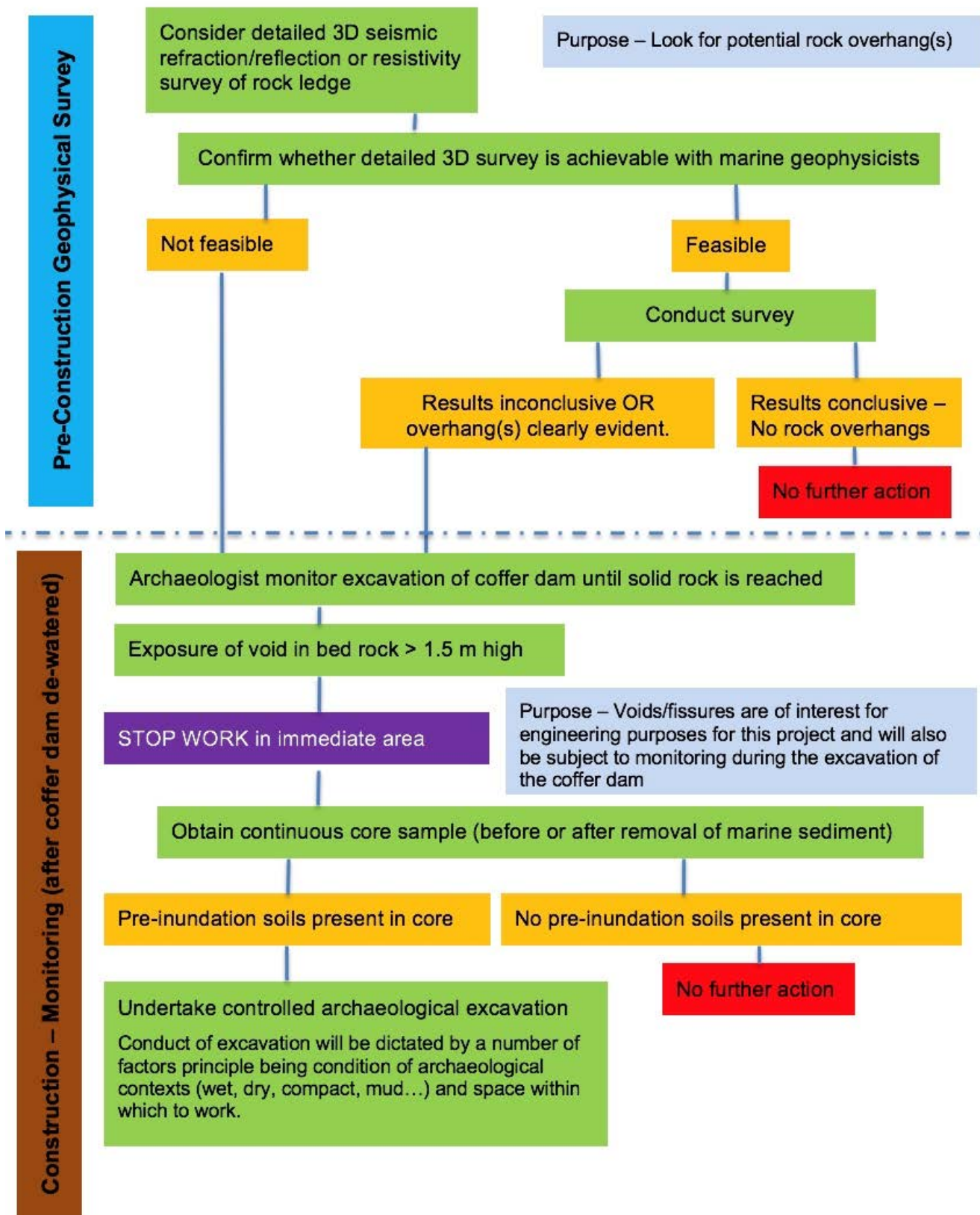


Figure 33: Flow chart of actions for Mitigation Measure 2 – Pre-construction investigation and Monitoring of excavation within the cofferdam footprint during construction

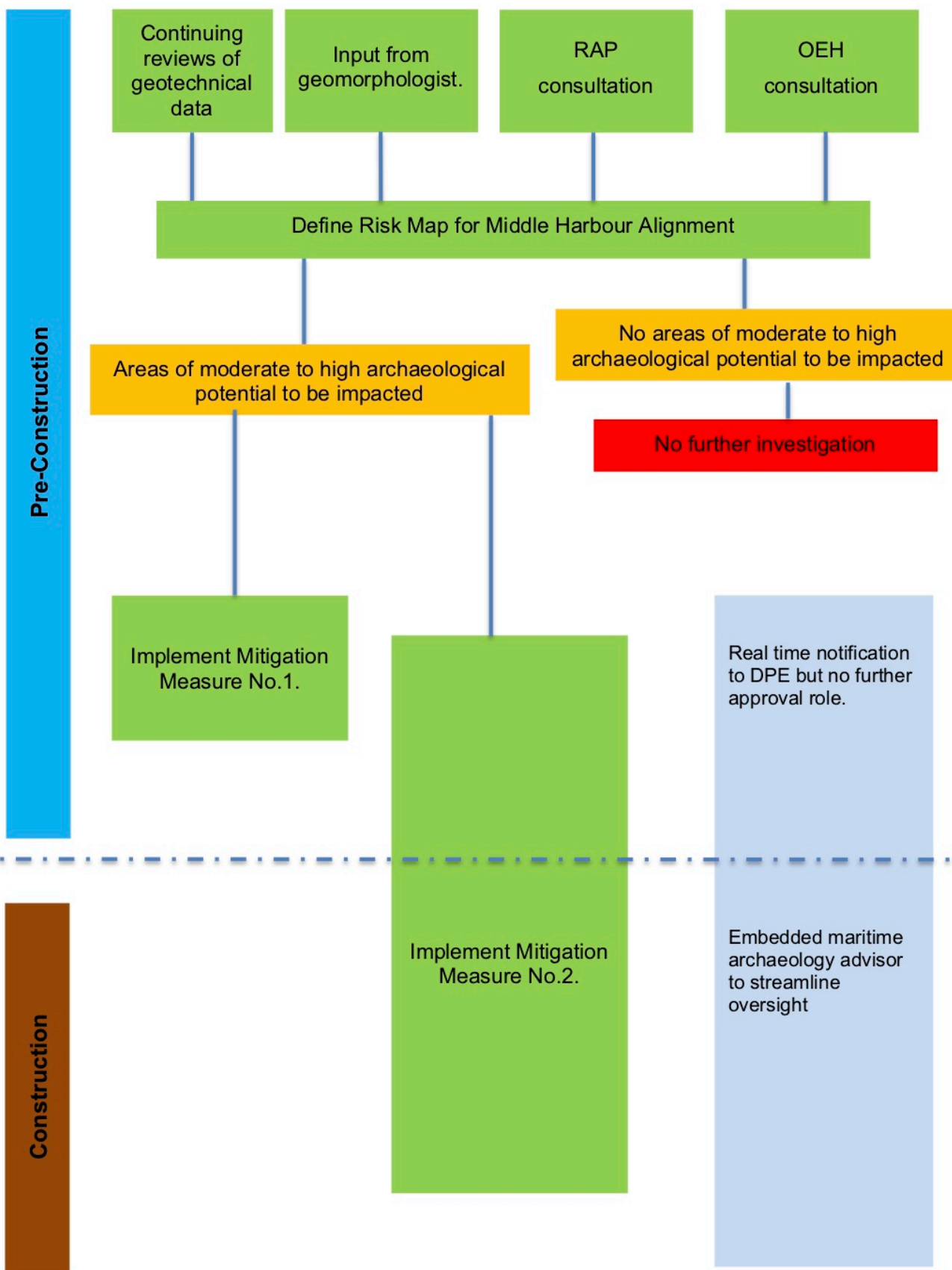


Figure 34: Process flow chart

REFERENCES

- Allen, M. J. & J. Gardiner (eds) 2001**, *Our Changing Coast: A Survey of the Intertidal Archaeology of Langstone Harbour, Hampshire*. Council for British Archaeology, York, UK.
- Artefact Heritage Services, 2016**, *HarbourLink Project – Preliminary Heritage Constraints Assessment*. Report to WSP / Parsons Brinckerhoff
- Arup wsp, 17 November 2017**, Western Harbour Tunnel and Beaches Link, Beaches Link – Tunnels Immersed Tube Tunnel. Sheet No. TM-2061 RMS Reg. No. DS2016/002059
- Attenbrow, V., 1987**, *The Upper Mangrove Creek Catchment: a study of quantitative change in the archaeological record*. Unpublished PhD Thesis, University of Sydney.
- Attenbrow, V., 1990**, *The Port Jackson Archaeological Project: Stage 1*. Unpublished report to the NSW National Parks and Wildlife Service.
- Attenbrow, V.J., 2002a**, *Sydney's Aboriginal Past: Investigating the Archaeological and Historic Records*. UNSW Press, Sydney.
- Attenbrow, V.J., 2002b**, *Resource and land use patterns around Sydney Harbour*. Unpublished seminar, Australian Museum, Prehistoric and Historical Archaeology Department.
- Attenbrow, V. & D. Steele, 1995**, "Fishing in Port Jackson, New South Wales – more than meets the eye." *Antiquity*. V. 69: 47-60.
- Bailey, G. N. & N. C. Flemming. 2008**. "Archaeology of the continental shelf: marine resources, submerged landscapes and underwater archaeology." *Quaternary Science Reviews* 27: 2153–2166.
- Benjamin, J., C. Bonsall, C. Pickard & A. Fischer (eds) 2011**, *Submerged Prehistory*. Oxbow Books, Oxford, UK.
- Birch, G. F., 2007**, "A short geological and environmental history of the Sydney estuary, Australia." In Birch, G. F. (ed). *Water, Wind, Art and Debate*, Sydney University Press, The Sydney University: 216
- Blaxell, G., 2009**, *The River: Sydney Cove to Parramatta*, Halstead Press: 28
- Bowdler, S., 1970**, *Bass Point: the excavation of a south-east Australian shell midden, showing cultural and economic change*. Unpublished BA (Hons) Thesis, Sydney University.
- CIRIA 1996** *Environmental assessment: good practice. Proceedings of Construction Industry Environmental Forum Conference*
- Commonwealth of Australia / Crawford House Publishing, 1995**, *Crawford's Mariners Atlas – Port Stephens to Jervis Bay (complete compendium of Royal Australian Navy Charts)*. Crawford Publishing House, Bathurst, NSW: Chart 24
- Cosmos Archaeology November 2017**, *Western Harbour Tunnel and Beaches Link: Maritime Archaeological Desktop Study*. Prepared for Roads and Maritime Services: Annex B
- Cosmos Archaeology Pty Ltd, November 2017a**, *Western Harbour Tunnel and Beaches Link – Maritime Archaeology Issues Paper*, prepared for Roads and Maritime Services.
- Cosmos Archaeology Pty Ltd, November 2017b**, *Western Harbour Tunnel and Beaches Link – Maritime Archaeological Desktop Study*, prepared for Roads and Maritime Services.
- Cosmos Archaeology Pty Ltd, April 2018**, *Western Harbour Tunnel and Warringah Freeway Upgrade Project, Maritime Heritage Impact Assessment*, prepared for Roads and Maritime Services.
- Douglas Partners & Golder Associates, August 2017**, Non-Core Drill Hole - Geological Log - Hole No: B120WA File: 16.0000302526.2138
- Earth Technology Solution Pty Ltd, July 2017a**, *WHTBL Marine Geophysical Survey July 2017, Sydney Harbour & Middle Harbour*. Report No ET471/1 prepared for Golder Associates Pty Ltd / Douglas Partners Pty Ltd on behalf of Roads & Maritime Services.
- Earth Technology Solution Pty Ltd, July 2017b**, *RMS Western Harbour Tunnel Beaches Link Seismic Refraction Survey July 2017*, Report No ET471.2 prepared for Golder Associates Pty Ltd / Douglas Partners Pty Ltd on behalf of Roads & Maritime Services: 3

Fischer, A. 2004. “Submerged Stone Age – Danish examples and North Sea potential”. In Flemming, N. C. (ed.) *Submarine Prehistoric Archaeology of the North Sea: Research Priorities and Collaboration with Industry*. CBA Research Report 141. York, Council for British Archaeology: 23–36.

Golder Associates and Douglas Partners, October 2017, Test Locations; Western Harbour Tunnel and Beaches Link; Middle Harbour. Drawing No. 2, Revision 1, drawn 19 October 2017.

Harris, P. and P. O’Brien, December 1998, *Australian Ports Environmental Data and Risk Analysis. Phase 1; Literature Review*, Prepared for Australian Quarantine Inspection Service (AQIS) Petroleum and Marine Division, Australian Geological Survey Organisation, Canberra, ACT.

Hedge, L.H., Ahyong, S.T., Booth, D.J. et al, 2014, *Sydney Harbour – A systematic review of the science 2014*. Sydney institute of Marine Science Technical Report: 6

Hiscock, P., 2008, *Archaeology of Ancient Australia*. Routledge, London and New York.

Jacobs, 21 December 2017, *Western Harbour Tunnel and Warringah Freeway disturbance footprint – Final GOLD release. Western Harbour Tunnel and Beaches Link Environmental Assessment*. Page 4 of 15

Jacobs Group Pty Ltd, 12 February 2018, *Beaches Link Disturbance Footprint – Revised Cofferdam (12.02.2018)*. *Western Harbour Tunnel and Beaches Link Environmental Assessment*.

Jacobs Group Pty Ltd, 2018. *Beaches Link and Gore Hill Freeway Connection, Beaches Link Cultural Heritage Assessment Report*. Report prepared for NSW Roads and Maritime Services.

Kohen, J. et al., 1984, “Shaws Creek Kill Rockshelter: a prehistoric occupation site in the Blue Mountains piedmont, eastern New South Wales.” *Archaeology in Oceania*. Vol. 19: 57-93.

Koppel, T. 2003. *Lost World: Rewriting Prehistory - How New Science is Tracing Americas Ice Age Mariners*. Atria Books, New York.

Lampert, R.J., 1971, “Burrill Lake and Currarong.” *Terra Australis* 1. Department of Prehistory, Australian National University, Canberra.

Lewis, S. E., C. R. Sloss, C. V. Murray-Wallace, C. D. Woodroffe & S. G. Smithers. 2013, “Post-glacial sea-level changes around the Australian margin: a review. *Quaternary Science Reviews*. Vol. 74.

Lourandos, H. & A. Ross, 1994, “The great ‘Intensification Debate’: Its history and place in Australian archaeology.” *Australian Archaeology*. 39:54-63.

Manly Council and Clontarf/Bantry Bay Estuary Management Working Group, 2007, *Clontarf/Bantry Bay Data Compilation and Estuary Processes Study*. Clontarf/Bantry Bay Estuary Management Planning Process, NSW.

Marine & Earth Sciences November, 2017, *Western Harbour Tunnel Beaches Link Seismic Refraction Survey*. Prepared for Golder Associates Pty Ltd.

Maritime Services Board of NSW, 1963 revised to 1975, “Plan Showing Hydrographic Survey – Balls Head to Pulpit Point”, pilot chart.

Masters, P.M. 1983. “Detection and assessment of prehistoric artefact sites off the coast of southern California.” in P. M Masters, and N. C Flemming (eds), *Quaternary Coastlines and Marine Archaeology*. Academic Press, New York.

Muche, J.F. 1978. “An inundated Aboriginal site, Corral Beach, California.” In J. Barto Arnold III (ed), *Beneath the Waters of Time: The Proceedings of the Ninth Conference on Underwater Archaeology*. Texas Antiquities Committee Publication No. 6 Austin, Texas, 101-108.

Nanson, G.C., R. W. Young & E. D. Stockton 1987, “Chronology and paleoenvironment of the Cranebrook Terrace (near Sydney) containing artefacts more than 40,000 years old.” *Archaeology in Oceania*. Vol. 22 (2): 72-78.

NSW Office of Environment & Heritage, Department of Premier & Cabinet, 2011, Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW.

Nutley, D. M., 2006, *The Last Global Warming? Archaeological Survival in Australian Waters*. Flinders University Maritime Archaeology Monograph Series Number 10.

Nutley, D., 2014, “Inundated site studies in Australia.” In A. Evans, N. Flemming & J. Flatman (ed.) *Prehistoric archaeology of the continental shelf: a global review*. 255–273.

Nutley, D.M., Coroneos, C. & J. Wheeler, 2016, “Potential submerged Aboriginal archaeological sites in South West Arm, Port Hacking, New South Wales, Australia.” In J. Harff, G.N. Bailey & F. Lüth (ed.). 2016. *Geology and archaeology: submerged landscapes of the continental shelf*: 265–285;

PIANC 2014, *Dredging and Port Construction: Interactions with features of archaeological or heritage interest*. : Appendix V – The Monitoring Programme for Archaeology in the Maasvlakte 2 Construction Project, Port of Rotterdam.

Roy, P.S., 1981, “Quaternary Geology.” in Herbert C, (ed.) *Geology of the Sydney, 1:1000,000 Sheet 9130*. Geological Survey of New South Wales, Sydney.

Roy P.S., Zhuang, W., Birch, G. F., Cowell, P.J. and Li, C., 1997, *Quaternary geology of the Forster-Tuncurry coast and shelf, Southeast Australia*. Geological Survey of New South Wales, Department of Minerals Resources, Sydney.

Sale, C., 2000, “Sydney: Olympic City 2000” *Geography Bulletin*. (Summer).

Stewart, D.J. 1999. “Formation processes affecting submerged archaeological sites: An overview.” *Geoarchaeology: An International Journal*, 15(6):565-187.

Stockton, E.D. & W.N. Holland, 1974, “Cultural sites and their environment in the Blue Mountains.” *Archaeology and Physical Anthropology in Oceania*. Vol. 9: 36-64.

Stright, M. 1990. “Archaeological sites on the North American continental shelf.” In N.P. Lasca, J. Donahue, (eds), *Archaeological Geology of North America: Centennial Special Volume 4*, Geological Society of America, Boulder Colorado, USA.

Thom, B.G., and P.S. Roy, 1985, “Relative sea levels and coastal sedimentation in southeastern Australia in the Holocene.” *Journal of Sedimentary Petrology*. Volume 55 (2)

Vinnicombe, P., 1980, “Predilection and Prediction: A Study of Aboriginal Sites in the Gosford-Wyong Region.” Unpublished report to the NSW National Parks and Wildlife Service.

Ward, I., P. Larcombe & P. Veth. 2015. “A new model for coastal resource productivity and sea level change: the role of physical sedimentary processes in assessing the archaeological potential of submerged landscapes from the northwest Australian coastline.” *Geoarchaeology* 30: 19–31

Williams, A.N., P. Mitchell, R.V.S. Wright & P.S. Toms, 2012, “A Terminal Pleistocene Open Site on the Hawkesbury River, Pitt Town, New South Wales. *Australian Archaeology*. No. 74.

Williams, R. J., 2014, “Estuarine shorelines of southeastern Australia.” In Swapan, P. (ed.) *Workbook for Managing Urban Wetlands in Australia*. Sydney Olympic Park Authority, NSW.