Cook Cove Northern Precinct Master Plan

Archaeological Report

Prepared for JBA Urban on behalf of Cook Cove Inlet Pty Ltd

12 May 2017

Biosis offices

AUSTRALIAN CAPITAL TERRITORY

Canberra
Floor 1, Unit 3, 38 Essington Street
Mitchell ACT 2911

Phone: (02) 6102 1200
Email: canberra@biosis.com.au

NEW SOUTH WALES

Newcastle
39 Platt Street
Waratah NSW 2298

Phone: (02) 4911 4040
Email: newcastle@biosis.com.au

Sydney
Unit 14 17-27 Power Avenue
Alexandria NSW 2015

Phone: (02) 9101 8700
Email: sydney@biosis.com.au

Wollongong
8 Tate Street
Wollongong NSW 2500

Phone: (02) 4201 1090
Email: wollongong@biosis.com.au

QUEENSLAND

Brisbane
Suite 4 First Floor, 72 Wickham Street
Fortitude Valley QLD 4006

Phone: (07) 3014 1110
Email: brisbane@biosis.com.au

VICTORIA

Ballarat
506 Macarthur Street
Ballarat VIC 3350

Phone: (03) 5304 4250
Email: ballarat@biosis.com.au

Melbourne (Head Office)
38 Bertie Street
Port Melbourne VIC 3207

Phone: (03) 8686 4800
Fax: (03) 9646 9242
Email: melbourne@biosis.com.au

Wangaratta
16 Templeton Street
Wangaratta VIC 3677

Phone: (03) 5718 6900
Email: wangaratta@biosis.com.au

Document information

Report to:	JBA Urban on behalf of Cook Cove Inlet Pty Ltd
Prepared by:	James Cole Rebecca Morris
Biosis project no.:	23972
File name:	23972.CookCoveNorthernPrecinct.AR.DR00.20170110.docx
Citation:	Biosis (2017). Cook Cove Northern Precinct Master Plan Archaeological Report. Report for JBA Urban. Authors: J Cole & R Morris, Biosis Pty Ltd, Sydney. Project no. 23972
LGA:	Bayside Council

Document control

Version	Internal reviewer	Date issued	Issued by
Draft 01	AJB	23/02/2017	JAC
Final 01	AJB	12/05/2017	JAC

© Biosis Pty Ltd

This document is and shall remain the property of Biosis Pty Ltd. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of the Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Disclaimer:

Biosis Pty Ltd has completed this assessment in accordance with the relevant federal, state and local legislation and current industry best practice. The company accepts no liability for any damages or loss incurred as a result of reliance placed upon the report content or for any purpose other than that for which it was intended.

Acknowledgements

Biosis gratefully acknowledges the contributions of the following people and organisations (listed alphabetically) in preparing this report:

Aboriginal community groups

- Metropolitan Local Aboriginal Land Council.

JBA Urban

- Alicia Baker
- Bernard Gallagher.

Biosis

- Lauren Harley for mapping.

Abbreviations

AHIMS	Aboriginal Heritage Information Management System
AMBS	Australian Museum Business Services
AR	Archaeological Report
DA	Determining Authority
DECCW	Department of Environment, Climate Change & Water
DP	Deposited Plan
DPE	Department of Planning and Environment
EFCP	Electrical Friction Cone Penetration
EP&A Act	*Environmental Planning and Assessment Act 1979*
GPS	Global Positioning System
GSV	Ground Surface Visibility
ICOMOS	International Council on Monuments and Sites
JMCHM	Jo McDonald Cultural Heritage Management
LALC	Local Aboriginal Land Council
RLEP 2011	*Rockdale Local Environment Plan 2011*
LGA	Local Government Area
MGA	Map Grid of Australia
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PAD	Potential Archaeological Deposit
SREPP 33	*Sydney Regional Environmental Plan No. 33 – Cooks Cove*
SWSOOS	Southern and Western Suburbs Ocean Outfall Sewer
The Code	The *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010)

Contents

List of Figures

List of Tables

List of Plates

Summary

Biosis Pty Ltd has been commissioned by JBA Urban on behalf of Cook Cove Inlet Pty Ltd to undertake an Aboriginal Archaeological Assessment for the proposed redevelopment of the site of the Kogarah Golf Course, Arncliffe, as part of a major mixed use project. It is intended that the study area will be developed into a mixed-use development zone as a sports and recreation precinct.

This assessment has been conducted in accordance with the conditions of the Draft Bayside West Land Use and Infrastructure Strategy, released by the Department of Planning and Environment, which stated that the proponent must complete ' an archaeological and Aboriginal cultural heritage assessment including a landscape heritage assessment taking into consideration the cultural landscape of the precinct and the landscape master plan'. The Archaeological assessment for this project has been undertaken in accordance with the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW 2010* (The Code).

Background research was undertaken for the study area, including a search of the Aboriginal Heritage Information Management System (AHIMS) database and a review of relevant reports. One previous assessment has been completed over the study area by Biosis (2001), which classified the study area as having low archaeological potential, however the report noted that it was possible that archaeological material was present in the buried, low lying marsh areas of the site (Biosis 2001, p. 18). The AHIMS search results identified 22 Aboriginal archaeological sites within a 10 kilometre by 10 kilometre search area centred on the study area, with no results falling within the study area.

The survey for this project was conducted on 20 January. The overall effectiveness of the survey for examining the ground for Aboriginal sites was considered to be low due to both low ground surface visibility predominantly due to vegetation cover and a low number of exposures. The survey did not identify any Aboriginal sites or objects within the study area, owing to extensive surface disturbance as a result of historical land use practices.

Based on the available evidence uncovered by this assessment, it is unlikely that any intact archaeological deposits are present within the study area. Based on the geotechnical data gathered to date, it appears that the fill which forms the current ground surface within the study area overlies either disturbed or imported sand and clay soil layers. If in situ soil deposits are present, they are located beneath the current groundwater level, and have a low potential to contain archaeological deposits.

Prior to any impacts occurring within the study area, the following is recommended:

Recommendation 1: No further archaeological assessment is required

It is recommended that no further archaeological assessment is required in the study area prior to the proposed development as this assessment has concluded that there is a low likelihood for Aboriginal sites to be present within the study area.

Recommendation 2: Discovery of unanticipated Aboriginal objects

All Aboriginal objects and places are protected under the *NSW National Parks and Wildlife Act 1974*. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the Office of Environment and Heritage (OEH). Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying the OEH and Aboriginal stakeholders.

Recommendation 3: Discovery of unanticipated historical relics

Should construction encounter unexpected historical structural or depositional remains, all works should cease. A determination should then be made by an appropriately qualified archaeologist of whether the remains identified are likely to be 'relics' under the *NSW Heritage Act 1977*.

Where the remains are identified as being 'relics', the Heritage Council of NSW must be notified in accordance with section 146 of the *NSW Heritage Act 1977*. Failure to notify the Heritage Council is considered an offence under the act, with penalties including fines and imprisonment. After contacting the Heritage Council, a permit or exemption should be sought under the relevant section of the act to allow works to recommence.

Recommendation 4: Discovery of Aboriginal ancestral remains

Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity you must:

1. Immediately cease all work at that location and not further move or disturb the remains
2. Notify the NSW Police and OEH's Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location
3. Not recommence work at that location unless authorised in writing by OEH.

1. Introduction

1.1 Project background

This report has been prepared, on behalf of Cook Cove Inlet Pty Ltd, to support a Planning Proposal which seeks to amend Rockdale Local Environmental Plan 2011 (RLEP 2011) to rezone land known as Cook Cove. The rezoning process will re-insert planning controls for Cook Cove within RLEP 2011 and consequently repeal Sydney Regional Environmental Plan No. 33 – Cooks Cove (SREP 33) which currently applies to the site.

Cook Cove is located adjacent the western foreshore of the Cooks River, in the suburbs of Arncliffe and Banksia within Bayside Council Local Government Area (LGA). The Cook Cove site comprises some 100ha of land, including that currently occupied by Kogarah Golf Course, located to the north of the M5 motorway (known as the Cook Cove Northern Precinct) and Barton and Riverine Parks, located to the south of the M5 motorway (known as the Cook Cove Southern Precinct).

The Planning Proposal, in conjunction with the remediation of contaminated public lands, the relocation of the publically accessible Kogarah Golf Course and ongoing environmental management as detailed with the Cook Cove Southern Precinct Development Application, aims to facilitate the redevelopment of the Cook Cove Northern Precinct into a new mixed use community incorporating a variety of uses including high density residential, commercial retail and office, cafes and restaurants, tourist and visitor accommodation, education, recreation, and community facilities.

This report applies to the Northern Precinct only and consists of an Aboriginal Archaeological Assessment for the proposed redevelopment. Biosis has been engaged to conduct an archaeological survey for the current study area in accordance with the *Due diligence code for the protection of Aboriginal objects in New South Wales 2010* (DECCW 2010a) (due diligence code) and the *Code of Practice for Archaeological Investigations of Aboriginal Objects in New South Wales* (The Code) (DECCW 2010b).

1.2 Study area

Cook Cove is located in the suburbs of Arncliffe and Banksia within the Bayside Council Local Government Area (LGA) (Figure 1). The site is located to the west of the Cooks River and Sydney Kingsford Smith Airport, approximately 10km south of the Sydney Central Business District (CBD), 6km west of Port Botany and 1.5km north-east of the Rockdale local town centre.

Cook Cove is strategically located within close proximity to a number of railway stations including Rockdale, Banksia, Arncliffe, Wolli Creek and the International Airport Terminal, which vary in distance from the site between 500m and 1.5km. The M5 motorway, which provides regional connectivity to the Sydney Metropolitan area, dissects the site into two distinct precincts, the Northern Precinct and Southern Precinct.

1.2.1 Cook Cove Northern Precinct

The current study area consists of the Cook Cove Northern Precinct (Figure 2). The Cook Cove Northern Precinct is located to the north of the M5 Motorway and Southern and Western Suburbs Ocean Outfall Sewer (SWSOOS), and is generally bound by the Cooks River to the east and Marsh Street to the north and west. The site is approximately 36.8ha and is owned and managed by a number of landowners, both public and private, including Kogarah Golf Club. Surrounding development includes a mix of low to medium density housing, recreation and open space and road and airport related infrastructure.

1.3 Planning approvals

The proposed development will be assessed against Part 5 of the *Environmental Planning and Assessment Act 1979* NSW (EP&A Act). Other relevant legislation and planning instruments that will inform this assessment include:

- Bayside West Precincts Draft Land Use and Infrastructure Strategy (draft LUIS)
- *Environmental Protection and Biodiversity Conservation Act 1999*
- Infrastructure State Environmental Planning Policy 2007
- NSW *National Parks and Wildlife Act 1974* (NPW Act)
- NSW *National Parks and Wildlife Amendment Act 2010*
- Rockdale Development Control Plan 2011
- *Rockdale Local Environmental Plan 2011* (RLEP 2011)
- Sydney Regional Environmental Plan No. 33 – Cooks Cove (SREP 33).

1.4 Assessment objectives

The major objectives of the assessment are to:

- Identify and consult with any registered Aboriginal stakeholders and the Metropolitan Local Aboriginal Land Council.
- Conduct additional background research in order to recognise any identifiable trends in site distribution and location.
- Search statutory and non-statutory registers and planning instruments to identify listed Aboriginal cultural heritage sites within the study area.
- Highlight environmental information considered relevant to past Aboriginal occupation of the locality and associated land use and the identification and integrity/preservation of Aboriginal sites.
- Summarise past Aboriginal occupation in the locality of the study area using ethnohistory and the archaeological record.
- Formulate a model to broadly predict the type and character of Aboriginal sites likely to exist throughout the study area, their location, frequency and integrity.
- Conduct a field survey of the study area to locate unrecorded or previously recorded Aboriginal sites and to further assess the archaeological potential of the study area
- Assess the significance of any known Aboriginal sites in consultation with the Aboriginal community.
- Identify the impacts of the proposed development on any known or potential Aboriginal sites within the study area.
- Recommend strategies for the management of Aboriginal cultural heritage within the context of the proposed development.

1.5 Investigators and contributors

The roles, previous experience and qualifications of the Biosis project team involved in the preparation of this archaeological report are described below in Table 1.

Table 1 Investigators and contributors

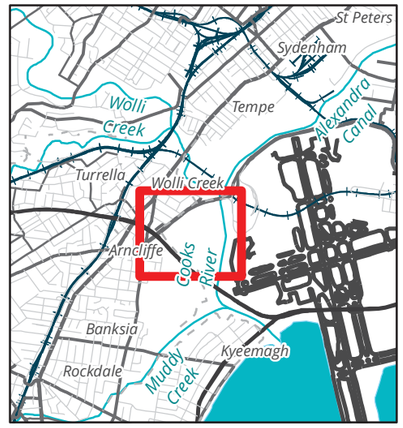
Alexander Beben	MA (Arch)	12 years experience
Alexander Beben is the Principal Archaeologist in NSW for Biosis Pty Ltd. Alex has twelve years archaeological experience and has conducted over 150 heritage projects across Australia and internationally in the UK and Italy. He has extensive experience in the successful completion of Aboriginal and historical assessments, archaeological surveys, excavations, permits and management plans. Alex is accomplished in obtaining approvals under the NSW *National Parks and Wildlife Act 1974* and NSW *Heritage Act 1977*. Alex has primarily undertaken projects on the east coast in New South Wales and Victoria and has a detailed understanding of the heritage values within the Illawarra, Sydney Basin, Cumberland Plain, Hunter Valley and rural areas such as Northern, Central West and Southern NSW. Alex has operated as the heritage consultant within large multidisciplinary teams tasked with delivering Environmental Impact Assessments (EIAs) under the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) and Commonwealth projects under *the Environmental Protection and Biodiversity Act 1999* (EPBC Act).		Project Roles • Technical review.
James Cole	**BA (Hons) Archaeology**	**3 years experience**
James Cole is an Archaeologist with Biosis Pty Ltd. James has three years archaeological experience in the management of both Aboriginal and historical heritage, participating in projects across NSW, Victoria, and Tasmania. James is skilled in both excavation and field recording and has developed his skills in Aboriginal and historical archaeology, on projects in Western Sydney, the Illawarra, and the Hunter Region. James is skilled in the completion of Aboriginal consultation, background research, predictive modelling, archaeological surveys, test and salvage excavation. This experience has expanded his skills in archaeological research and report writing, where he has authored in excess of 50 reports.		Project Roles • Project management • Aboriginal community consultation • Archaeological survey • Preparation of the report.
Rebecca Morris	**BA (Hons) Archaeology**	**1 year experience**
Rebecca is a research assistant with Biosis Pty Ltd. Rebecca graduated from the University of Sydney with First Class Honours in Archaeology and has experience with desktop assessments, archaeological field surveys, aboriginal and historical excavations, and the recording and analysis of cultural material. She also has skills in lithic analysis and project, administrative and client liaison experience. Most recently she has been involved in field survey, salvage and test excavation and archaeological report writing for Western Sydney, the NSW North Coast and the Southern Tablelands.		Project Roles • Background research.
Lauren Harley	**Dip GIS**	**6 years experience**
Lauren is a GIS Operator with Biosis. Lauren has over six years experience in the field of GIS and has worked on a diverse range of projects within both the private and public sectors. Before joining Biosis in 2015, Lauren worked within local government as a GIS Officer in the Land and Property Services Branch at Hornsby Council. In this role, Lauren was responsible for maintaining Council's GIS and Property Management		Project Roles • GIS mapping.

Systems. Lauren also provided technical and expert advice for a wide range of land and property information matters and trained staff in the use of GIS and related systems. Since joining Biosis, Lauren's experience with the preparation and production of high quality maps and plans and her proficiency across a wide range of technical skills including georeferencing, data conversion, data extracts, digitising, spatial analysis and data management has been demonstrated.	

Figure 1: Location of the study area

Biosis Pty Ltd
Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Matter: 23972
Date: 19 January 2017,
Checked by: JAC, Drawn by: LH, Last edited by: lharley
Location:P:\23900s\23972\Mapping\



Legend

Study area

Figure 2: Study area detail

0 30 60 90 120 150

Metres

Scale: 1:3,600 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Biosis Pty Ltd

Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Acknowledgements: Basemap © Land and Property Information 2016; Imagery © Nearmap 2017

Matter: 23972
Date: 19 January 2017,
Checked by: JAC, Drawn by: LH, Last edited by: lharley
Location:P:\23900s\23972\Mapping
23972_F2_StudyArea

2. Development proposal

The Planning Proposal seeks to amend Rockdale Local Environmental Plan 2011 (RLEP 2011) to insert land use zoning, maximum floor space ratio, maximum building height and various other provisions specific to Cook Cove (both Northern and Southern Precincts).

The Planning Proposal, as it applies to the Northern Precinct, is informed by the Cook Cove Northern Precinct Master Plan (the 'master plan'), dated 12 May 2017, prepared by Skidmore, Owings & Merrill (SOM). The key features of the master plan include:

- 16.74ha (45% of the Northern Precinct) of publicly accessible open space comprising, a 9ha Sports and Recreation Precinct featuring a 750 seat Premier League stadium with FIFA standard synthetic soccer pitch, 2 supporting synthetic soccer pitches and 1 grassed multipurpose field;
- a development precinct of approximately 21.6ha (13.6ha net of roads and open space) that will accommodate a total of 608,458m2 Gross Floor Area (GFA) made up of:
  - 542,368m2 of residential GFA;
  - 63,590m2 of commercial, retail and short stay accommodation GFA;
  - 2,500m2 of community and education GFA;
- 5,480 residential dwellings with a mix of one, two and three-bedroom apartments in a variety of building typologies ranging from 3 storey townhouses to 29 storey residential towers;
- a mixed use high street including retail, supermarket, community and commercial office, bookended by hotel and serviced apartments and a feature alfresco waterfront dining/retail precinct set amongst existing Moreton Bay Fig trees;
- a highly accessible and activated urban waterfront with regional graded pedestrian and cycle paths, pocket parks, outdoor dining, and community facilities;
- various walking and cycling paths, exercise areas, children's playgrounds and passive recreation spaces;
- local open space including the Central Greenway, multiple pocket parks and urban plazas and vegetated through-site links with water quality improvement measures;
- ecological improvements and enhancements throughout including naturalisation of the Cooks River foreshore and retention and enhance of the Green and Golden Bell Frog habitat;
- a 1.5ha site for a future education facility catering for up to 600 students; and
- improvements to connectivity including shared pedestrian/cycle bridges over the Cooks River, new intersections along Marsh Street and new bus stops throughout the precinct.

Figure 3 Proposed development.

3. Desktop assessment

A desktop assessment has been undertaken to review existing archaeological studies for the study area and surrounding region. This information has synthesised to develop an Aboriginal site prediction model for the study area and identify known Aboriginal sites and/or Places recorded in the study area. This desktop assessment has been prepared in accordance with requirements 1 to 4 of the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010).

3.1 Landscape context

It is important to consider the local environment of the study area in any heritage assessment. The local environmental characteristics can influence human occupation and associated land use and consequently the distribution and character of cultural material. Environmental characteristics and geomorphological processes can affect the preservation of cultural heritage materials to varying degrees or even destroy them completely. Lastly landscape features can contribute to the cultural significance that places can have for people.

3.1.1 Geology

The site is situated on the western margins of Botany Bay, bounded to the north and east by the Cooks River and to the south and west by urban settlement of Rockdale. The study area is contained within the Botany Lowlands physiographic region (Chapman & Murphy, 1989; Hazelton & Tille, 1990). The geological character of the area is described as Quaternary sand, peat and mud deposits, which overlies Hawkesbury Sandstone, present in the norther portion of the study area and common throughout the Sydney basin (Figure 4). Quartz and marine sand with varying amounts of shell fragments dominate the coastal and estuarine margins. Local relief of the undulating flood plain of the Cooks River is typically up to five metres with broad concave valleys and valley flats, although extensive remodelling of the landscape has removed all natural landform features in this area.

The majority of the land in and around the study area was (and in some locations still is) wetland, characterised by level to gently undulating swales, depressions and infilled lagoons on Quaternary sands.

3.1.2 Hydrology

Stream order is recognised as a factor which helps the development of predictive modelling in Aboriginal archaeology in NSW. Predictive models which have been developed for the region have a tendency to favour permanent water courses as the locations of campsites as they would have been more likely to provide a stable source of water and by extension other resources which would have been used by Aboriginal groups.

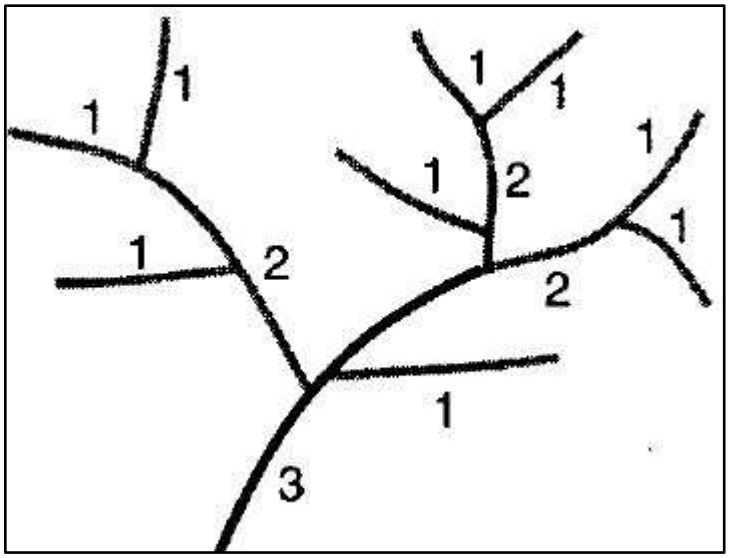


Plate 1 Diagram showing Strahler stream order (Ritter et al, 1995, p. 151).

The stream order system used for this assessment was originally developed by Strahler (1952). It functions by adding two streams of equal order at their confluence to form a higher order stream, as shown in Plate 1. As stream order increases, so does the likelihood that the stream would be a perennial source of water.

The study area is located adjacent to the Cooks River, a fourth order perennial source of water. There is also one ephemeral drainage channel located within the study area.

The study area has been subject to extensive disturbance, and the Cooks River has been diverted on a number of occasions in the local area due to land reclamation and the construction of Sydney Airport. As such, the hydrology of the area has been modified significantly, and it is difficult to make firm assessments about the exact location of watercourses prior to impacts as a result of European colonisation. It can be stated that the Cooks River would have been in close proximity to the study area, and likely flowed through the southern part of it.

3.1.3 Soil landscapes and geotechnical work

The study area is considered disturbed terrain, being predominately comprised of reclaimed land (Figure 5). According to Mitchell's landscapes the study area belongs to SnB Sydney – Newcastle Barriers and Beaches which comprise of "Quaternary coastal sediments on long recurved quartz sand beaches between rocky headlands." These are often backed by sand dunes and occasionally closed and open lagoons. An understanding of soil landscapes is useful as it assists in creating a model of site potential within the area. An understanding of the depth and composition of soils impacts on the likelihood for subsurface deposits to be present, with deeper deposits having a higher potential to contain archaeological deposits than comparatively shallow ones. In this instance, the extensive disturbance of the terrain suggests intact subsurface deposits are unlikely, excepting for areas of reclaimed land where the potential exists for early to mid Holocene material (Biosis 2001).

Previous geotechnical work

Based on the results of the prior assessment conducted for the site by Biosis (2001), it was understood that a surface survey would not be sufficient to adequately map the archaeological potential of the study area. As such, Biosis has referred to geotechnical and contamination works undertaken over the past 10 years at the site, in order to gain a better understanding of existing soil profiles across the study area, and attempt to identify the depth at which intact soil profiles are present.

Jeffery and Katauskas Pty Ltd (2008) undertook preliminary geotechnical investigations on behalf of Cook Cove Pty Ltd. The investigations consisted of the drilling of four boreholes to a depth of between 15.91 metres and 28.82 metres below the existing ground level, and ten Electrical Friction Cone Penetration (EFCP) tests, which ranged in depth from 4.3 metres to 32.2 metres. The assessment of subsurface conditions stated that 'subsurface conditions within the boreholes and EFCPs varied substantially and in general terms consisted of shallow to moderately deep sandy fill overlying a deep sequence of interbedded clays and sands above sandstone and shale bedrock. The depth to bedrock appears to increase substantially near the southern extremity of the site and may indicate a buried valley or watercourse in this area' (Jeffery and Katauskas Pty Ltd 2008, p. 5). A summary of the soil profiles as presented in the report is provided in Table 2.

Table 2 Geotechnical results for the study area (Jeffery and Katauskas Pty Ltd 2008, pp. 5-7).

Layer	Description
Fill	Fill containing a mixture of silt, sand, and clay, encountered at depths of 0.5m to 1.8m. Fill typically poorly to moderately compact.
Interbedded clays and sands	Intersected below fill layer. Upper profiles relatively loose and weak, but increased in density with depth, although this varied between the boreholes and EFCPs. Clays contained varying amounts of sand, shell, and organic matter. Underlying sands and clays improved in strength, with the sands ranging from medium dense to very dense, and the clays from stiff to very stiff.
Sandstone and shale bedrock	Bedrock belonging to the Hawkesbury Sandstone formation. Encountered at a depth of 10.82m in BH101, 9.97m in BH106, 29.4m in BH109, and 33.65m in BH113.

The results also indicated that groundwater seepage occurred within the boreholes at depths from 1.0 metres to 2.1 metres below existing levels in the boreholes, and inferred to be at 0.8 metres to 1.5 metres within the EFCPs. The report raised a number of issues with the soil profiles on site including: weak and variable subsoil layers, shallow groundwater level, and the softness of the sand subsoils.

The results of this assessment largely support the assessment of how the study area has developed over time, with the two boreholes situated further south within the study area being considerably deeper, which is consistent with land reclamation activities.

The study area itself is located within the Disturbed Terrain soil landscape, defined as areas where soils have been disturbed to at least a depth of 100 centimetres by human activity, including complete disturbance, removal, or burial of soil. In order to gain a clearer understanding of any soil profiles which may potentially underlie this disturbance, soil landscapes adjacent to the study area were examined. These included the Birrong and the Warriewood soil landscapes.

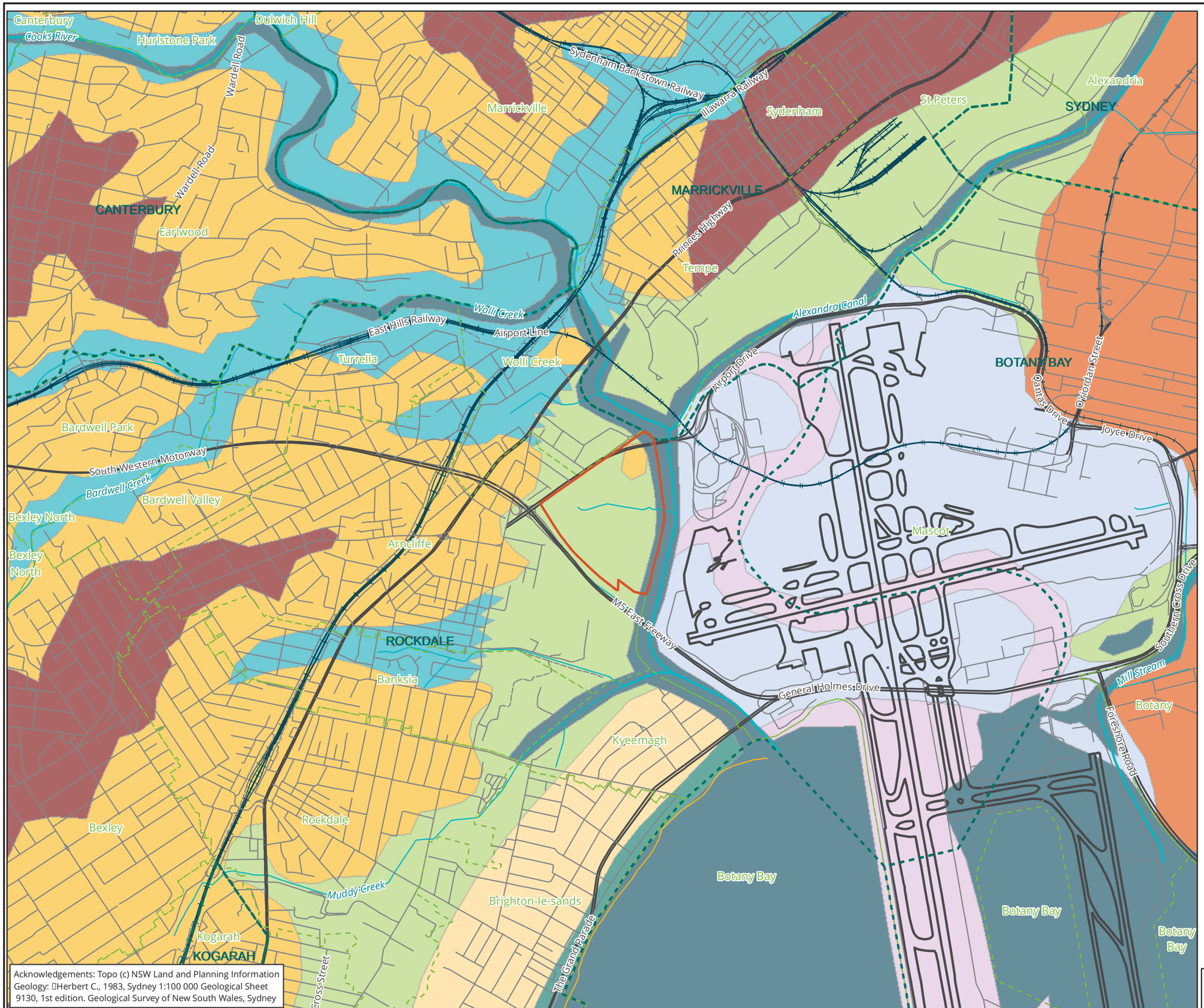
The Birrong soil landscape is typically present over the floodplains and watercourses draining the Wianamatta Group shales, including along the Cooks River. These soils are typically identified in association with level to gently undulating alluvial floodplains. They tend to be deep (>250 centimetres), and consist of clay loam layers overlying silty clay, which in turn overlies a mottled clay subsoil.

The Warriewood soil landscape is typically present over swales, depressions, and infilled lagoons on Quaternary sands. These soils are typically identified in association with level to gently undulating plains. They tend to be deep (>150 centimetres), and consist of sand and loamy sand topsoils and subsoils.

Geotechnical investigations undertaken in the study area revealed intersecting layers of sand and clay underlying the fill layers across the study area. This assessment was consistent throughout, including areas of reclaimed land, and suggests that whatever underlying soil profiles were present consist of redeposited or disturbed soil landscapes, or potentially that the study area was at the interface of these two soil landscapes.

3.1.4 Topography

The study area contains a number of landforms, but is predominately comprised of flats and gentle slopes. Given the degree of disturbance which exists throughout the site as a result of historical and recent uses, particularly land reclamation and the landscaping associated with its use as a golf course, an analysis of landforms is of limited use in this context.



Legend

- Study area

Geological Units (1:100 000)

- Qha,
- Qhb,
- Qhbr,
- Qhd,
- Qhs,
- Rh,
- Rwa, Ashfield Shale
- mf,
- mf/Qhs,
- water,

Figure 4: 1:100 000 geological units within and surrounding the study area

0 200 400 600 800 1,000

Metres

Scale: 1:20,000 @ A3

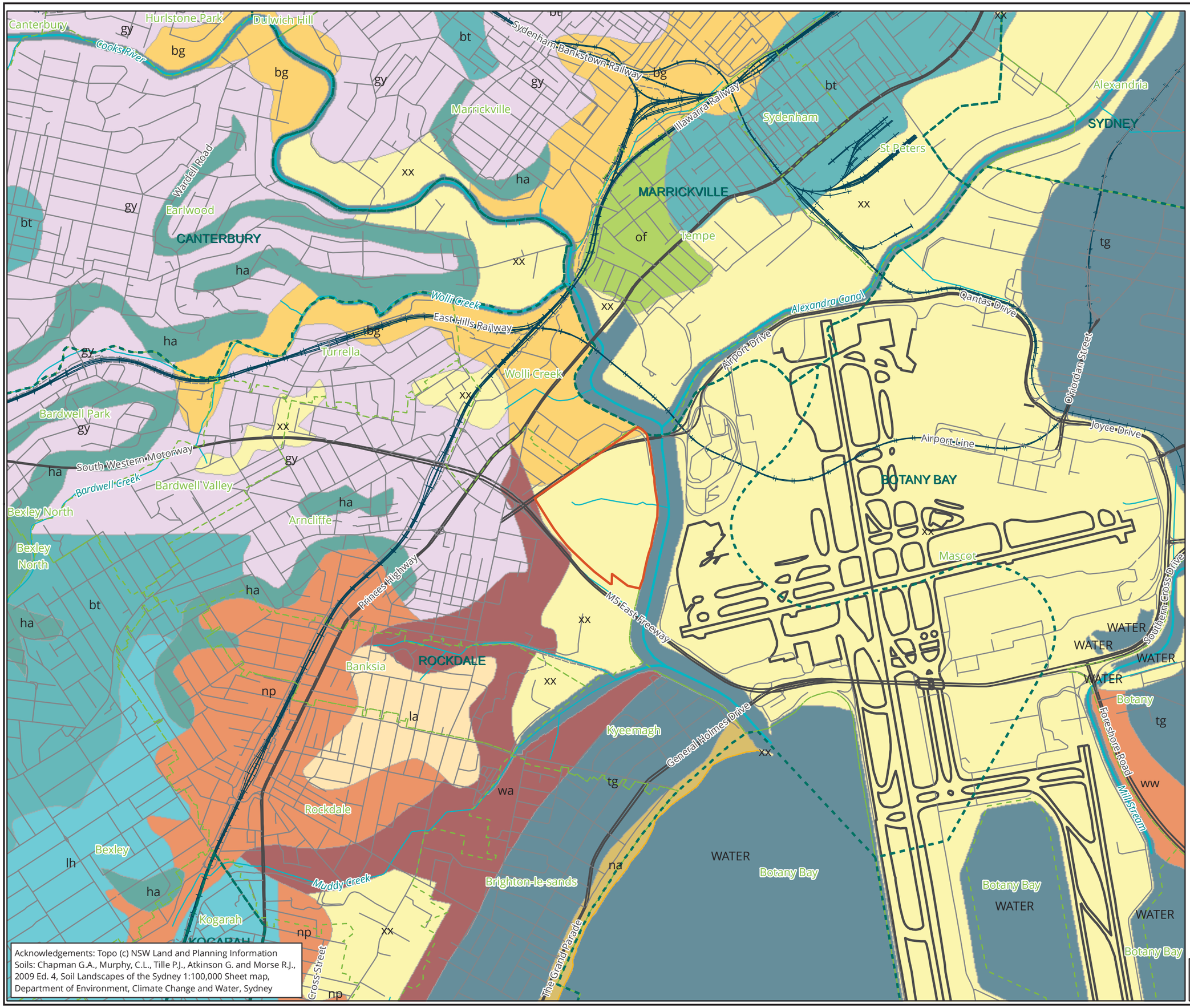
Coordinate System: GDA 1994 MGA Zone 55

Acknowledgements: Topo (c) NSW Land and Planning Information
Geology: Herbert C., 1983, Sydney 1:100 000 Geological Sheet 9130, 1st edition. Geological Survey of New South Wales, Sydney

Biosis Pty Ltd

Ballarat, Brisbane, Canberra, Melbourne, Sydney, Wangaratta & Wollongong

Matter: 23972,
Date: 16 February 2017,
Checked by: JAC, Drawn by: LH, Last edited by: lharley
Location:P:\23900s\23972\Mapping\23972_F4_Geology.mxd



Legend

Study area

Soil landscape 1:250 000

- BIRRONG
- BLACKTOWN
- DISTURBED TERRAIN
- GYMEA
- HAWKESBURY
- LAMBERT
- LUCAS HEIGHTS
- NARRABEEN
- NEWPORT
- OXFORD FALLS
- TUGGERAH
- WARRIEWOOD
- WATER
- WOY WOY

Figure 5: 1:250 000 soil landscapes within and surrounding the study area

0 210 420 630 840 1,050

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

Biosis Pty Ltd

Ballarat, Brisbane, Canberra, Melbourne, Sydney, Wangaratta & Wollongong

Acknowledgements: Topo (c) NSW Land and Planning Information
Soils: Chapman G.A., Murphy, C.L., Tille P.J., Atkinson G. and Morse R.J., 2009 Ed. 4, Soil Landscapes of the Sydney 1:100,000 Sheet map, Department of Environment, Climate Change and Water, Sydney

Matter: 23972,
Date: 16 February 2017,
Checked by: JC, Drawn by: LH, Last edited by: lharley
Location:P:\23900s\23972\Mapping
23972_F5_Soils.mxd

3.1.5 Landscape resources

The area has been extensively cleared of native vegetation; however the past environment, including the native vegetation would have offered rich resources to the Aboriginal population.

Native fauna would have included a wide variety of birds, reptiles, kangaroos and wallabies, possums and echidna. These resources would have included terrestrial mammals and avian resources used for food, tool making, and clothing and potentially provide and are interconnected with social and ceremonial aspects of Aboriginal life. Terrestrial and avian resources were not only used for food, but also provided a significant contribution to the social and ceremonial aspects of Aboriginal life through their use as ritual implements or even simply through fashioning as personal adornments (Attenbrow 2010, p. 107-10). Mammals such as kangaroos and wallabies and arboreal mammals such as possums were used as a food source and also for tool making. Bones and teeth were used as points or barbs for hunting spears and fishing spears. Tail sinews are known to have been used as a fastening cord, whilst 'bone points' frequently occur in rock shelters (Attenbrow 2010, p. 99). Animal skin, fur and sinews were also used for personal adornment and in making cloaks.

In the inner parts of Botany Bay even up as far as Wolli Creek oysters would have been plentiful. Many other mollusc species were eaten, some abundant in the estuaries, such as whelks, cockles, periwinkles and snails, and others on the rock platforms fringing the headlands such as rock oysters, tritons, turbans, limpets and mussels.

A wide variety of fish was available in the Bay and along the coast. There may also have been the occasional seals, dolphins and beached whales. Stingrays were also present in the bay and would have provided a source of food, Captain Cook mentions that sting rays were a welcome addition to the Endeavours rations during his visit to Botany Bay in 1770. Flora species such as Lilli Pilli and Cabbage Tree Palms and numerous other naturally occurring food plants would have supplemented the indigenous populations' diet.

The landscape itself was well suited for occupation with Hawkesbury sandstone outcrops to the south and west of Cooks Cove affording shelter in the numerous caves and rock shelter/overhangs that are found in sandstone country. In addition to a shelter these features were used as sites of Aboriginal art (engravings and paint). Springs and rock pools ensured supplies of fresh water and the grainy stone was used to sharpen tools.

3.1.6 Land use history

Captain Cook described the area of the Cooks River and Wolli Creek as "a fine meadow", an assessment rejected by Governor Phillip who described the same area 18 years later as "marshes…not to be attempted by first settlement (Geeves & Jervis 1986, p. 7). This unflattering opinion of the area and the difficulties of travel in the early colonial period meant that the Botany Bay area remained substantially undeveloped until the 1830s. In particular this was the case with the sand dunes and wetlands adjacent to the Cooks River and Botany Bay. In the early 1800s the area was primarily utilised for collecting timber and extracting shell to produce lime for mortar. Lime burners were active in the area for more than 60 years and it is likely that many Aboriginal middens were destroyed during that time.

Land was granted or otherwise acquired and land clearance was carried out in earnest prior to the 1830s. To service these properties several watercourses were dammed, including the Cooks River. The first formal subdivisions in the area occurred in the 1830s and 1840s, the majority small houses and utilities, until a recession in the 1840s saw building markedly decline.

During the years 1879 to 1898 a number of parks were developed in the area. This included over 100 acres of tidal wetlands were given to the council to form Scarborough Park, which was soon followed by the acquisition of Cooks Park.

Communications and access were rudimentary in the early years. Prior to the 1830s tracks pushed through the bush connected estates and settlement pockets. From the 1830s better roads were constructed, generally by the occupants of the region, including Rockey Point Road and Muddy Creek Road. These roads and the arrival of the railway opened up the area for a dramatic increase in the population. In the 1870s residents along Rocky Point Road began building private roads including Spring Street. This intensified in the 1880s and by 1886 the area was on mains gas, with mains water by the centenary in 1888.

A number of major historical developments have significantly altered the landscape of the Cook Cove site and its potential to contain in situ Aboriginal material.

When the main works of the Southern Sewerage System were formulated in 1877, the original design did not provide for an ocean outfall but was planned to terminate at a sewage farm. The site selected and resumed in 1882 was 309 acres of Webb's Grant (located immediately to the north-east of the study area) and was located on the tongue of land created by a large meander in the Cooks River (Plate 3). Later an additional 311 acres were resumed.

Plate 2 1930 aerial photograph of the study area (NSW LPI 2016).

The area of the sewage farm was bounded by the Cooks River, Botany Bay, Bestic Street, Eve Street and Marsh Street. The farm consisted of irrigation farming, filtration beds and underbed drains at some depth. The farm closed in 1916 with the completion of the Southern and Western Suburbs Ocean Outfall Sewer (SWSOOS) and the land was sold off. During its operation the land was extensively disturbed and the areas closest to the Cooks River were reclaimed (Plate 2). The majority of the old farm became Kingsford Smith Airport when the Cooks River was diverted in 1947-56. The south-western section of the farm is located within the study area and is now the Kogarah Golf Course, Barton Park and some of the other recreational areas.

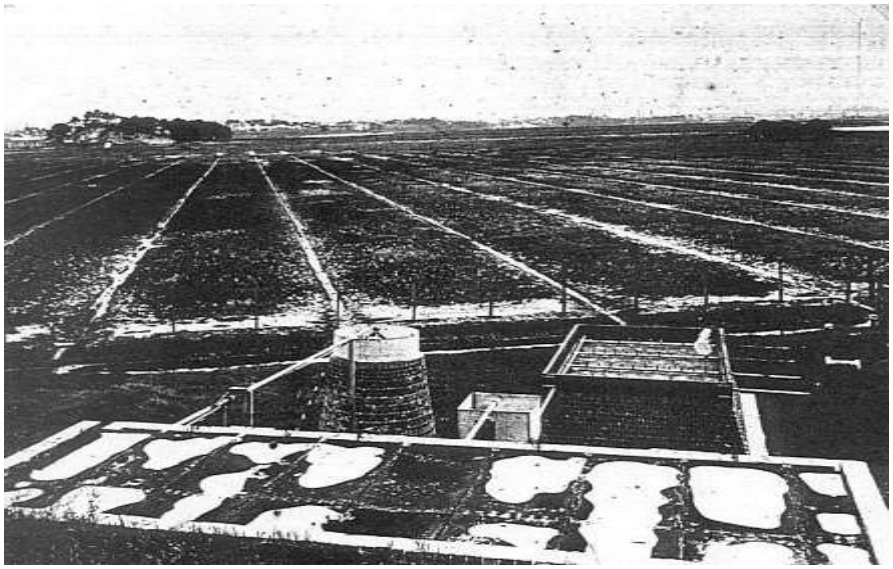


Plate 3 Arncliffe Sewage Farm (Rockdale Local History Collection).

The Cooks River itself forms the northern and eastern boundary to the Cooks Cove site and also experienced extensive modification over the last two hundred years. The Cooks River Dam, which was located where the modern Cooks River Bridge (Pacific Highway) now crosses the river, was built in 1839 resulting in the formation of a formed river channel (Plate 4). The dam was eventually removed prior to the realignment of the River in 1947. Siltation upstream and associated dredging and dumping of the dredged material covered large areas of land on either side of the river.

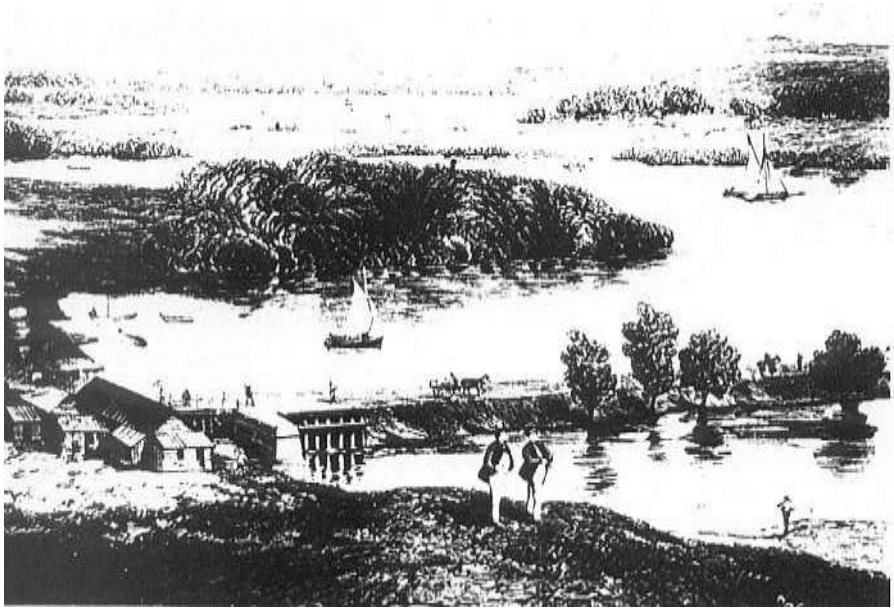


Plate 4 Image of Cooks River Dam during the mid 19th Century (source Rockdale Local History Collection).

Most recently, the expansion of the airport after World War II meant that the Cooks River had to be completely diverted below the line of the dam as shown in Plate 5. Between the years of 1947 and 1956 the river was realigned to the west and south west which resulted in the destruction of large sections of the estuarine wetlands and original river shore. It also affected the remaining Cooks Cove site with the reconfiguration of Muddy Creek and through the construction of lining and bunding along the river edge.

Prior to and during these major river works irrigation channels, large open drains and other features were constructed in the Cooks Cove site to aid in the draining of the site. Despite these efforts old aerial photos show that the northern section of Barton Park was frequently inundated. After the construction of the new river alignment approximately 70% of the land to the south of the SWSOOS and approximately 80% to the north was subject to land filling operations resulting in the present landscape.

Plate 5 1978 aerial of the study area (NSW LPI 2016).

3.2 Previous archaeological work

A large number of cultural heritage surface (surveys) and sub-surface (excavations) investigations have been conducted throughout the Botany Bay region in the past 30 years. There has been an increasing focus on cultural heritage assessments in NSW due to ever increasing development, along with the legislative requirements for this work and greater cultural awareness of Aboriginal cultural heritage.

3.2.1 Regional context

AMBS (2003) undertook an excavation at an Aboriginal shell midden site in Kendrick Park, Tempe. The assessment identified six stone artefacts, as well as locally available estuarine shell and three animal bone fragments. Radiocarbon dates from and intact layer of the midden dated the midden to around 4,000 years BP.

Jo McDonald Cultural Heritage Management (JMCHM2005) undertook a salvage excavation at Discovery Point, north of Tempe House. The assessment was hampered by historical disturbance, however a total of 389 stone artefacts were recovered from a number of knapping floors within a sand body, as well as one

hearth. Silcrete was the dominant raw material, with artefact densities generally low. Radiocarbon dating from the site returned a date of 9,376 ± 61 years BP.

JMCHM (2006) undertook a salvage excavation in the vicinity of Tempe House, within two excavation areas. The assessment identified densities of stone artefacts and shell midden material, with carbon dating placing the site between 3,600 and 4,900 years BP. There were no animal bones identified at the site, and it was concluded that the evidence likely represented a series of short-term camping events.

3.2.2 Local context

AECOM (2015) undertook Aboriginal and historical assessments for the New M5 component of the Westconnex project in 2015, which included a portion of the current study area along its northern boundary. The background assessment undertaken by AECOM stated that areas within the corridor that were contained within the Disturbed Terrain soil landscape had a low archaeological potential within the fill itself, and that underlying soil profiles may have been disturbed by fill activities (AECOM 2015, p. 23).

On the basis of the background review undertaken by AECOM, the following predictions were made in relation to Aboriginal heritage:

- *Surface evidence of past Aboriginal occupation within the project corridor and construction footprint is likely to comprise rock shelter sites, shell middens, scarred trees and stone artefact sites in surface and subsurface contexts.*
- *Rock shelter sites will be located in areas of significant sandstone outcrops such as the Wolli Creek Valley, and may include archaeological features such as art, stone artefacts, midden and archaeological deposit.*
- *Aboriginal shell midden sites will occur in tidal estuarine foreshore zones (that is, within 10 metres of high water level) associated with the Cooks River, Wolli Creek, around Botany Bay and the original alignment of Sheas Creek in areas not subject to significant landscape modification. The location of shell midden sites may be considerable distances from existing foreshore areas and may represent past foreshore environments.*
- *Scarred trees may occur in areas of remnant bushland such as the Wolli Creek Valley, Stotts Reserve and the Bardwell Creek Valley.*
- *Stone artefact sites, comprising flaked stone assemblages most likely of silcrete and tuff, where identified, will be located in areas of remnant landscape such as Wolli Creek Valley, Stotts Reserve and the Bardwell Creek Valley. Stone artefact sites may occur in surface or sub-surface contexts.*
- *Aboriginal archaeological sites are highly unlikely to occur in areas previously subjected to significant levels of landscape modification as a result of urban development* (AECOM 2015, p. 33).

Within the 'Arncliffe Surface Works' (the area assessed by AECOM which overlaps with the current study area), the results of the archaeological survey stated that overall visibility was poor, and that the ground integrity was low. The assessment stated that there was extensive landscape modification from land reclamation and the construction of the golf course, with no original landscape being retained, and concluded that there was no archaeological sensitivity as a result of this disturbance (AECOM 2015, p. 35).

The historical assessment for the surface works noted that the area was used for market gardening throughout the mid-20th century, and that at the time the area appeared to be low-lying and subject to flooding. It was considered that there was a low potential for historical heritage items to remain in the area.

Biosis (2001) undertook an Aboriginal heritage assessment for the Cooks Cove Master Plan, a wider precinct that encompasses the current study area. The assessment noted that ethnographic and archaeological evidence available at the time for the Botany Bay region indicated that the area would have been subject to

intensive occupation by Aboriginal people, and that this would result in a number of site types being present in the local area, including open campsites, shell middens and burials.

The site inspection identified that the area was heavily disturbed, and no archaeological sites or areas of potential were identified. The results stated that ' the majority if not all of the evidence of past Aboriginal occupation/ Aboriginal history on the site has since been removed, heavily disturbed or buried under deep landfill' (Biosis 2001, p. 18).

It was concluded that 'excluding the areas of reclaimed land there is a small possibility of Pleistocene or early Holocene archaeological material existing in the river gravels and salt water swamp deposits lying under the derived material. The depth of these deposits (below the surface) and their integrity is unknown and would need to be assessed by geomorphological investigation' (Biosis 2001, p. 18).

Biosis stated that there was a low potential for any Aboriginal sites to be identified, and recommended that no further assessment was required prior to development.

3.2.3 AHIMS site analyses

A search of the OEH Aboriginal Heritage Information Management System (AHIMS) database (Client Service ID: 261291) on 9 January 2017 identified 22 Aboriginal archaeological sites within a 10 kilometre search area, centred on the study area (Figure 6). None of these registered sites are located *within* the study area. AHIMS search results are provided in Table 3. The mapping coordinates recorded for these sites were checked for consistency with their descriptions and location on maps from Aboriginal heritage reports where available. These descriptions and maps were relied where notable discrepancies occurred.

It should be noted that the AHIMS database reflects Aboriginal sites that have been officially recorded and included on the list. Large areas of NSW have not been subject to systematic, archaeological survey; hence AHIMS listings may reflect previous survey patterns and should not be considered a complete list of Aboriginal sites within a given area.

Table 3 AHIMS search results within 5 kilometres of the study area.

AHIMS Site No	Site Name	Site Types	Status
45-6-2597	Wynyard St Midden	Shell, Artefact	Valid
45-6-2358	K1(same as site 45-6-2198)	Shell, Artefact	Deleted
45-6-2671	Wolli Creek 3	Artefact : 3	Valid
45-6-2737	Tempe House 1	Artefact, Potential Archaeological Deposit (PAD)	Partially Destroyed
45-6-2547	Nanny Goat Hill 1;NGH 1;	Artefact	Valid
45-6-0615	Undercliffe Road	Shell, Artefact, Art (Pigment or Engraved)	Valid
45-6-0629	Buoy;Botany Shell Midden;	Artefact, Shell, Burial	Valid
45-6-2414	Wolli_Creek 1.6;	Artefact	Valid
45-6-2415	Wolli_Creek 1.4;	Artefact	Valid
45-6-2564	Wolli Creek 2.5	Shell, Artefact	Valid
45-6-2565	Wolli Creek 2.4	Artefact	Valid

AHIMS Site No	Site Name	Site Types	Status
45-6-2566	Wolli Creek 2.1	Artefact	Valid
45-6-2567	Wolli Creek	Shell, Artefact	Valid
45-6-2568	Wolli Creek	Artefact	Valid
45-6-2416	Wolli_Creek 1.3;	Shell, Artefact	Valid
45-6-2417	Wolli_Creek 1.2;	Shell, Artefact	Valid
45-6-2418	Wolli_Creek 1.1;	Artefact	Valid
45-6-2198	View Street	Shell, Artefact	Valid
45-6-0751	Shea's Creek Dugong	Artefact, Aboriginal Resource and Gathering, Non-Human Bone and Organic Material	Destroyed
45-6-1496	Shea's Creek	Shell, Artefact	Valid
45-6-1648	Bibby Street;Carlton;	Art (Pigment or Engraved)	Valid
45-6-2654	Fraser Park PAD	Potential Archaeological Deposit (PAD)	Valid

3.3 Discussion

Based on the background review completed, it is clear that any Aboriginal archaeology present in the study area would take the form of subsurface deposits. All available evidence suggests that the entirety of the study area has been subject to heavy disturbance to a depth of at least 1 metre, with the southern portion of the study area being constructed entirely on reclaimed land. As such, there is an extremely low potential for surface sites to be identified. Should any surface sites be identified during the survey, they will be located in a disturbed context.

Locally, it is clear that the most commonly identified archaeological sites are artefact sites and shell middens, with rock shelters also common in areas with the appropriate geology and topography. Archaeological deposits in sand bodies are also present in the local area, with multiple excavations having occurred in Tempe, demonstration occupation of the study area up to 9,000 years before present at least.

3.3.1 Predictive statements

A model has been formulated to broadly predict the type and character of Aboriginal cultural heritage sites likely to exist(ed) throughout the study area and where they are more likely to be located.

This model is based on:

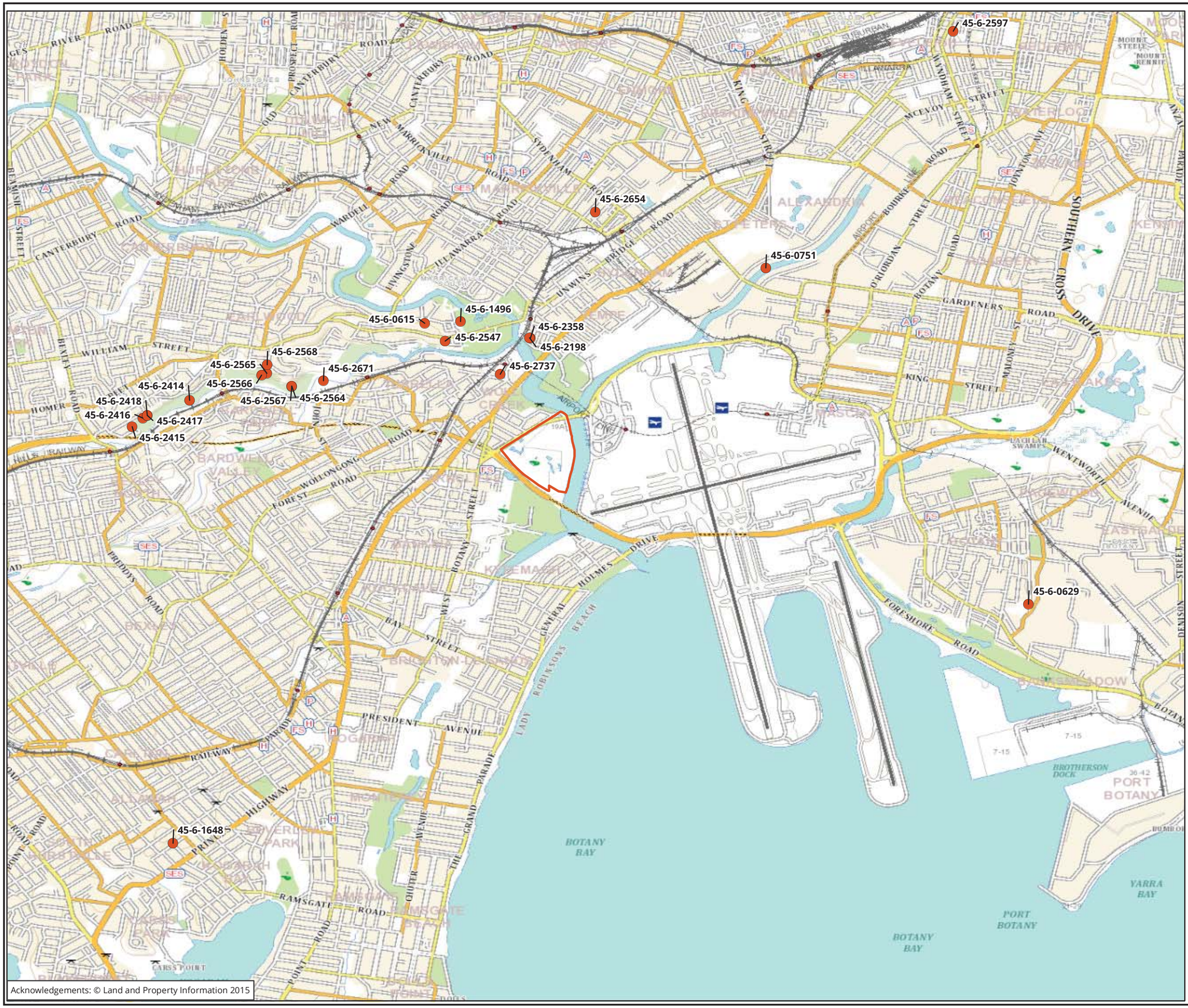
- Site distribution in relation to landscape descriptions within the study area.
- Consideration of site type, raw material types and site densities likely to be present within the study area.
- Findings of the ethnohistorical research on the potential for material traces to present within the study area.
- Potential Aboriginal use of natural resources present or once present within the study area.
- Consideration of the temporal and spatial relationships of sites within the study area and surrounding region.

Based on this information, a predictive model has been developed, indicating the site types most likely to be encountered during the survey and subsequent sub-surface investigations across the present study area (Table 4). The definition of each site type is described firstly, followed by the predicted likelihood of this site type occurring within the study area.

Table 4 Aboriginal site prediction statements.

Site type	Site description	Potential
Flaked stone artefact scatters and isolated artefacts	Artefact scatter sites can range from high-density concentrations of flaked stone and ground stone artefacts to sparse, low-density 'background' scatters and isolated finds.	**Low**: Owing to heavy disturbances and landscaping within the study area, as well as the large part of it which is built on reclaimed land, there is a low potential for this site type to be identified in the study area. If artefacts are identified, they will almost certainly be located in a disturbed context.
Potential archaeological deposits (PADs)	Potential sub surface deposits of cultural material.	**Low:** Previous reports have indicated the potential for archaeological deposits to be present beneath fill layers within the study area. This potential is extremely limited within the study area, given the impact of past land use activities, the level of fill present, and the level of the water table. This is reflected in the results of the geotechnical assessment.
Shell middens	Deposits of shells accumulated over either singular large resource gathering events or over longer periods of time.	**Low:** Shell middens are a common site type in the local area. Owing to heavy disturbances and landscaping within the study area, as well as the large part of it which is built on reclaimed land, there is a low potential for this site type to be identified in the study area. In addition to this the course of the Cooks River has been changed on a number of occasions, is likely to have impacted on any middens located on the shoreline.
Burials	Aboriginal burial sites.	**Low:** Aboriginal burial sites are generally situated within deep, soft sediments, caves or hollow trees. Areas of deep sandy deposits will have the potential for Aboriginal burials.
Aboriginal places	Aboriginal places may not contain any "archaeological" indicators of a site, but are nonetheless important to Aboriginal people. They may be places of cultural, spiritual or historic significance. Often they are places tied to community history and may include natural features (such as swimming and fishing holes), places where Aboriginal political events commenced or particular buildings.	**Low**: There are currently no recorded Aboriginal historical associations for the study area.

Site type	Site description	Potential
Aboriginal ceremony and Dreaming Sites	Such sites are often intangible places and features and are identified through oral histories, ethnohistoric data, or Aboriginal informants.	**Low**: There are currently no recorded mythological stories for the study area.
Post-contact sites	These are sites relating to the shared history of Aboriginal and non-Aboriginal people of an area and may include places such as missions, massacre sites, post-contact camp sites and buildings associated with post-contact Aboriginal use.	**Low**: There are no post-contact sites previously recorded in the study area and historical sources do not identify one.
Axe grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	**None**: The geology of the Study Area lacks suitable horizontal sandstone rock outcrops for axe-grinding grooves. Therefore there is low potential for axe grinding grooves to occur in the study area.
Rock shelters with art and / or deposit	Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground characterised by cliff lines and escarpments. These naturally formed features may contain rock art, stone artefacts or midden deposits and may also be associated with grinding grooves.	**None**: The sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space exist, which are not present in the study area.
Modified trees	Trees with cultural modifications	**None**: There are no mature growth trees within the study area, and this is an uncommon site type in the local area.
Quarries	Raw stone material procurement sites.	**None**: There is no record of any quarries being within or surrounding the study area.



Legend

- AHIMS Records
- Study area

Figure 6: AHIMS sites in the vicinity of the study are

0 400 800 1,200 1,600 2,000

Metres
Scale: 1:40,000 @ A3
Coordinate System: GCS GDA 1994

N

Biosis Pty Ltd

Ballarat, Brisbane, Canberra, Melbourne, Sydney,Wangaratta & Wollongong

Matter:
Date: 16 February 2017,
Checked by: lharley, Generated by: lharley
Location:P:\23900s\23972\Mapping
23972_F6_AHIMS.mxd

4. Archaeological survey

A field survey of the study area was undertaken on 20 January 2017. The field survey sampling strategy, methodology and a discussion of results are provided below.

4.1 Archaeological survey aims

The principle aims of the survey were to:

- To attempt to re-identify Aboriginal archaeological sites previously identified in the study area
- To undertake a systematic survey of the study area targeting areas with the potential for Aboriginal heritage
- Identify and record Aboriginal archaeological sites visible on the ground surface
- Identify and record areas of potential archaeological deposits (PADs).

4.2 Archaeological survey methodology

The survey methods were intended to assess and understand the landforms and to determine whether any archaeological material from Aboriginal occupation or land use exists within the study area.

4.2.1 Sampling strategy

The survey effort targeted those portions of the study area with the highest potential to contain Aboriginal sites. Desktop research and a review of previous studies in the vicinity indicated that there was a low potential for surface sites to be present within the study area, so the primary focus of the survey was to determine if there were any indicators of archaeological potential within the study area.

4.2.2 Survey methods

The archaeological survey was conducted on foot with a field team of three members. Recording during the survey followed the archaeological survey requirements of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010) and industry best practice methodology. Information that recorded during the survey included:

- Aboriginal objects or sites present in the study area during the survey
- Survey coverage
- Any resources that may have potentially have been exploited by Aboriginal people
- Landform
- Photographs of the site indicating landform
- Evidence of disturbance
- Aboriginal artefacts, culturally modified trees or any other Aboriginal sites.

Where possible, Identification of natural soil deposits within the study area was undertaken. Photographs and recording techniques were incorporated into the survey including representative photographs of survey units; landform, vegetation coverage, ground surface visibility and the recording of soil information for each survey unit were possible. Any potential Aboriginal objects observed during the survey were documented and

photographed. The location of Aboriginal cultural heritage and points marking the boundary of the landform elements were recorded using a hand-held Global Positioning System and the Map Grid of Australia (94) coordinate system.

4.3 Survey constraints

The study area is approximately 40 hectares in size. The overall effectiveness of the survey for examining the ground for Aboriginal sites was considered to be very low due to very poor ground surface visibility (GSV). Opportunities to examine the ground surface were extremely limited, being present primarily tracks throughout the study area and bunkers within the golf course.

The study area was vegetated throughout with low grass cover and rows of trees. As the site is an active golf course, all of these features are relatively recent, and it was considered that there was a low potential for scarred trees to be present within the study area.

The grass cover present, as well as other vegetation reduced GSV within the study area considerably. Overall, visibility within the study area averaged between 0 and 5%, with the main areas of exposure being associated with bunkers (Plate 6) and small scours (Plate 7) throughout the study area.

Plate 6 Exposure associated with bunkers within the study area, view north.

Plate 7 Small scour in low-lying portion of the study area, view north-east.

Visibility within these areas of exposure varied, being quite high in relation to areas such as walking tracks (Plate 8), but variable in relation to scours (Plate 9) and other exposures. This reduced the effective coverage of the archaeological survey to between 0 and 1%, which lessened the likelihood of any Aboriginal sites being identified, if present.

Plate 8 Walking track through the study area, view south.

Plate 9 Exposure associated with small scour adjacent to Cooks River, view south.

The entirety of the study area has been subject to significant disturbance to at least a depth of 0.5 metres, as discussed in Section 3. The survey noted areas of significant disturbance throughout the northern portion of the study areas and extending south, which t the time of survey was being utilised for the M5 upgrade (Figure 2, Plate 10). In addition to this, there are a number of structures associated with the golf course in the north-eastern corner of the study area.

Plate 10 Area adjacent to M5 works, view north-west.

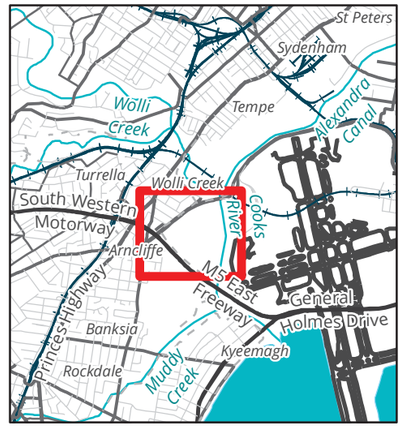
4.4 Survey results

Archaeological survey was conducted on 20 January with a field team of one member. A total of 13 transects were walked across four landforms. This follows the methodology set out in Burke and Smith (2004, p. 65) which states that a single person can only effectively visually survey an area of two linear metres. There were no previously identified Aboriginal sites within the study area, and the survey did not identify any new Aboriginal sites.

Generally the survey was hampered by poor ground surface visibility and narrow survey transects in some areas due to grass cover. Overall survey coverage was low, averaging less than 1 per cent in all landforms, with the study area being divided into a total of two landforms: slopes and flats.

In this context, an analysis of landforms is of little use, as the study area has been subject to extensive landscape modification. The southern portion of it is constructed on reclaimed land, while the northern half has seen historical disturbances associated with market gardening and the redirection of the Cooks River, prior to its current use as a golf course. Geotechnical works suggest that there is a minimum of 0.5 metres of fill over all areas of site, up to 1.8 metres in some areas. As such, it is highly likely that whatever landforms were present within the study area prior to European occupation of the site have been extensively modified. Landscape analysis is typically used to assist in determining areas of archaeological potential, however given the extensive disturbance that the study area has been subject to, this determination will need to be made on the basis of the geotechnical work undertaken to date.

Acknowledgements: Basemap © Land and Property Information 2016; Imagery © Nearmap 2017



Legend

- Study area
- Survey tracks

Figure 2: Study area detail

0 30 60 90 120 150

Metres

Scale: 1:3,600 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

Biosis Pty Ltd

Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Matter: 23972
Date: 16 February 2017,
Checked by: JAC, Drawn by: LH, Last edited by: lharley
Location:P:\23900s\23972\Mapping
23972_F7_SurveyCoverage

5. Discussion

A surface survey of the study area did not identify any Aboriginal sites or areas of archaeological potential. As noted in Section 3.2, owing to the history of disturbance associated with fill activities and land reclamation within the study area, the current landscape context cannot necessarily provide us with a clear understanding of the subsurface archaeological potential within the study area.

A review of the available borehole data for the project, the most accurate available information relating to the subsurface condition of the study area, was completed to provide a better understanding of subsurface conditions within the study area. As outlined in Section 3.1.3, the current soil profiles within the study area consist of imported fill to a depth of 0.5 to 1.8 metres, overlying interbedded sands and clays, which in turn overly sandstone bedrock at a depth of between 9 and 33 metres.

If any intact archaeological material were to be present within the study area, it would be located within the interbedded clays and sands underlying the fill. A comparison was conducted between the four boreholes and adjacent soil landscapes in order to determine the likelihood of these sands and clays being intact, and whether or not they were imported. The depositional sequences between the boreholes appear to be relatively consistent, with the same materials (sand, clay, sandy clay, and silty clay), being deposited in random layers, with the sequence being more extensive in areas with deeper bedrock. This would suggest that there are similar depositional processes across the study area. Given that the southern portion of the study area, in which two of the boreholes were located, is built on reclaimed land, it is likely that the interbedded sands and clays in the northern portion of the study area were also created through extensive filling.

Based on the descriptions available, the interbedded sands and clays appear to be a mixture of the soil landscapes located in closest proximity to the study area, the Birrong and Warriewood soil landscapes, suggesting that the soils have been sourced locally.

The current groundwater depth would also have a role in subsurface investigations within the study area. Groundwater seepage was encountered at varying depths during the geotechnical assessment, from 1.0 metres to 2.1 metres below existing levels in the boreholes, and inferred to be at 0.8 metres to 1.5 metres within the EFCPs. Based on the available data, this would suggest that there is an average of less than 1 metre of interbedded clays and sands underlying the fill which is not subject to groundwater seepage. This would be consistent with historical descriptions of the area, which suggest it was low-lying and marshy. As such, it is considered that there is a low potential for Aboriginal sites to be present within the study area.

6. Conclusion and recommendations

6.1 Conclusion

Based on the available evidence, it is unlikely that any intact archaeological deposits are present within the study area. Based on the geotechnical data gathered to date, it appears that the fill which forms the current ground surface within the study area overlies either disturbed or imported sand and clay soil layers. If in situ soil deposits are present, they are located beneath the current groundwater level, and have a low potential to contain archaeological deposits.

There is a low potential for any Aboriginal sites to be encountered during works within the study area.

6.2 Recommendations

Strategies have been developed based on the archaeological (significance) of cultural heritage relevant to the study area and influenced by:

- Predicted impacts to Aboriginal cultural heritage.
- The planning approvals framework.
- Current best conservation practise, widely considered to include:
  - Ethos of the Australia ICOMOS Burra Charter
  - The Code.

Prior to any impacts occurring within the study area, the following is recommended:

Recommendation 1: No further archaeological assessment is required

It is recommended that no further archaeological assessment is required in the study area prior to the proposed development as this assessment has concluded that there is a low likelihood for Aboriginal sites to be present within the study area.

Recommendation 2: Discovery of unanticipated Aboriginal objects

All Aboriginal objects and places are protected under the *NSW National Parks and Wildlife Act 1974*. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the Office of Environment and Heritage (OEH). Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying the OEH and Aboriginal stakeholders.

Recommendation 3: Discovery of unanticipated historical relics

Should construction encounter unexpected historical structural or depositional remains, all works should cease. A determination should then be made by an appropriately qualified archaeologist of whether the remains identified are likely to be 'relics' under the *NSW Heritage Act 1977*.

Where the remains are identified as being 'relics', the Heritage Council of NSW must be notified in accordance with section 146 of the *NSW Heritage Act 1977*. Failure to notify the Heritage Council is considered an offence

under the act, with penalties including fines and imprisonment. After contacting the Heritage Council, a permit or exemption should be sought under the relevant section of the act to allow works to recommence.

Recommendation 4: Discovery of Aboriginal ancestral remains

Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity you must:

1. Immediately cease all work at that location and not further move or disturb the remains
2. Notify the NSW Police and OEH's Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location
3. Not recommence work at that location unless authorised in writing by OEH.

References

AECOM 2015. WestConnex New M5 Technical Working Paper: Aboriginal Heritage. Report to Roads and Maritime Services.

Attenbrow V 2010. *Sydney's Aboriginal Past: Investigating the archaeological and historical records.* University of New South Wales Press Ltd, Sydney.

Australian Museum Business Services 2003. Report on the Salvage Excavation of a Portion of the Kendrick Park Midden, Tempe, NSW. Report to Marrickville Council.

Biosis 2001. Cultural Heritage Issues and Constraints for the Cooks Cove Master Plan. Report to Hassell Pty Ltd

Chapman G and Murphy C 1989. Soil Landscapes of the Sydney 1;100 000 sheet. Soil Conservation Service of NSW Sydney.

Department of Environment, Climate Change and Water 2010a. The *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW.* NSW Department of Environment, Climate Change and Water, Sydney NSW.

Geeves P and Jervis J 1986. Rockdale Its Beginnings and development. The Council of the Municipality of Rockdale.

Jeffery and Katauskas Pty Ltd 2008. Report to Cook Cove Pty Ltd on Preliminary Geotechnical Investigation for Proposed Trade and Technology zone at off Marsh Street, Arncliffe, NSW. Report to Cook Cove Pty Ltd.

Jo McDonald Cultural Heritage Management 2005. Archaeological Testing and Salvage at Discovery Point, Site #45-6-2737 in the former grounds of Tempe House, NSW. Report to Australand Pty Ltd.

Jo McDonald Cultural Heritage Management 2006. Archaeological Salvage of a Stormwater Easement and Testing Within the State Heritage Register Conservation Precinct at the former Tempe House, Discovery Point. Report to Australand Pty Ltd.

Speight J 1998. 'Landform' in McDonald R & R Isbell (eds.) Australian Soil and Land Survey Field Handbook, p9-57. Goanna Print, Canberra Australian.

Strahler A 1964. 'Quantitative geomorphology of drainage basins and channel networks' in Chow, V.T. (eds.), Handbook of Applied Hydrology. McGraw-Hill, New York.

Tindale N 1974. Aboriginal tribes of Australia: their terrain, environmental controls, distribution, limits, and proper names. Australian National University Press, Canberra.

Appendices

Appendix 1 AHIMS search results

THE FOLLOWING APPENDIX IS NOT TO BE MADE PUBLIC

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 23972

Client Service ID : 261291

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-6-2597	Wynyard St Midden	AGD	56	333469	6247920	Open site	Valid	Shell : -, Artefact : -	Midden	102494,102763,102765
	Contact	**Recorders**	Mr.D Coe					**Permits**		
45-6-2358	K1(same as site 45-6-2198)	AGD	56	329510	6244350	Open site	Deleted	Shell : -, Artefact : -	Midden	
	Contact	**Recorders**	Ms.Jillian Comber					**Permits**	1330,1331	
45-6-2671	Wolli Creek 3	AGD	56	327550	6243825	Open site	Valid	Artefact : 3		
	Contact	**Recorders**	Michael Guider					**Permits**		
45-6-2737	Tempe House 1	AGD	56	329230	6243930	Open site	Partially Destroyed	Artefact : -, Potential Archaeological Deposit (PAD) : -		99680,100447,102150,103452
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**	2016,2209,3767	
45-6-2547	Nanny Goat Hill 1;NGH 1;	AGD	56	328700	6244300	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Michael Guider					**Permits**		
45-6-0615	Undercliffe Road	AGD	56	328500	6244500	Closed site	Valid	Shell : -, Artefact : -, Art (Pigment or Engraved) : -	Midden,Shelter with Art	99514
	Contact	**Recorders**	Ms.Bronwyn Conyers,D Burns					**Permits**		
45-6-0629	Buoy;Botany Shell Midden;	AGD	56	334300	6241400	Closed site	Valid	Artefact : -, Shell : -, Burial : -	Burial/s,Midden,Shelter with Deposit	
	Contact	**Recorders**	ASRSYS					**Permits**		
45-6-2414	Wolli_Creek 1.6;	AGD	56	326280	6243580	Closed site	Valid	Artefact : -	Shelter with Deposit	1452
	Contact	**Recorders**	Tranby College					**Permits**		
45-6-2415	Wolli_Creek 1.4;	AGD	56	325740	6243270	Closed site	Valid	Artefact : -	Shelter with Deposit	1452
	Contact	**Recorders**	Tranby College					**Permits**		
45-6-2564	Wolli Creek 2.5	AGD	56	327250	6243760	Closed site	Valid	Shell : -, Artefact : -	Shelter with Midden	
	Contact	**Recorders**	Tranby College					**Permits**		
45-6-2565	Wolli Creek 2.4	AGD	56	327010	6243900	Closed site	Valid	Artefact : -	Shelter with Deposit	
	Contact	**Recorders**	Tranby College					**Permits**		
45-6-2566	Wolli Creek 2.1	AGD	56	326960	6243880	Closed site	Valid	Artefact : -	Shelter with Deposit	
	Contact	**Recorders**	Tranby College					**Permits**		
45-6-2567	Wolli Creek	AGD	56	327250	6243760	Closed site	Valid	Shell : -, Artefact : -	Shelter with Midden	
	Contact	**Recorders**	Tranby College					**Permits**		

Report generated by AHIMS Web Service on 09/01/2017 for Rebecca Morris for the following area at Datum :GDA, Zone : 56, Eastings : 324870 - 334870, Northings : 6238532 - 6248532 with a Buffer of 0 meters. Additional Info : Due diligence assessment. Number of Aboriginal sites and Aboriginal objects found is 22

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 23972

Client Service ID : 261291

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-6-2568	Wolli Creek	AGD	56	327010	6244000	Closed site	Valid	Artefact : -	Shelter with Deposit	
	Contact	**Recorders**	Tranby College					**Permits**		
45-6-2416	Wolli_Creek 1.3;	AGD	56	325840	6243370	Closed site	Valid	Shell : -, Artefact : -	Shelter with Midden	1452
	Contact	**Recorders**	Tranby College					**Permits**		
45-6-2417	Wolli_Creek 1.2;	AGD	56	325880	6243400	Closed site	Valid	Shell : -, Artefact : -	Shelter with Midden	1452
	Contact	**Recorders**	Tranby College					**Permits**		
45-6-2418	Wolli_Creek 1.1;	AGD	56	325880	6243400	Closed site	Valid	Artefact : -	Shelter with Deposit	1452
	Contact	**Recorders**	Tranby College					**Permits**		
45-6-2198	View Street	AGD	56	329500	6244350	Open site	Valid	Shell : -, Artefact : -	Midden	
	Contact	**Recorders**	Michael Guider,Michael Guider					**Permits**	1330,1331	
45-6-0751	Shea's Creek Dugong	GDA	56	331839	6245378	Open site	Destroyed	Artefact : -, Aboriginal Resource and Gathering : -, Non-Human Bone and Organic Material : -	Open Camp Site	
	Contact	**Recorders**	ASRSYS,AECOM Australia Pty Ltd (previously HLA-Envirosciences),Mr.Luke Kirkw(					**Permits**		
45-6-1496	Shea's Creek	AGD	56	328842	6244524	Open site	Valid	Shell : -, Artefact : -	Midden	30,591,940
	Contact	**Recorders**	ASRSYS					**Permits**		
45-6-1648	Bibby Street;Carlton;	AGD	56	326215	6238528	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	ASRSYS					**Permits**		
45-6-2654	Fraser Park PAD	AGD	56	330100	6245800	Open site	Valid	Potential Archaeological Deposit (PAD) : -		98669
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**	1639	

Report generated by AHIMS Web Service on 09/01/2017 for Rebecca Morris for the following area at Datum :GDA, Zone : 56, Eastings : 324870 - 334870, Northings : 6238532 - 6248532 with a Buffer of 0 meters. Additional Info : Due diligence assessment. Number of Aboriginal sites and Aboriginal objects found is 22

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.