LONG REEF BOARDWALK, COLLAROY, NSW

ARCHAEOLOGICAL REPORT

Report to Northern Beaches Council

LGA: Northern Beaches

December 2023

APEX ARCHAEOLOGY

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EXECUTIVE SUMMARY

Apex Archaeology has been engaged by Northern Beaches Council to assist in preparing an Aboriginal Cultural Heritage Assessment (ACHA) for the proposed realignment and replacement of the existing boardwalk and bridge that is situated on the southern side of Long Reef Headland in Collaroy, NSW. The proposed works will impact on sections within Long Reef Golf Club and Long Reef Beach in Collaroy. The study area is within the Northern Beaches Local Government Area (LGA).

This report details the results of the archaeological assessment of the site, prepared in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (September 2010) (the Code of Practice). This Archaeological Report (AR) forms an appendix to the ACHA report prepared for the project.

An Aboriginal site is registered on the Aboriginal Heritage Information Management Services (AHIMS) as being within the study area. It is AHIMS #45-6-741 (QP3) and is recorded as an Aboriginal shell midden. It has been mapped as being on the northern side of the current boardwalk and approximately 50 m west of the bridge that crosses the man-made creek that drains onto Long Reef Beach. As the proposed works have the potential to impact on this registered site, an assessment is necessary to determine whether an application for an Aboriginal Heritage Impact Permit (AHIP) prior to the commencement of works will be required.

A site inspection and pedestrian survey of the study area was undertaken by Jenni Bate, Leigh Bate and Rebecca Bryant from Apex Archaeology, and Justine Coplin from Darug Custodian Aboriginal Corporation on 21 July 2023. No shell or remnants of a shell midden were identified within the study area, nor were any other Aboriginal material such as stone artefacts located.

The entire area was found to have been highly disturbed by natural and man-made impacts. The section along the cliff line where the current boardwalk is situated is under continuous erosion due to the nature of the underlying sandstone and claystone geology. This has been further exacerbated by the consistent impact of ocean waves. The other areas within the sandy soil landscape either side of the exposed cliff line have been largely impacted by either the introduction of fill or, in the case of the golf course, the original sand dunes have been excavated and contoured since the early 1800s. These disturbances were a result of initial farming practices, followed by the construction of Long Reef Golf Club, military exercises, and excavations for the construction of a drainage channel emptying onto Long Reef Beach.

Given the extensive historical disturbance and that no areas of potentially intact archaeological deposits were identified, no further archaeological assessment is considered necessary for the site. The previously registered site is considered to have been completely impacted by natural forces and no longer exists. The site card for this site has been updated to reflect the destroyed status of the site.

The Aboriginal Heritage Office requested that the initial earthworks be monitored by a suitably qualified representative from the Aboriginal community. Monitoring of the initial works in this instance is not considered warranted on archaeological grounds due to the wholesale disturbance to the area. The Aboriginal Heritage Office also requested that all personnel working on site are provided with an Aboriginal heritage site induction prior to the commencement of works.

Further, the Aboriginal Heritage Office and representatives of the Registered Aboriginal Parties (RAPs) for this project also requested that information signs on Aboriginal sites found within Long Reef Headland be erected along the new boardwalk or an appropriate viewing area to inform the public about the rich and diverse Aboriginal cultural heritage that would have been present within the area.

No further Aboriginal heritage investigations or approvals are considered warranted prior to the commencement of the proposed works.

The following recommendations are based on the research and conclusions of our assessment outlined in this report, and in consultation with the RAPs and the Aboriginal Heritage Office.

RECOMMENDATION 1: NO FURTHER ARCHAEOLOGICAL ASSESSMENT REQUIRED

The Aboriginal archaeological potential of Long Reef Boardwalk, Collaroy, NSW has been assessed as negligible. No further archaeological assessment is required for the site prior to the commencement of proposed development activities. No Aboriginal Heritage Impact Permit (AHIP) is required prior to works commencing.

RECOMMENDATION 2: ABORIGINAL HERITAGE SITE INDUCTION

An Aboriginal heritage site induction should be presented to the site workers by a suitably qualified person. This induction will include the possible kinds of Aboriginal archaeological remains that may be contained within the sand bodies and it will outline the 'unexpected finds policy'.

RECOMMENDATION 3: INSTALLATION OF INTERPRETATION

It is recommended that consideration is given to installation of interpretive signage along the boardwalk to explain the Aboriginal history of the place and the continuing connection to Country.

RECOMMENDATION 4: DEVELOPMENT BOUNDARIES

The proposed development works must be contained within the assessed boundaries for this project. If there is any alteration to the boundaries of the proposed development to include areas not assessed as part of this archaeological investigation, further investigation of those areas should be completed to assist in managing Aboriginal objects and places which may be present in an appropriate manner.

RECOMMENDATION 5: REPORTING

One digital copy of this report should be forwarded to Heritage NSW for inclusion on the Aboriginal Heritage Information Management System (AHIMS).

One copy of this report should be forwarded to each of the registered Aboriginal stakeholders for the project.

RECOMMENDATION 6: STOP WORK PROVISIONS

Should unanticipated Aboriginal archaeological material be encountered during site works, all work must cease in the vicinity of the find and an archaeologist contacted to make an assessment of the find and to advise on the course of action to be taken. Further archaeological assessment and Aboriginal community consultation may be required prior to the recommencement of works. Any objects confirmed to be Aboriginal in origin must be reported to Heritage NSW.

Human remains of Aboriginal people have previously been recorded in sand bodies in coastal bays and open beaches within Sydney area including Long Reef headland. In the unlikely event that suspected human remains are identified during works, all activity in the vicinity of the find must cease immediately and the find protected from harm or damage. The NSW Police and the Coroner's Office must be notified immediately. If the finds are confirmed to be human and of Aboriginal origin, further assessment by an archaeologist experienced in the assessment of human remains and consultation with both Heritage NSW, the Aboriginal Heritage Office and the RAPs for the project would be necessary.

Apex Archaeology acknowledges and pays respect to the past, present and future Traditional Custodians and Elders of this nation and in whose land this assessment took place, and to the continuation of cultural, spiritual and educational practices of Aboriginal and Torres Strait Islander peoples.

Document Control

The following register documents the development and issue of the document entitled 'Long Reef Boardwalk, Collaroy, NSW: Aboriginal Cultural Heritage Assessment Report', prepared by Apex Archaeology in accordance with its quality management system.

Revision	Prepared by	Reviewed by	Comment	Issue Date
1 – Draft	Rebecca Bryant	Jenni Bate	Client Review	27 October 2023
2 – Draft	Jenni Bate	Eliza Halsey	Issue for RAPs	11 November 2023
3 – Final	Jenni Bate	RAPs	Issue of final	11 December 2023

GLOSSARY OF TERMS

Aboriginal Object	An object relating to the Aboriginal habitation of NSW (as defined in the NPW Act), which may comprise a deposit, object or material evidence, including Aboriginal human remains.
ACHA	Aboriginal Cultural Heritage Assessment
ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHCRs	*Aboriginal cultural heritage consultation requirements for proponents 2010*
AHIMS	Aboriginal Heritage Information Management System maintained by Heritage NSW, detailing known and registered Aboriginal archaeological sites within NSW
AHIP	Aboriginal Heritage Impact Permit
AR	Archaeological report
ASIRF	Aboriginal Site Impact Recording Form
BP	Before Present, defined as before 1 January 1950.
Code of Practice	The DECCW September 2010 *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*
Consultation	Aboriginal community consultation in accordance with the DECCW April 2010 *Aboriginal cultural heritage consultation requirements for proponents 2010.*
DA	Development Application
DECCW	The Department of Environment, Climate Change and Water (now Heritage NSW)
Disturbed Land	If land has been subject to previous human activity which has changed the land's surface and are clear and observable, then that land is considered to be disturbed
Due Diligence	Taking reasonable and practical steps to determine the potential for an activity to harm Aboriginal objects under the *National Parks and Wildlife Act 1974* and whether an application for an AHIP is required prior to commencement of any site works, and determining the steps to be taken to avoid harm
Due Diligence Code of Practice	The DECCW Sept 2010 *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*
GIS	Geographical Information Systems
GSV	Ground Surface Visibility
Harm	To destroy, deface or damage an Aboriginal object; to move an object from land on which it is situated, or to cause or permit an object to be harmed
Heritage NSW	Heritage NSW within the Department of Premier and Cabinet; responsible for overseeing heritage matters within NSW
ka	Kiloannus, a unit of time equating to 1,000 years
LALC	Local Aboriginal Land Council
LGA	Local Government Area
NPW Act	NSW *National Parks and Wildlife Act* 1974
NPWS	National Parks and Wildlife Service
OEH	The Office of Environment and Heritage of the NSW Department of Premier and Cabinet (now Heritage NSW)
PAD	Potential Archaeological Deposit
RAPs	Registered Aboriginal Parties

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1.0 Introduction

Apex Archaeology has been engaged by Northern Beaches Council to assist in preparing an Aboriginal Cultural Heritage Assessment (ACHA) for the proposed realignment and replacement of the existing boardwalk and bridge that is situated on the southern side of Long Reef Headland in Collaroy, NSW. The proposed works will impact on sections within Long Reef Golf Club and Long Reef Beach in Collaroy. The study area is within the Northern Beaches Local Government Area (LGA).

An Aboriginal site is registered on the Aboriginal Heritage Management Services (AHIMS) as being within the study area. It is AHIMS #45-6-0741 (QP3) and is recorded as an Aboriginal shell midden. The site is mapped as being on the northern side of the current boardwalk and approximately 50 m west of the current bridge that crosses the man-made creek that empties drains onto Long Reef Beach.

The proposed works have the potential to impact on this registered site and as such, an assessment is necessary to determine whether an application for an Aboriginal Heritage Impact Permit (AHIP) prior to the commencement of works. Is required.

This report details the results of the archaeological assessment of the site, prepared in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (September 2010) (the Code of Practice). This report forms an appendix to the ACHA report prepared for the project. It has been prepared to inform Northern Beaches Council prior to the proposed realignment and replacement of the existing boardwalk and bridge.

1.1 Project Proponent

The proponent for the project is Northern Beach Council and Environment. The client contact for the project was Eliza Halsey, Senior Project Officer.

1.2 Objectives of the Archaeological Assessment

The archaeological investigation was undertaken to meet the requirements of the Code of Practice.

The purpose of the archaeological investigation is to understand and establish the potential harm the proposed development may have on Aboriginal cultural heritage within the study area, both tangible and intangible.

Any development works which disturb the ground surface have the potential to impact Aboriginal archaeological deposits and therefore an assessment of whether the study area contains such deposits is required prior to the commencement of construction works. An assessment of whether the proposed development would impact these deposits (if present) is also necessary, and identification of to what extent the deposits would be impacted is also required. The degree of impact which may be allowable is determined, in part, with consideration of the level of cultural significance attributed to the cultural values of the study area, both tangible and intangible.

As such, the objectives of the assessment are to determine whether Aboriginal cultural values exist within the study area, and whether the proposed project can avoid impact to these values, or if mitigation measures may be necessary.

1.3 Study Area and Project Brief

The study area is located on the southern side of Long Reef Headland and is bound by the Pacific Ocean to the south and Long Reef Golf Course to the north (Figure 1 and Figure 2). The study area is located approximately 10 km north of Manly and 21 km northeast of the Sydney CBD. It is within the Northern Beaches LGA.

The Long Reef boardwalk and bridge within the Long Reef Headland loop track have been subjected to a high volume of use by the community and unusually large ocean swells that have caused significant structural damage to the lower section of the foreshore boardwalk. Repairs were carried out to ensure that it was serviceable for the short term (9-12 months). The structure Is now reaching the end of this period and approximately 120 m of the existing the existing boardwalk and bridge require replacement (Figure 3).

To ensure the new structures do not succumb to the same impacts it is proposed to reposition them further north up the dune face. Sections of the dune will have to be flattened by the removal of sand to accommodate the boardwalk. This will involve a cut of approximately 23 m long and a max depth of 1.2 m into the sand dune on a section west of the drainage line, and a cut approximately 22 m long with a maximum depth of .8 m deep on the eastern side of the drainage line (Figure 4). The proposed works will also move the northern section of the woman's and men's 17th tees approximately 2 m north, as well as the realignment of a section of the concrete path that parallel to the tees. This will also involve excavations that may be up to 30 cm below the current surface level (Figure 5).

An Aboriginal site is registered on The Aboriginal Heritage Information Management System (AHIMS) as #45-6-0741 (QPS) and is identified as being within the study area (Figure 6). It is recorded as an Aboriginal shell midden and mapped as being on the northern side of the current boardwalk and within an area of the proposed realigned boardwalk. This area is approximately 50 m west of the current bridge that crosses the man-made creek that drains onto Long Reef Beach.

As the proposed works have the potential to impact on this registered site an assessment is necessary to determine whether an application for an Aboriginal Heritage Impact Permit (AHIP) prior to the commencement of works is required.

The subject land is within Crown Lands, which are managed by the Northern Beaches Council.

1.4 Investigators and Contributors

This archaeological assessment was commissioned by the Northern Beaches Council. Apex Archaeology thanks Eliza Halsey from Northern Beaches Council for her assistance with the project. Thanks are also extended to the registered Aboriginal

groups for their participation and assistance with the project, with particular thanks to Justine Coplin from Darug Custodian Aboriginal Corporation who assisted with the fieldwork. We are also grateful for the advice and assistance provided by Archaeologist and Heritage Officer Susan Whitby, and Senior Archaeologist Phil Hunt, from the Aboriginal Heritage Officer.

This report has been prepared by Rebecca Bryant, Archaeologist with Apex Archaeology. The report was reviewed by Jenni Bate, Director and Archaeologist with Apex Archaeology. Both Jenni and Leigh have over sixteen years of archaeological consulting experience within NSW, and Rebecca has 11 years' experience in archaeological research projects (inc five years in consultancy). Project team roles and qualifications are shown in Table 1.

Table 1: Project team roles and qualifications

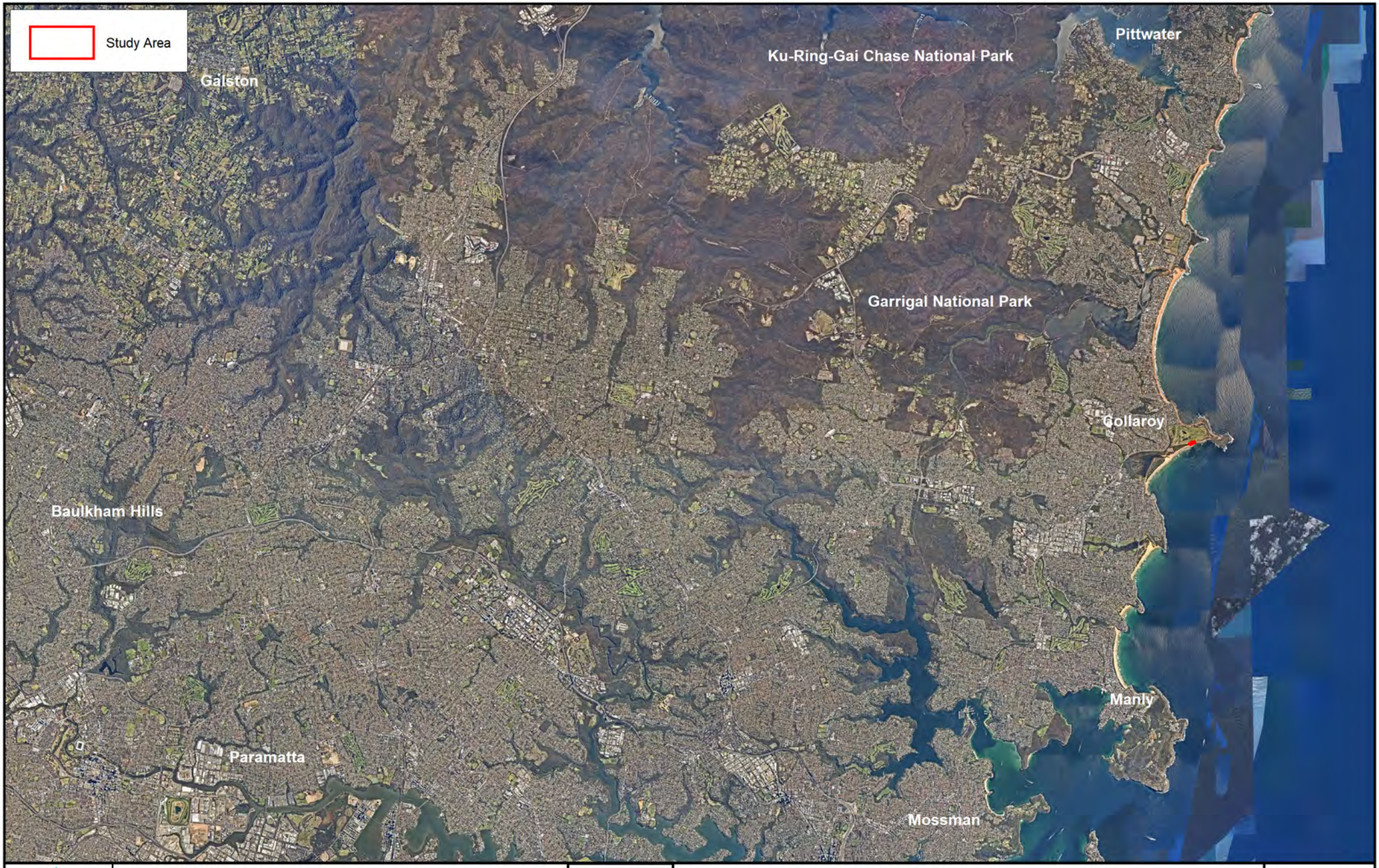
Name	Role	Qualifications
Rebecca Bryant	Report Author	B.Science (Arch/Paleo); Mphil (lithics)
Jenni Bate	Project Manager; Report Author; Field Inspection; Review	B.Archaeology; Grad. Dip. CHM
Leigh Bate	Field inspection; Review; GIS	B.Archaeology; Grad. Dip. Arch; Dip. GIS

1.5 LIMITATIONS

This report relies in part on previously recorded archaeological and environmental information for the wider region. This includes information from AHIMS, which is acknowledged to be occasionally inaccurate, due to inaccuracies in recording methods. No independent verification of the results of external reports has been made as part of this report.

It should be noted that AHIMS results are a record only of the sites that have been previously registered with AHIMS and are not a definitive list of all Aboriginal sites within an area, as there is potential for sites to exist within areas that have not previously been subject to archaeological assessment.

Field investigations for this report included survey. The results are considered to be indicative of the nature and extent of Aboriginal archaeological remains within the study area, but it should be noted that further Aboriginal objects and sites which have not been identified as part of this assessment may be present within the wider area.



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NOWRA
NEW SOUTH WALES 2541

0 5 10
kilometres

Projection:
MGA Zone 56 (GDA 94)
Base Map:
NearMaps 2023
Image Date: 21/10/2023
Final - Version 1

Figure 1: Study area within its regional context.

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NEW SOUTH WALES 2541

0 150 300
metres

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Figure 2: Study area within its local context.

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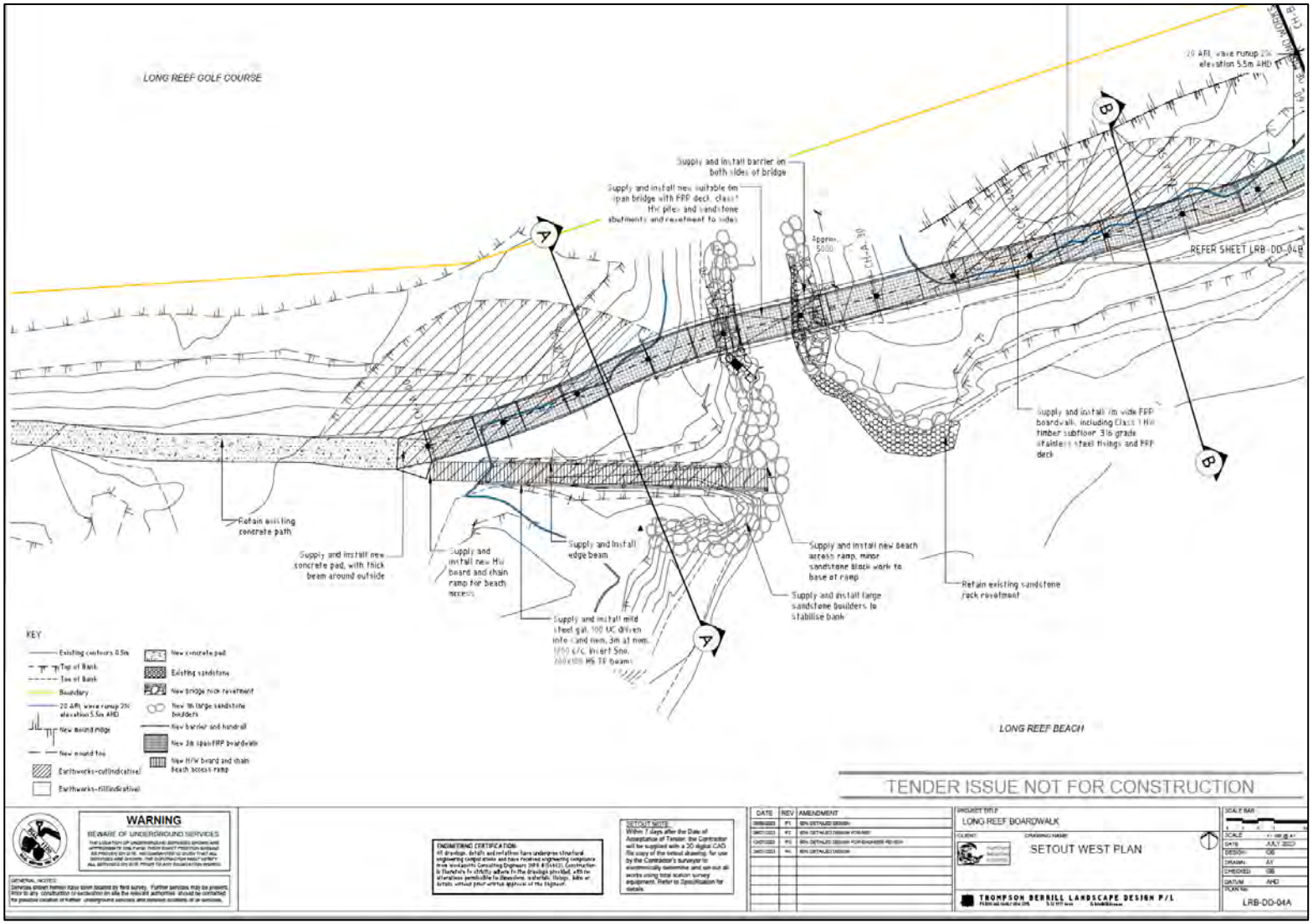

Figure 3: Preliminary draft of proposed works within the study area. (Source: Thompson Berrill Landscape Design July 2023 Plan No. LRB-DD-04A).

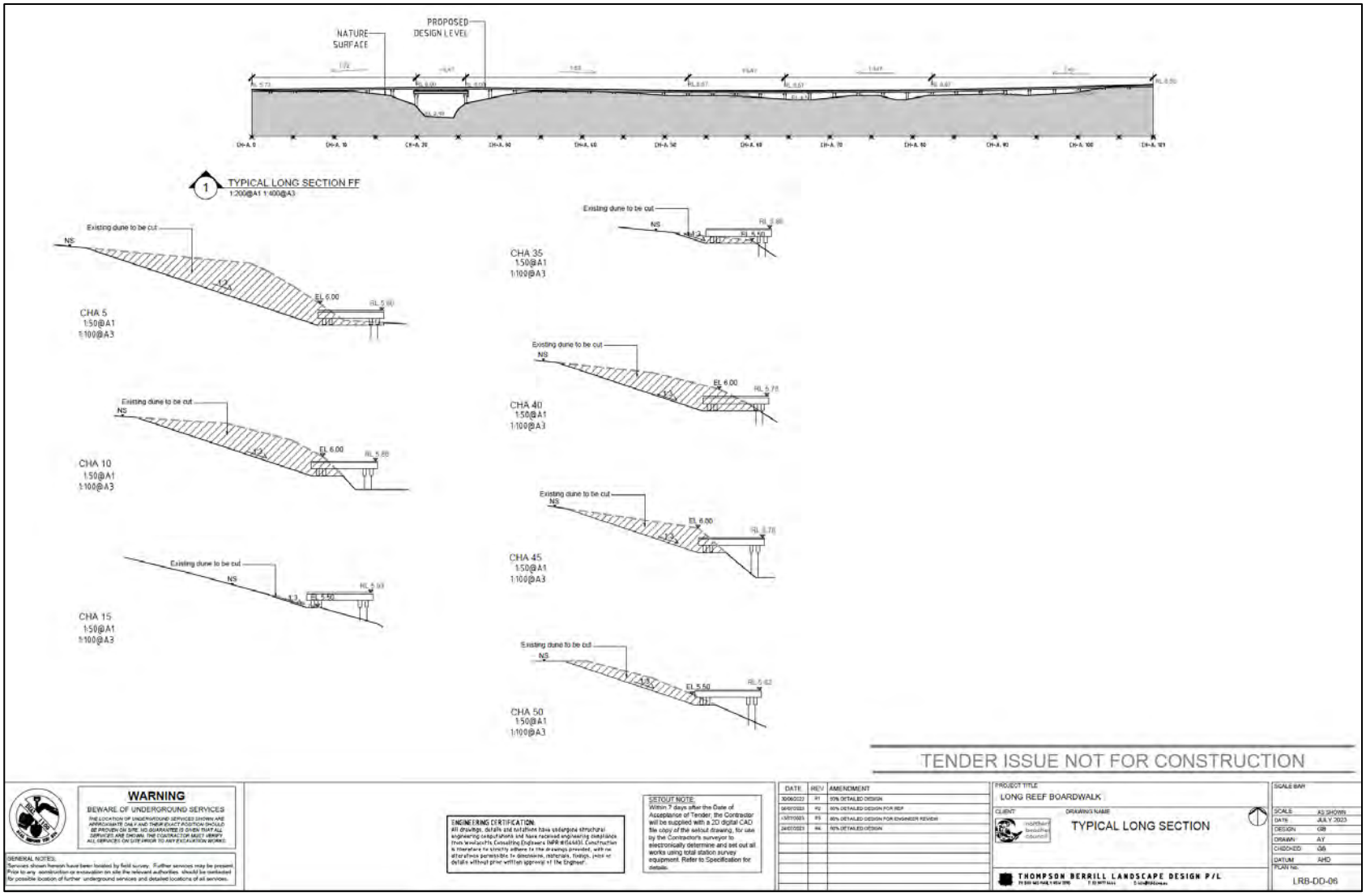

Figure 4: Preliminary draft of proposed cross section of excavation within the sand dune. (Source: Thompson Berrill Landscape Design July 2023 Plan No. LRB-DD-06).

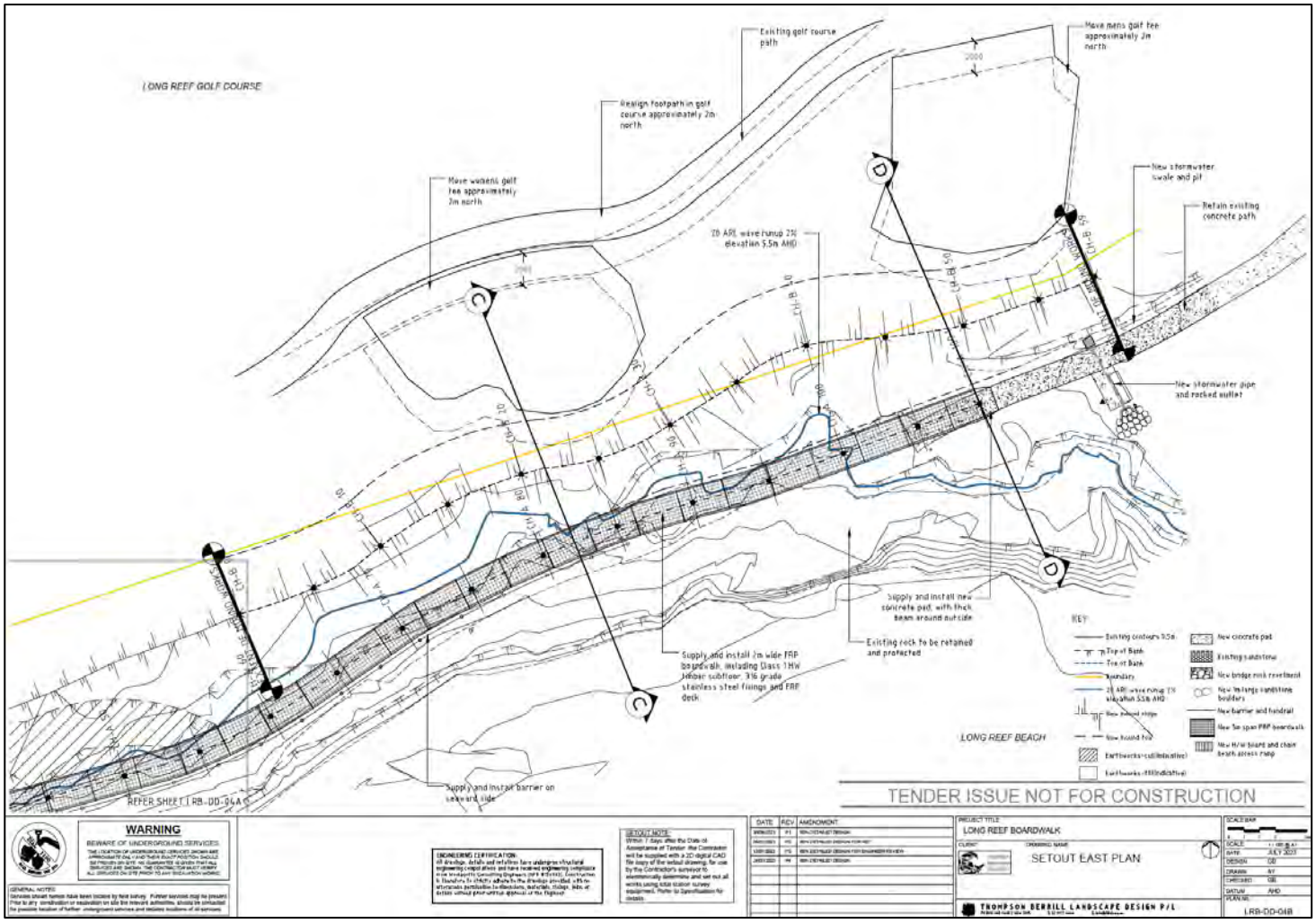

Figure 5: Preliminary draft of proposed realignment of the footpath within the golf course, approximately 2 m north (Source: Thompson Berrill Landscape Design July 2023 Plan No. LRB-DD-04B).

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NEW SOUTH WALES 2541

0 30 60
metres

Projection:
MGA Zone 56 (GDA 94)
Base Map:
NearMaps 2023
Image Date: 21/10/2023
Final - Version 1

Figure 6: Location of registered AHIMS Site # 45-6-0741 in relation to study area.

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2.0 Statutory Context

Heritage in Australia, including both Aboriginal and non-Aboriginal heritage, is protected and managed under several different Acts. The following section presents a summary of the applicable Acts which provide protection to cultural heritage within NSW.

2.1 Commonwealth Legislation

2.1.1 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

This Act provides for the preservation and protection of injury and/or desecration of areas and objects in Australia and its waters that are of significance to Aboriginal people, in accordance with Aboriginal tradition.

Under this Act, the responsible Minister has provision to make both temporary and/or long-term declarations, in order to provide protection to areas and objects which are at threat of injury or desecration. In some instances, this Act can override State or Territory provisions, or be invoked if State or Territory provisions are not enforced. An Aboriginal or Torres Strait Islander individual or organisation must invoke the Act.

No items within the study area are listed or protected under this Act.

2.1.2 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides protection to environmental sites of national significance, including places with cultural heritage values that contribute to Australia's national identity. The Act aims to respect the role of Indigenous peoples in the conservation and ecologically sustainable use of Australia's biodiversity, and to enhance the protection and management of important natural and cultural places. Additionally, the Act is designed to promote the use of Indigenous peoples' knowledge of biodiversity with the involvement of, and in cooperation with, the owners of the knowledge.

The National Heritage List provides a listing of natural, historic and Indigenous places of outstanding significance to the nation, while the Commonwealth Heritage List details the Indigenous, historic and natural places owned or controlled by the Australian Government.

Under the EPBC Act, approvals are required if any action is proposed that will have (or is likely to have) a significant impact on the National Heritage values of a National Heritage place. Therefore, actions must be referred to the Australian Government Minister for the Environment and Heritage. A decision will be made as to whether the proposed action will have a significant impact on any matters of national significance.

Long Reef Aquatic Reserve in Collaroy is currently listed on the Australian Heritage Database as in 'Indicative Place' (ID No. 14684) for its 'Natural' significance. It is

within an aquatic reserve and includes numerous tropical invertebrate species and was registered. It was registered on the 21/10/1980 (ID 102514).

2.1.3 Native Title Act 1993

The *Native Title Act 1993*, as amended, provides protection and recognition for Native title. Native title is recognised where the rights and interests of over land or waters where Aboriginal and Torres Strait Islander practiced traditional laws and customs prior to the arrival of European settlers, and where these traditional laws and customs have continued to be practiced.

The National Native Title Tribunal (NNTT) was established to mediate native title claims made under this Act. Three registers are maintained by the NNTT, as follows:

- National Native Title Register
- Register of Native Title Claims
- Register of Indigenous Land Use Agreements.

Searching the NNTT registers allows identification of potential Aboriginal stakeholders who may wish to participate in consultation.

A search of all three registers did not identify any registered Native Title claims within, or close to the study area. The closest Native Title claim is by the South Coast People and commences approximately 40 km south of the current study area.

2.2 New South Wales Legislation

2.2.1 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* provides protection for all Aboriginal objects and places within NSW. Aboriginal objects are defined as the material evidence of the Aboriginal occupation of NSW, while Aboriginal Places are defined as areas of cultural significance to the Aboriginal community. All Aboriginal objects are protected equally under the Act, regardless of their level of significance. Aboriginal Places are gazetted if the Minister is satisfied that the location was and/or is of special significance to Aboriginal people.

Following amendments to the NPW Act in 2010, approval to impact Aboriginal cultural heritage sites is only granted under a Section 90 AHIP, which is granted by Heritage NSW in the Department of Premier and Cabinet.

2.2.2 NSW National Parks and Wildlife Regulation 2019

Part 5, Division 2 of the *National Parks and Wildlife Regulation 2019* addresses Aboriginal objects and places in relation to the NPW Act 1974, and outlines how compliance with relevant codes of practice can be met.

Clause 58(1) outlines the defence of low impact acts or omissions to the offence of harming Aboriginal objects, which includes maintenance works on existing roads and fire trails, farming and land management work, grazing of animals, activities on land

that has been disturbed that is exempt or complying development, mining exploration work, removal of vegetation (aside from Aboriginal culturally modified trees), seismic surveying or groundwater monitoring bores on disturbed ground, or environmental rehabilitation work (aside from erosion control or soil conservation works such as contour banks).

Clause 58(4) outlines the definition of 'disturbed land', as land that "has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable".

Clause 59 relates to the notification of Aboriginal objects and sites and Clause 60 relates to the requirements for the consultation process to support an AHIP application. The regulation sets out the requirements broadly in line with those outlined in the ACHCRs.

2.2.3 Environmental Planning & Assessment Act 1979

Under the EP&A Act, it is necessary to consider environmental impacts, including impact to cultural heritage, as part of the land use process. Local Environmental Plans (LEPs) and Development Control Plans (DCPs) are also required to be prepared by Local Government Areas (LGAs) in order to provide guidance on the applicable level of environmental assessment. LGAs are required to maintain a list of locally significant heritage items as part of their LEP.

Under the EP&A Act, Part 3 describes the planning instruments at both local and regional levels; Part 4 relates to development assessment and consent processes, and Part 5 refers to infrastructure and environmental impact assessment.

The determining authority in this instance is Northern Beaches Council, who will determine a Development Application for the project.

2.2.4 Warringah Local Environmental Plan 2014

The *Warringah Local Environmental Plan (LEP) 2014* is the overarching planning instrument applicable to the Northern Beaches LGA. Although Northern Beaches Council is an amalgamation of the former Manly Pittwater and Warringah councils, they do not yet have a separate LEP. This is due to be released sometime in 2023. It is noted that the WLEP contains the following clauses relevant to works near Aboriginal sites.

Clause 5.10(2) (e) identifies that no buildings may be erected on land within a heritage conservation area, or which contains an Aboriginal object, without first obtaining development consent. Further, Clause 5.10(2) (c) states that archaeological sites may not be disturbed or excavated without development consent. Exceptions to the requirement for development consent are detailed by Clause 5.10(3) (a) and include work that is minor in nature or is for the maintenance of a heritage item, Aboriginal object, Aboriginal place, archaeological site or heritage conservation area, and would not adversely affect the heritage significance

of the heritage item, Aboriginal object, Aboriginal place, archaeological site or heritage conservation area, or (b) the development is in a cemetery or burial ground and the proposed development would not cause disturbance to human remains, relics, Aboriginal objects in the form of grave goods, or to an Aboriginal place of heritage significance.

Clause 5.10(8) (a & b) requires that the effect of any development on an Aboriginal place of heritage significance must be considered, and the Aboriginal community must be notified of any proposed developments and take into consideration any responses received with 28 days after the notice was sent. This document details the notification to the registered Aboriginal community regarding the intention to develop the study area and the consultation undertaken regarding the proposed development's potential impact on Aboriginal cultural heritage in the area.

A portion of Long Reef Headland is shaded in green, which falls into the "Conservation Area – Landscape". The eastern section of the current study area appears to be just outside this. However, no archaeological sites, which would be identified in yellow, are mapped on the Warringah Local Environmental Plan 2011 (Figure 7), or within or in the vicinity of the study area.

Although there are no Aboriginal heritage items listed this does not mean that the land has low Aboriginal cultural heritage significance. Numerous sites have been recorded on Long Reef Headland.

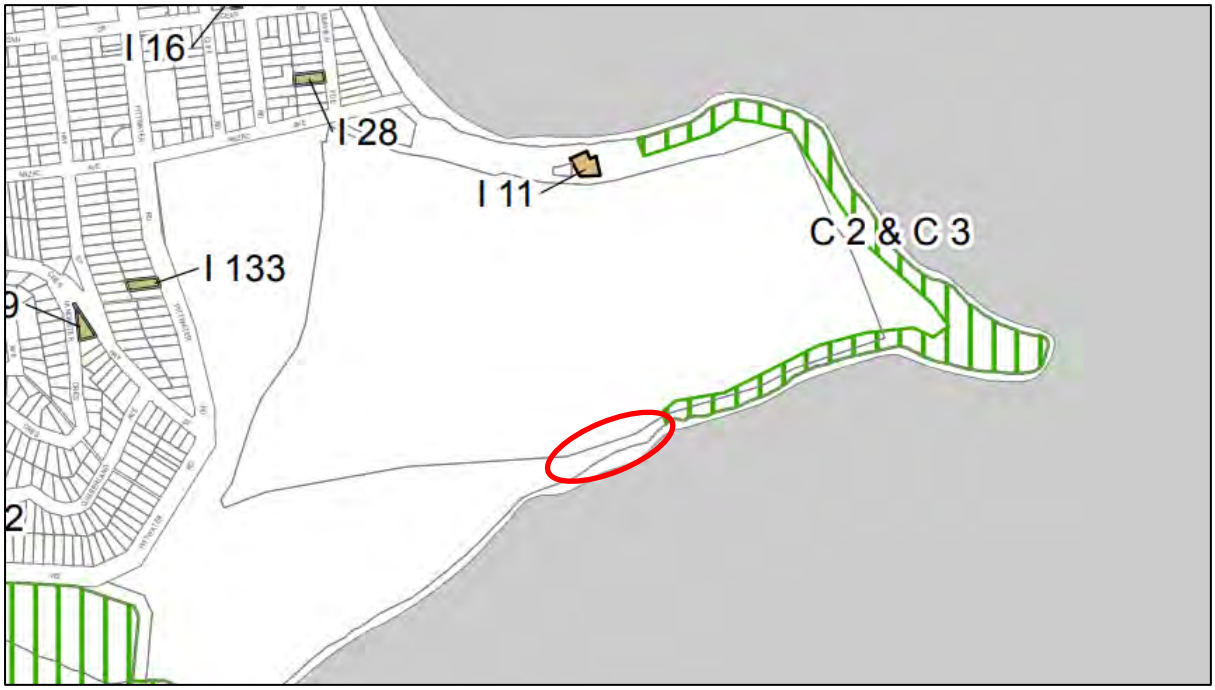

Figure 7. Detail of the Warringah LEP Heritage Map. Approx. location of study area indicated by red circle (Source: Warringah LEP 2014 Heritage Map Sheet HER_009)

3.0 Aboriginal Cultural Heritage

This section presents information about both the physical and cultural landscape in which the study area is located, as well as previous archaeological and ethnohistorical studies, to provide context and background to the existing knowledge of Aboriginal culture in the area.

3.1 Existing Environment

The study area is located within the geological structure known as the Sydney Basin, which is roughly bounded by the Great Dividing Range to the west, the coast to the east, Newcastle to the north and Durras, near Batemans Bay, to the south. More specifically, the study area is located on the southern side of Long Reef Headland within Sydney's Northern Beaches (Branagan & Packham 2000). The headland which slopes down in a westerly fashion from its eastern most point, is not actually a part of mainland Australia. It is a section of exposed bedrock that is connected by a tombolo, which comprise sand deposits and form a sand spit (Retallack 2015).

3.1.1 Soils, Geology and Topography

The underlying geology of Long Reef Headland is varied and complex. The Narrabeen Group of sedimentary rocks that were formed in the Triassic period (approx. 250 mya to 200 mya) are exposed here. This stratum is not often seen along the Sydney Coast because it lies below the Hawkesbury Sandstone, that is the geological layer usually visible in the cliff lines. The Bulgo sandstone that is within the study area is within the Narrabeen Group and is not as fine-grained as the Hawkesbury. It is capped by the Bald Hill Claystone, which is a striking red colour due to the high iron content (Retallack 2005).

There are also exposures of other claystones and shales within Long Reef headland that can contain fossils from ancient animals and plants. For example, the remnants of a jawbone measuring one meter from a giant salamander-like amphibian was found at Long Reef. Additionally, a 2 m volcanic dolerite dyke has also protruded through the sandstone but has largely been mined so it has been significantly reduced in size (Retallack 2005).

Long Reef Headland contains three soil landscapes: the Newport, North Head and Ettalong. The Newport and North Head soil landscapes are sandy soils that can be quite deep, especially the North Head which can be over 2 m deep. The Ettalong soil landscape is mapped in a small swampy area in the lower-lying western portion of the headland. The soils in this type of landscape can also be very deep (>150 cm) but comprise of spongy dark organic peat that has a high component of decomposing vegetation.

The study area falls entirely within the Newport soil landscape which comprises gentling undulating plains to rolling rises of shallow wind-blown Holocene sands. The A1 topsoil can be up to 30 cm of loose dark brown loamy sand that overlies up to 50 cm of greyish yellow brown massive clayey sand or bleached loose sand. There can

also be wind-blown sand that covers the underlying soil or has been deposited directly onto bedrock. Although archaeological remains tend to be contained in the top A1 horizon and A2 by downward movement, wind-blown sand accumulation in areas such as this can mean that original surfaces may have been buried quite deeply, depending on the landscape formation.

3.1.2 Flora and Fauna

The plants found within the Long Reef headland varied depending on the underlying soils. Around the edge of the swamp there would have been a variety of trees including: *Melaleucas* (paperbark), *Casuarinas*, (swamp-oak), *Livistona* (cabbage gum) and *Eucalyptus* (Gum trees). There also would have been sedges and rushes.

The frontal dunes along the coast tend to be made up of shifting sands that have not had time to form proper soils. They are inclined to be low in nutrients and covered by grasses such as Spinifex, which provide habitat for birds, reptiles and mammals that reside in the sand burrows and feed within the grasses and at the waterline. Tall grass trees, like *Xanthorroea arborea*, called 'Cadi' by the Aboriginal people who lived in Sydney, had many uses. Its long stalks were used to make spears, the dried flower stalk was used to generate fire, and the resin collected from the leaf bases and damaged area on the trunk, were used to adhere ornaments to hair and bind the parts of composite tools. Colonists also remarked on the extraordinary strength of this resin to fasten stone heads to their hatchets (Clarke 2012:138).

The coastal sand dunes would have supported *Banksia* species as well as *Eucalyptus* like red bloodwood, *Angophora* such as smooth-barked apple, and cycads including the *Macrozomia communis*. The *Macrozamia* produces seeds that were eaten by Aboriginal people after they were leached of their toxins (Asmussen 2011). The various *Eucalypts* would have provided wood for shields, canoes and coolamons. Another type of tree with creamy white to deep yellow flowers that grows within this habitat are the Acacias, commonly known as wattle. They were recorded as having been used to make wooden clubs in the Sydney area (Attenbrow 2010: 113)

Many other plants and trees found around Long Reef would have provided resources for Aboriginal people; to fulfill dietary needs, provide raw material for tools and implements, and used for medicinal purposes. For example, fur from possums would have been sewn together using a needle made from animal bones and thread made from the sinew of animal's muscles. The shellfish collected around the shoreline and rocky reef platform would have provided protein for food a raw material source to make implements such as fish hooks from turban shells (*Turbo marmoratus*) and scrapping tools from Sydney cockles (*Anadara trapezia*).

3.1.3 Hydrology

There are no fresh-water creeks mapped within the study area itself. However, there is an unnamed drainage line that appears to originate in the southwestern section and extend to approximately 40 m to the north of the study area. It also feeds into the wetland area in the western portion of the headland but it is not clear how

reliable these would have been as a water source. Recent aerial photos show a man-made channel has extended this drainage line, which now cuts through the study areas from north to south and empties onto Long Reef Beach.

In general, remnants of former Aboriginal occupation sites tend to be found close to a reliable fresh water source that would be considered a higher-order water course. For example, watercourse classification ranges from first order through to fourth order (and above), with first order being the lowest, ie a minor creek or ephemeral watercourse, and fourth or above being a large watercourse such as a river, as defined by the Department of Planning and Environment (DPE; Figure 8). This classification is recognised as a factor which helps the development of predictive modelling in Aboriginal archaeology in NSW.

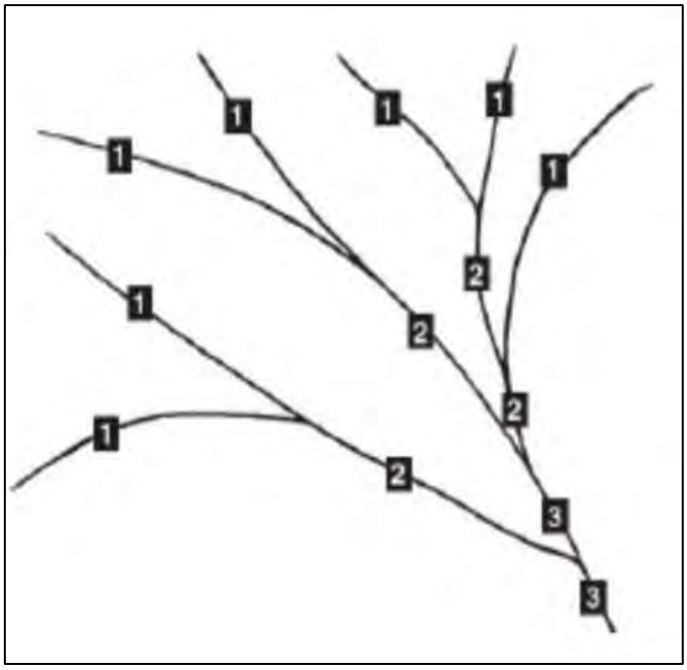

Figure 8: The Strahler system (Source: Department of Planning and Environment 2016).

3.1.4 Raw Materials

A wide range of raw materials were selected by Aboriginal people for flaking to create stone implements. Material types ranged from high quality to poor quality for flaking purposes, depending on the geology of the area and readily available material types. The following is a description of a range of raw material types known to have been utilised by Aboriginal people for the creation of stone artefacts. Not all occur naturally within all environments, although different resources can be identified within different regions due to trade or resource carrying (ie 'manuport' stone). Although quartz pebbles most probably would have been available within the sandstone within the Northern Beaches area, no major rocks sources such as silcrete outcrops have been recorded. It is likely that fine-grained material suitable for flaking into tools such as scrappers, eloueras and backed artefacts would have been brought into the area by direct access to the stone source or traded in. For

example, Yarrumundi along the Nepean River, approximately 78 km north west to the current study area has a plethora of cobbles made from silcrete, tuff, indurated mudstone.

As discussed in the literature review in the following section, Corkill (2005) inspected beaches and cliff lines from Palm Beach to Port Jackson to locate potential sources for ground-edged stone hatchets that have been found within the Sydney Coast and Hinterland Regions. She observed that, although there are basalt diatremes along this stretch of coast located (in Avalon and Bondi for example), no useful sources (bedrock and/or cobbles) were identified. Corkill proposed that the closest sites to obtain raw material is along the Hawkesbury/Nepean Rivers in western Sydney, and/or at Bellambi Point in the Illawarra Region to the south, and Kulnura (Peats Ridge/Popran Creek) in the Central Coast Region to the south.

Breccia

Breccias are coarse, angular volcanic fragments cemented together by a finer grained tuffaceous matrix.

Chalcedony

Chalcedony is a microcrystalline, siliceous rock which is very smooth and can be glossy. Introduction of impurities can produce different coloured versions of chalcedony, including yellow/brown (referred to as carnelian), brown (sard), jasper (red/burgundy) and multicoloured agate. It flakes with a sharp edge and was a prized material type for the creation of stone artefacts in parts of Australia (Kuskie & Kamminga 2000: 186).

Chert

Chert is a highly siliceous sedimentary rock, formed in marine sediments and also found within nodules of limestone. Accumulation of substances such as iron oxide during the formation process often results in banded materials with strong colours. Chert is found in the Illawarra Coal Measures and also as pebbles and colluvial gravels. It flakes with durable, sharp edges and can range in colour from cream to red to brown and grey.

Petrified Wood

Petrified wood is formed following burial of dead wood by sediment and the original wood being replaced by silica. Petrified wood is a type of chert and is a brown and grey banded rock and fractures irregularly along the original grain.

Quartz

Pure quartz is formed of silicon dioxide, and has a glossy texture and is translucent. Introduction of traces of minerals can lead to colouration of the quartz, such as pink, grey or yellow. The crystalline nature of quartz allows for minute vacuoles to fill with gas or liquid, giving the material a milky appearance.

Often quartz exhibits internal flaws which can affect the flaking quality of the material, meaning that in general it is a low-quality flaking material (Kuskie & Kamminga 2000: 186). However, quartz is an abundant and widely available

material type and therefore is one of the most common raw materials used for artefact manufacture in Australia. Flaking of quartz can produce small, very sharp flakes which can be used for activities such as cutting plant materials, butchering and skinning. Quartz may have been available locally in pebble form eroding out of sandstone and sandstone conglomerates.

Quartzite

Formed from sandstone, quartzite is a metamorphic stone high in silica that has been heated or had silica infiltrate the voids found between the sand grains. Quartzite ranges in colour from grey to yellow and brown.

Silcrete

Silcrete is a siliceous material formed by the cementing of quartz clasts with a matrix. These clasts may be very fine grained to quite large. It ranges in colour from grey to white, brown, red or yellow. Silcrete flakes with sharp edges and is quite durable, making silcrete suitable for use in heavy duty woodworking activities and also for spear barbs (Kuskie & Kamminga 2000:184).

Tuff/Indurated Mudstone

There is some disagreement relating to the identification of lithic materials as tuff or indurated mudstone. The material is a finely textured, very hard yellow/orange/reddish-brown or grey rock. Kuskie and Kamminga (2000: 6, 180) describe that identification of lithic materials followed the classification developed by Hughes (1984), with indurated mudstone described as a common stone material in the area. However, Kuskie and Kamminga's analysis, which included x-ray diffraction, identified that lithics identified as 'indurated mudstone' was actually rhyolitic tuff, with significant differences in mineral composition and fracture mechanics between the stone types. They define mudstone as rocks formed from more than 50% clay and silt with very fine grain sizes and then hardened.

The lithification of these mudstones results in shale (Kuskie & Kamminga 2000: 181) and thus 'indurated mudstone', in the opinion of Kuskie and Kamminga, do not produce stones with the properties required for lithic manufacture.

In 2011, Hughes, Hiscock and Watchman undertook an assessment of the different types of stones to determine whether tuff or indurated mudstone is the most appropriate terminology for describing this lithic material. The authors undertook thin section studies of a number of rocks and determined that the term 'indurated mudstone' is appropriate, with an acknowledgment that some of this material may have been volcanic in origin. They also acknowledge that precise interpretation of the differences between material types is difficult without detailed petrological examination, and suggest that artefacts produced on this material are labelled as 'IMT' or 'indurated mudstone/tuff'.

VOLCANIC

Both volcanic and acid volcanic stones are raw material type within the South Coast. Without detailed petrological analysis it can be sometimes difficult to identify the specific raw material. However, probably one of the most common and recognisable types of volcanic stone is basalt, which is commonly referred to as 'blue metal'. It is solidified lava that was produced by now extinct volcanoes and diatremes that are spread-out within the Sydney Basin. If the lava cools quickly it results in fine-grained basalt that is easily flaked or ground to make tools, implements or weapons. Tuff forms from the tiny ash particles that are also released during volcanic explosions. When it cools it hardens into a fine-grained rock called 'tuff', as discussed above.

Basalt would have been either collected from the primary deposits formed during the eruption, which would require pieces to be broken off (quarried) or it was collected in cobble-form from a creek bed or shoreline. Cobbles are referred to as secondary sources as they are formed from pieces of rock that have been dislodged from their primary source and end up in creeks and/or river systems (Petrequin 2016; Attenbrow *et al*. 2017). The flow of water moves them around and smooths them into water-rolled cobbles that can be transported considerable distance from the original source. Basalt was often used to make axes which were either flaked into the desired shape from quarried stone, or from cobbles which quite often only required only one end to be ground into a sharp working edge.

Basalt and other types of volcanic cobbles can be found along the banks of rivers, and in bedrock quarries within the Sydney Basin. Recent research undertaken by the Australian Museum and University of New England using portable XRF technology demonstrated that a number of stone axes and ground-edged artefacts held at the Australian Museum have been traced to these sources (Attenbrow et al. 2017). However, none of these have been matched to the diorite volcanic diatreme that outcrops on Long Reef headland (Attenbrow et al in prep)

3.1.5 PROCUREMENT

Assemblage characteristics are related to and dependent on the distance of the knapping site from raw materials for artefact manufacture, and different material types were better suited for certain tasks than other material types. Considerations such as social or territorial limitations or restrictions on access to raw material sources, movement of groups across the landscape and knowledge of source locations can influence the procurement behaviour of Aboriginal people. Raw materials may also have been used for trade or special exchange between different tribes.

3.1.6 MANUFACTURE

A range of methodologies were used in the manufacture of stone artefacts and tools, through the reduction of a stone source. Stone may have been sourced from river gravels, rock outcrops, or opportunistic cobble selection. Hiscock (1988:36-40) suggests artefact manufacture comprises six stages, as follows:

1. The initial reduction of a selected stone material may have occurred at the initial source location, or once the stone had been transported to the site.
2. The initial reduction phase produced large flakes which were relatively thick and contained high percentages of cortex. Generally, the blows were struck by direct percussion and would often take advantage of prominent natural ridges in the source material.
3. Some of these initial flakes would be selected for further reduction. Generally only larger flakes with a weight greater than 13-15 grams would be selected for further flaking activities.
4. Beginning of 'tranchet reduction', whereby the ventral surface of a larger flake was struck to remove smaller flakes from the dorsal surface, with this retouch applied to the lateral margins to create potential platforms, and to the distal and proximal ends to create ridges and remove any unwanted mass. These steps were alternated during further reduction of the flake.
5. Flakes were selected for further working in the form of backing.
6. Suitable flakes such as microblades were retouched along a thick margin opposite the chord to create a backed blade.

Hiscock (1986) proposed that working of stone materials followed a production line style of working, with initial reduction of cores to produce large flakes, followed by heat treatment of suitable flakes before the commencement of tranchet reduction. These steps did not necessarily have to occur at the same physical location, but instead may have been undertaken as the opportunity presented.

Although probably less common than the process of flaking stone to modify it, the grinding technique was used within the Sydney Basin. This has been documented by early settlers particularly in the manufacture of axe heads where the end of a cobble was ground to achieve a working edge (Corkill 2005).

3.2 Land Use History

3.2.1 Indigenous Occupation

When Aboriginal occupation of Australia is likely to have first commenced, around 60,000 years ago (Mulvaney and Kamminga 1999; Bowdler *et al* 2003; Attenbrow 2010), sea levels were around 30-35 m lower than present levels, and this further decreased to up to 130 m lower than present sea levels (Attenbrow 2010). Sea levels stabilised around 7-6,500 years ago, and as a result many older coastal sites would have been inundated with increasing sea levels. It is possible that areas that are now considered "coastal" would once have limited resources available to Aboriginal people, and as such would have been less likely to have been occupied or used for repeated habitation sites.

Archaeological work at the Madjedbebe site in Arnhem Land in the Northern Territory revealed evidence confidently dated to the period before 45-46 ka and possibly up to 50-55 ka (Clarkson *et al* 2015). In NSW, there is strong evidence available to support Aboriginal occupation of the Cumberland Plain region in the Pleistocene

period (approximately 40 ka) and possibly earlier. Work in Cranebrook Terrace was dated to 41,700 years BCE by Stockton and Holland (1974), and a site in Parramatta within deep sandy deposits was dated to 25-30 ka (JMcDCHM 2005). Kohen's 1984 assessment of Shaws Creek in the Blue Mountain foothills yielded ages of 13 ka, while Loggers Shelter at Mangrove Creek was dated to 11 ka by Attenbrow (1987). Deeply stratified occupation deposits at Pitt Town were dated to 39ka (Apex Archaeology 2018). These ages are obtained from both radiocarbon and optically stimulated luminescence (OSL) dating.

Some experts have cast doubt onto the assessment of the items from Cranebrook Terrace as artefactual (Mulvaney & Kamminga 1999; McDonald 2008), although they do not doubt the results of the radiocarbon dates – it is the association of the artefacts with the dated deposits that is problematic, and Mulvaney and Kamminga (1999) consider that there are better examples of sites with more robust identification of age available. There has certainly been a great deal of research undertaken within the Sydney region in the intervening years.

It is unknown when Aboriginal people first occupied the Northern Beaches as there has only been a limited amount excavations undertaken within this area. Additionally, sites that may have been along a former shoreline more than 6,000 years would now be submerged underwater due to rising sea levels around that period. In 1988 human remains were found on the surface of a rock shelter in Angophora Reserve in Avalon. The shelter was subsequently excavated and more remain were identified. One of the occupation layers was dated from charcoal samples to approximately 2,000 years ago, but it was believed occupation may have begin up to 5,000years ago (McDonald 1992). And, in 2005, a human skeleton was accidently unearthed during the building-excavation works at bus shelter in Narrabeen and was dated to approximately 4,000 years old (Fullagar et al. 2009).

The wide-range of material that was excavated from Angophora Reserve and analysed by a variety of experts, found that the former occupants utilised a wide-range of natural resources. Terrestrial animals contributed significantly to the diet with shellfish and fish contributing less than 10%. The former occupants would have acquired the animal and plants locally, and the stones, bones and shells used to manufacture implements and tools would have most likely been procured both locally and further afield (McDonald 1992).

3.2.2 Post Contact Occupation

One of the first documented evidence of Aboriginal settlement in the Northern Beaches region is a diary entry after Governor Phillip's trip to Broken Bay in 1788. It was noted by the surgeon, George Worgan (cited in Attenbrow 2010:53) that:

> *They met with vast number of natives here, some of what they thought they had seen before at Botany Bay, indeed, it is pretty clear that they wander up & down the Coast...*

During the first three months of initial settlement at Sydney Cove in 1788, Governor Arthur Phillip took exploratory trips to Manly Cove, Broken Bay, and the upper reaches of the Parramatta River. An area known as Rose Hill (now Parramatta) was settled by a small group of 11 soldiers and 10 convicts in response to the food shortage in the less-fertile areas around Sydney Cove. The grain crops had failed and the settlement at Rose Hill was ordered to be used for agriculture. These crops were successful, and a further settlement comprising a convict farm was established at Toongabbie. Exploration of the wider region continued, and in 1791, expeditions travelled the Hawkesbury and Nepean areas, identifying them as likely spots for agriculture. The Hawkesbury was subsequently settled in late 1793 (Champion and Champion 1997:15).

The body of water known as Pittwater is within the Northern Beaches and was named by Governor Phillip after the British Prime minister at the time, William Pitt the Younger. It is located on the western side of the Pittwater Peninsula and opens up into Broken Bay which is at the mouth of the Hawkesbury River. By the late 1700s land grants were allocated to former convicts and free settlers along the fertile banks of the Hawkesbury River (Grose 1794). The farmland provided agricultural produce that was transported by ships waiting in the sheltered waters of Pittwater Bay before forming a convoy to Sydney. Eventually the Pittwater area and parts of the Northern Beaches were also used for farming. There were also numerous reports of smuggling, piracy and bushranging being carried on at Middle Harbour, North Harbour and Broken Bay (Champion and Champion 1997:34)

Pittwater remained isolated throughout most of the 1800s but gradually a rough bush road was established from Manly to Narrabeen. The road ran parallel to the coast and a bridge was built to cross Narrabeen lagoon around 1880. By 1913 the trams, that terminated at Narrabeen, had replaced the horse-drawn coaches. From the 1920's a succession of bridges were built, including the Sydney Harbour Bridge in 1932, and the Northern Beaches became more accessible. Although the early settlements comprised mainly holiday shacks, by the 1950s Pittwater became more residential.

The name Long Reef was in use by 1814 and the first owner was a free settler, William Crossar who was granted 200 ha in 1815. Crossar sold his holdings to Matthew Bacon in 1822. It changed hands a couple of more time before been sold to the James Jenkins in 1825 who held on to the property and farmed the land until they sold it to the Salvation Army. The Salvation Army continued to farm the land for a few more years. In 1912 the State Government resumed 72 ha of Long Reef for public recreation and named it Griffith Park (Morecombe 2022).

3.2.3 Documentary Evidence

To assess natural and historical disturbance within the immediate study area and surrounds, a series of historical aerial photographs dating back to the 1930s were

reviewed, along with information obtained from the Lanes and Mellowes (2021) book, 'Long Reef Golf Club, The First One Hundred Years'.

The golf club initially was constructed in 1921 as a 9-hole layout because the lower south western portion was a swamp. The swamp was drained and subsequently filled in the late 1920s which enabled the course to increase to 19 holes in 1931 (Plate 1). In 1942 the Army requisitioned a section of the course on the southern side centred around the 17th hole, including where the current study area is located. It was used as an artillery range and in order to make defence observation easier they flattened the large sand dunes in 1943 (Plate 2). Some of this sand was used to make sandbags and the rest was spread over several holes. This led to ongoing sand erosion and sand settling over other areas. In some case the sand was over 4.5 m high and blocked some of the water sources and fairways. The military equipment and vehicle tracks further impacted and damaged the course. The Club received compensation from the Army and engaged course designer Eric Apperly to rebuild and redesign the golf course. (Lanes and Mellowes 2021).

By 1961 a drainage channel had been constructed from north to south through the study area (Plate 3), and in 1963 problems were also noted in the area. Sand had blown in and accumulated on the 16th hole which led to its abandonment and the creation of a new one west of the old 17th and 18th holes. (Lanes and Mellowes 2021:82). A boundary was also created at the new 17th hole to relieve problems of the sand invasion (Lanes and Mellowes 2021:128). In the 1990s the club commenced a drainage project to alleviate the problem of water pooling in the swampy south section of the course. It was called the Wetland Project Phase 1 and included the construction of two ponds adjacent to the 4th and 5th holes. The fill from these was used to raise the adjacent fairways. These ponds also became a collection point for the stormwater which was then piped south across the 6th and 17th fairways (including the study area). Strip and dish drains were also added. Images from the early 1980s to early 2000s (Plate 4, Plate 5, and Plate 6) show the progress of this project. Between 2005 and 2016 a bridge had been constructed through the study area (Plate 7).

The available information establishes that the study area has been heavily impacted since at least the 1930s, which was the earliest available image of the area. The southern section of the study area has been subject to natural erosion from wind and wave action that has severely compromised the underlying geology and boardwalk. The construction of Long Reef Golf Course in the northern section of the study area included the clearance of original vegetation and modification to the original sand dune landscape. This would have resulted in the loss of most, if not all, of the original topsoil profile. Further impacts by the Army's use of the golf course for training exercises during the 1940s, including impact from an artillery range, led to further damage to the sand dune landscape through the levelling of them to obtain better visuals of the ocean. Water drainage works involving deep excavation and the construction of walking paths from the 1960s have further damaged the

study area. The historical and continuing natural and man-made impacts indicate that it is unlikely that any Aboriginal material cultural in an intact context would remain.

Comparison of the 1943 historical imagery (Plate 8) and imagery from 2022 (Plate 9) with cadastral boundaries overlaid allows an assessment of the impact of natural erosion of the coast over time. Even allowing for discrepancies in the alignment of the imagery, the alteration to the coastline over these years is significant.

Plate 1: 1930 aerial. Approx study area in red (Source: NSW Spatial Services HV 2023).

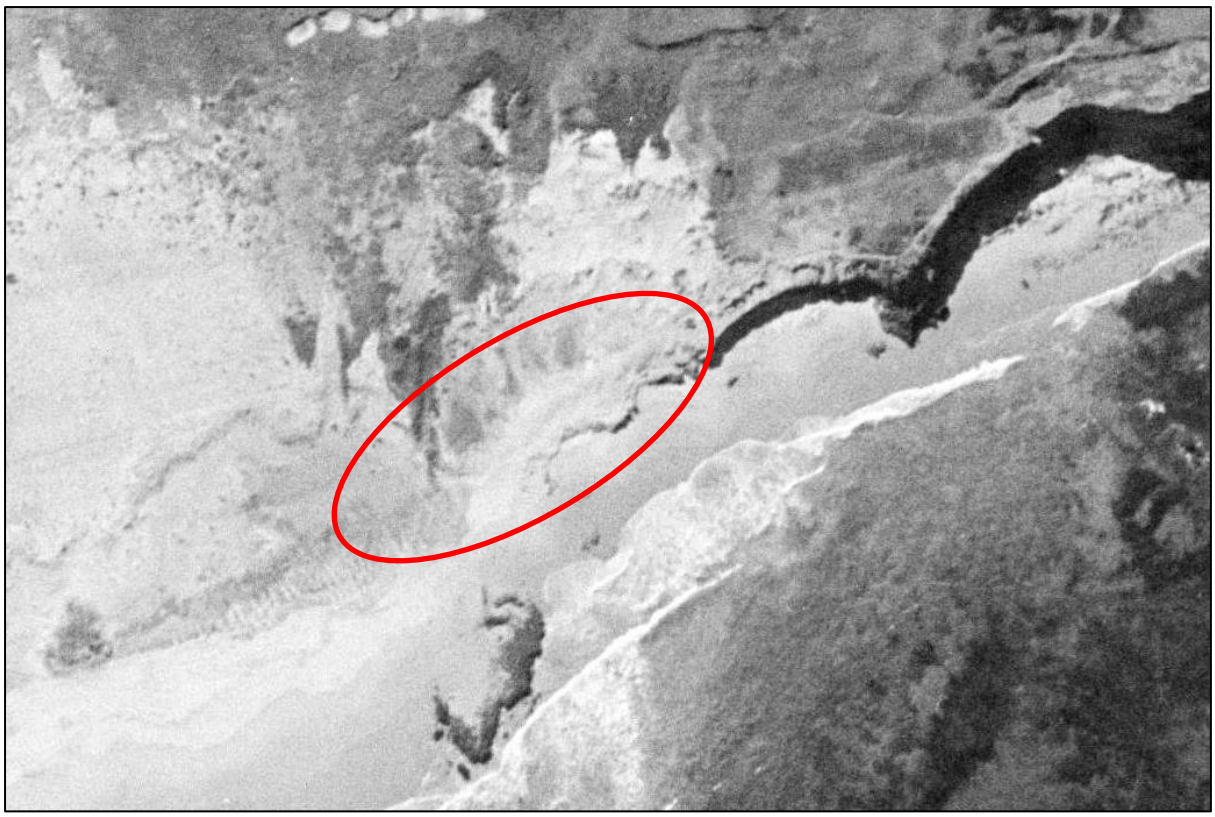

Plate 2: 1943 aerial. Approx study area in red. (Source: NSW Spatial Services HV 2023).

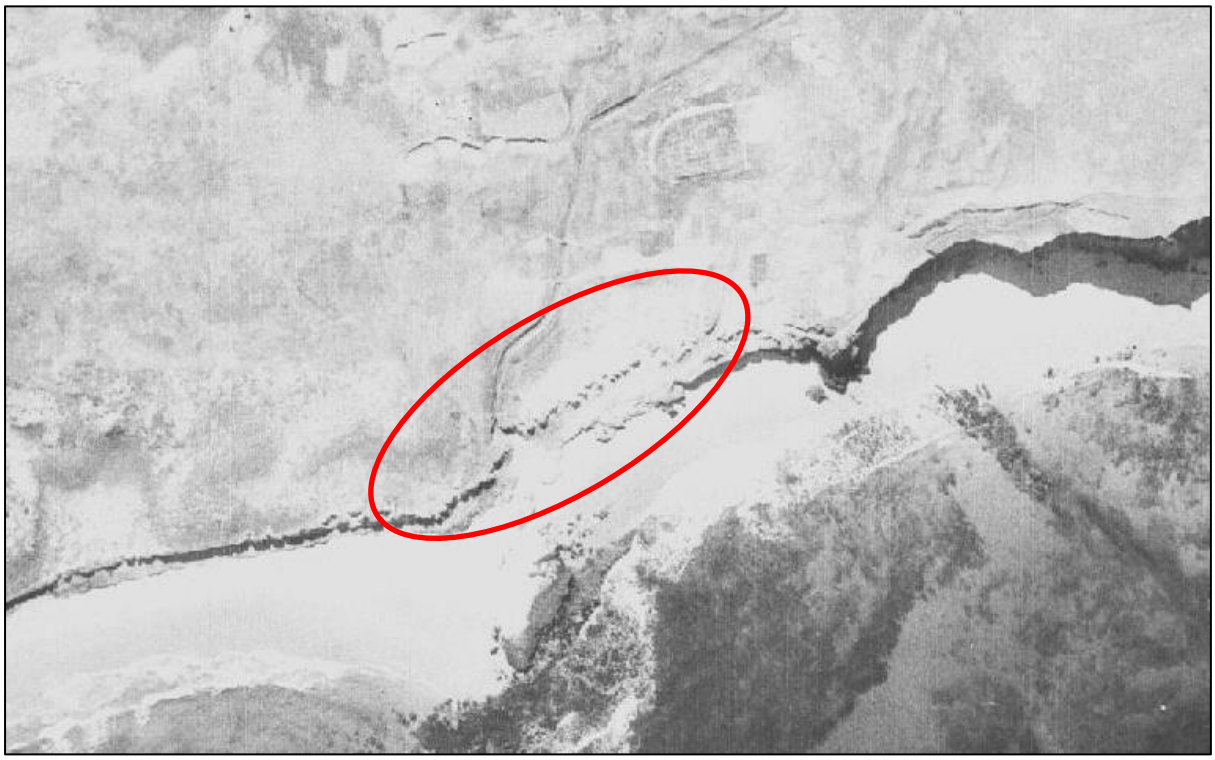

Plate 3: 1961 aerial. Approx study area in red (Source: NSW Spatial Services HV 2023).

Plate 4: 1986 aerial. Study area in red (Source NSW Spatial Services HV 2023).

Plate 5: 1996 aerial. Study area in red (Source; NSW Spatial Services HV 2023)

Plate 6: 2005 aerial. Study area outlined in red (Source; NSW Spatial Services HV 2023

Plate 7: 2016 aerial. Approx study area outlined in red

Plate 8: 1943 aerial imagery with current cadastral boundaries overlaid (Source: SIXMaps)

Plate 9: 2022 aerial imagery with current cadastral boundaries overlaid (Source: SIXMaps)

4.0 Literature Review

A review of previous archaeological work within the surrounding region of the study area was undertaken. A number of reports were identified from background research and the AHIMS database and are summarised below, with detailed summaries presented in Section 4.1.

Table 2: Previous heritage assessments undertaken by archaeological consultants in the region

Consultant	Date	Sites Identified	Region
Campbell	1899	Numerous	Broken Bay
Ross	1974	Numerous	Deep Creek
Denis Byrne	1984	Numerous	Palm Beach
Brayshaw McDonald	1987	Numerous	Queenscliff – Palm Beach
McDonald	1988	One	Bilgola/Avalon
Mary Dallas	1990	One	Cromer
R.G. Gunn	1992	Numerous	Garigal National Park
Tessa Corkill	2005	None	Palm Beach to Botany Bay
Fullagar et al.	2009	One	Narrabeen
Artefact	2020	None	Frenchs Forest
Coast History and Heritage	2021	None	Manly
Bryant	2023	Numerous	Northern Beaches

4.1 Previous Archaeological Work

An analysis of previous archaeological work within the study area assists in the preparation of predictive models for the area, through understanding what has been found previously. By compiling, analysing and synthesising the previous archaeological work, an indication of the nature and range of the material traces of Aboriginal land use is developed. An understanding of the context in which the archaeological assessment is vital, as development does not occur within a vacuum, but within a wider cultural landscape, and this must be considered during any archaeological assessment in order to develop appropriate mitigation and management recommendations.

4.1.1 Previous Regional Heritage Assessments

A number of previous archaeological assessments and research projects have been undertaken within the Northern Beaches area, as well as surveys that included Long Reef. Some of the more relevant investigations assessments are summarised below.

Campbell 1899

The government surveyor W.D Campbell undertook private archaeological surveys between 1886 and 1893 throughout the Sydney area and noted at the time that the creek beds within Narrabeen and Broken Bay warranted further investigation. Numerous rock engravings were identified in Manly and the wider Narrabeen Lake region. The many and varied engravings at Narrabeen around Middle Creek and Deep Creek included shields, boomerangs, waddys (wooden clubs), fishing spears, oval figures, fish, a whale, eels, ducks, kangaroos and wallabies, footprints

(mundoes) and net bags. Additionally, engravings on tessellated sandstone around the Beacon Hill area included shields, a boomerang, a club and an emu. Fred McCarthy from the Australian Museum later interpreted these in 1983 as an emu being hunted.

Ross 1974

In 1974 the Sydney University Prehistory Group undertook archaeological investigations around the Belrose and Beacon Hill areas, which are approx. 8 km northwest, and 4 km southwest, respectively of the current study area. Another survey was undertaken along Deep Creek in Narrabeen and Terry Hills approximately 5 km northwest of the current study area.

A number of engravings previously identified by Campbell were found in a reserve in Belrose, along with human-like anthropomorphic figures. Axe grinding grooves were located in a reserve at Beacon Hill close to Wheeler Creek, and a number of other engravings were relocated within private property in Beacon Hill. One site in a back garden contained a hammerhead shark engraving on a rock platform and water channels had been carved into the rock to divert water into holes. Axe grinding grooves were also around these waterholes.

The survey undertaken along Deep Creek identified engravings of a turtle, kangaroo and crest-shaped objects. These had not been recorded by Campbell and it was believed that some of them had been redone later by Europeans. A rock shelter with five artefacts made of quartz and jasper were found. Another site close to Monash Golf Club featured fish, a dolphin, snake and a shield on sandstone platform. The area around Terry Hills also noted rock engravings of figures including male and female figures, a shield, and kangaroo. Axe grinding grooves were also located here.

Byrne 1984

Byrne undertook an archaeological survey of the northern section for the Palm Beach sand barrier, approximately 19 km to the north of the current study area. The investigation was to inform the Warringah Shire Council (now the Northern Beaches Council).

The investigations identified 11 midden occurrences, and except for some intact *Anadara* (Sydney Cockle), the shells were only fragments. A 2 m x 2 m square was strung out on the surface of each midden and the material within each square was counted and classified. The middens ranged from a thin and sparce scattering of shell material to more concentrated layers. Although the majority of shells were Sydney cockle shells, oyster, and unspecified gastropods; *Nerita* and chiton were also identified. This demonstrated that the Aboriginal people were obtaining resources from both the rocky platform and estuarine environments. Stone artefacts, faunal remains and numerous pieces of sandstone pieces were also noted within the midden sites.

It was recommended that two of the middens were of high archaeological significance and should not be disturbed. If they were required to be buried, it was recommended that a durable material should be placed over them to enable relocation at a later date. The two other sites considered to be of 'medium' archaeological significance were also recommended to be avoided, but in the event impact could not be avoided, a thorough salvage was recommended. The remainder of the middens were considered to be of 'low' archaeological significance and destruction, if essential, was considered permissible.

Brayshaw McDonald Consultant Archaeologists 1987

Brayshaw McDonald Consultant Archaeologists (BMCA) undertook an archaeological survey for a bicentenary coast walk from Palm Beach to Queenscliff. The survey also included Long Reef Headland and the current study area.

A total of five previously unidentified archaeological sites were recorded and another eight known sites in the vicinity of the route were inspected to verify their location and the possible impact of the proposed development.

Although Hawkesbury sandstone was found to be outcropping along the headland it was generally found to be rough and unsuitable for engravings. The high levels of exfoliation of the sandstone were also considered to be pronounced and indicated a low probability for the survival of Aboriginal engravings. However, it was suggested that there was a high potential for sandstone platforms to contain engravings on Dee Why Head and Bangalley Head, but none were found.

As pointed out by BMCA at the time of their report, apart from Byrne's (1984) work at Palm Beach, few systematic archaeological surveys had taken place on the Northern Beaches. Previous investigations had been carried out away from the immediate coast, such as in the Narrabeen Lagoon area around Deep Creek.

The background research also found that 12 midden sites were the only site type recorded along the proposed walking route from the southern end of Palm Beach to Long Reef. However, several rock engravings including one at Palm Beach and three at Long Reef were recorded but not precisely located.

The pedestrian survey was undertaken by two archaeologists from BMCA. Although numerous attempts were made to contact the Metropolitan Local Aboriginal Land Council to invite them to participate in the survey, no response was received. The degree of disturbance along the route was considered very high and the only completely 'undisturbed' area was Bangalley Head at Avalon.

The five new sites identified are discussed in detail below. All were shell middens, three of them open sites, and two within rockshelters.

The Site QP3 (AHIMS #45-6-0741) falls within the current study area and was described as follows:

A sparse, scattered midden possibly a "dinnertime time camp" (Meehan 1982), the shells were found in an eroded section at the interface of a darker soil layer with a lighter horizon some 30- 40 cm below the present ground level. The lighter horizon is presumed to be post contact because of an in situ house brick 20 cm below the surface. Existing walking tracks in this area have accelerated erosion in several points across the site.

Shell was observed along only 22 m of the eroded bank, which is over 50 m long in total. A maximum of 20 individual shells were seen, most of these being large triton (over 80%), Cockle, oyster (Saccostrea commercialis) and sand snail (probably Polinices aulacoglossa) shells were also observed. Fragmented shell and an indurated mudstone artefact were observed below the bank, along the gullied and sheet washed erosion area. Another stone artefact was located 25 metres east of the erosion bank on a gravel lag. This was also of indurated mudstone, and consisted of an unmodified flake < 3 cm long.

The site was considered to be of low archaeological significance. As it was proposed that the access path could be moved to avoid it, no further archaeological investigations were considered warranted.

Plate 10: QP3 as recorded in 1987, located in eroded section to left of image (Brayshaw McDonald 1987)

AHIMS #45-6-07350 (QP1) was identified as being in a rock shelter immediately adjacent to the North Curl Curl Surf Life Saving Club car park. Only a portion of the midden deposit remained undisturbed due to the construction of a stone wall drain. It was approx. 40 cm deep in a black humic deposit in an area of 3 m x 1 m. It

contained approx. 80% triton and 20% black periwinkle, limpet, and other periwinkle species. The remaining has been reduced to bedrock. The site was not going to be impacted by the development and was considered to have limited potential due to the highly disturbed nature.

AHIMS #45-6-1756 (QP2) was in a rock shelter at Dee Why point situated approx. 15 m from the proposed track. It contained fragmented triton, black periwinkle and one cockle. There were also 14 stone artefact flakes and flaked pieces made from quartz, mudstone, and silcrete. The surface was also littered with broken glass, ring pulls and other garbage.

AHIMS #45-6-0746 (QP4) is approximately 460 m northeast of the current study area, it was described as an extensive, extremely rich and partially disturbed midden eroding out from the top of the cliff at Long Reef. It was approx. 100 m from the rock platform below and the variety of shell observable in the midden was considered to be a direct reflection of the abundance of the resource zone in the area. It was assessed as being 50 – 70 cm deep but the real extent was not known due to grass cover. The predominant species present in the midden were Sydney whelk (*Pyrazus ebinus*), the small whelk (*Velacumantus australis*), and many other species including cockle, periwinkle, triton, oyster, mussel, pipi and sand snail were present. It was recommended that a management plan be implemented as the scientific and cultural information were considered to be high.

AHIMS #45-6-0738 (QP5) on North Narrabeen headland was described as an open shell midden containing species including oysters, black periwinkle, whelks and cockle, positioned on a slope above a sheer drop from Narrabeen Head down to the entrance to Narrabeen Lakes. The site shell was intermixed with building rubble and other foreign matter.

A previously recorded site (AHIMS #45-6-112) at Turrimetta Head that was situated adjacent to the proposed walkway was also inspected and recorded. It comprised a shelter with midden and was at the base of the cliff at the northern end of the beach, just above the high tide mark. The deposit consisted of black humic sandy loam densely packed with shell material, including black periwinkle, triton, cockle, limpet, oyster and turban shell and sand snail. A fish scapula was also observed, as was a ground artefact measuring 4.5 cm x 5 cm and 1.4 cm. It was described as fine-grained basic and had grinding on both sides and was proposed to be the 'perfect shell-opening implement'.

Overall, the report assessed that the sites showed both estuarine and marine species of shell fish were targeted and only three of the six sites had stone artefacts. With the exception of AHIMS #45-6-0746 (QP4) on Long Reef Headland, the newly identified sites were considered to be of low archaeological potential due to the extensive disturbance. The AHIMS #45-6-0746 site was considered to have a rich deposit that had only been partially disturbed. It was recommended that this site be fenced off and stabilised. Further archaeological investigation would also be

required to define the limits of the site. It was also recommended that after the archaeological results had been completed, they be incorporated into the project as an interpretation feature.

Three of the four previously identified sites were found to have been destroyed. Only AHIMS # 45-6-112 at Turimetta Head was found to still exist. Although it was disturbed it was considered to potentially contain a rich deposit.

McDonald 1992

In 1988 human skeletal material was discovered on the surface of the deposit in an Aboriginal rock shelter within Angophora Reserve in Avalon, approximately 14 km to the north of the current study area. The examination of the bone fragment was initially considered to be of a 5-year-old child and the police conducted investigations within the shelter deposit. McDonald and her team conducted further controlled archaeological excavations. Although the top 10 cm was disturbed there was intact archaeology including a shell midden within the shelter. Preliminary carbon dating of the site indicated that the occupation of the site began approximately 2,000 before present (BP) but it was suggested that the site could be as old as 5,000 years old (McDonald 1992:96). The rock shelter was used most intensively as an occupation place around 2,000 years ago, after it had been used as a burial ground. Occupation ceased sometime around 1,150 years BP.

At the time of the report, it was considered that the remains of at least five (possibly six) Aboriginal people were recovered during the fieldwork. These included one adult buried with an Aboriginal baby around 6 months, two children between the ages of 3 and 5, and one (possibly two) other adult Aboriginal people. A total of 17 days were spent excavating selected areas within the site and 6,700 kg of deposit were removed from the site during this time, from which 3,350 kg of cultural material was also collected. The cultural material collected included shell, stone, plant, and faunal remains. Faint pigmented art work was also detected high on the western wall and featured faded charcoal drawings of several small anthropomorphic figures and red ochre drawings of two macropods (kangaroo/wallaby?) and a fish.

The shell species included over 30 species from the rock platform and estuarine environments with the dominate species being rock oyster that comprised 51% of the assemblage, followed by hairy mussel (21%), then Sydney cockle (10%). Most of the faunal material which made up the bulk of the protein (90%) brought into the site consisted of macropods (swamp wallabies, eastern grey kangaroos) and larger mammals such as possums and dingos, but also included; gliders, echidnas, bandicoots, reptiles, amphibians, birds and crustaceans. Seventeen species of fish were also retrieved but snapper was the dominant species, comprising 85% of the assemblage.

A total of 5,715 stone artefacts were recovered with the majority found within the shell midden (78%). The predominant stone material was quartz (55%), followed by indurated mudstone (14%), veined chert (11%) and chert (8%), and the remainder

comprised fine-grained volcanic, granite, fine-grained basic and other siltstone material. It was proposed that the quartz and veined chert would probably have been available locally as water-worn pebble. The tool/implement types included backed-blade (type of point that could be attached to a spear), and microliths (small stone tools) still coated in hafting resin from the *Xanthorrhoea* plant were also found. Other artefact types included several different types of bone points that were proposed to have been used as barbs for fishing spears, and some had evidence of polish that indicated use as awls for sewing baskets or animal skins. Shell scrapers made from Sydney cockle shells (*Anadara*) were also present and could have been used for cutting and scrapping wood to make implements. A piece of volcanic material with evidence of grinding that may have been from a ground-edged axe was also found.

Apart from the *Xanthorrhoea* residue, a variety of plant material including the poisonous *Macrozamia communis* kernels, burnt *Banksia* and *Casurina* seeds, paperbark and seaweed remnants were found. *Macrozamia* kernels were an important part of the Aboriginal diet and were ground to make flour. However, they are highly toxic and require extensive treatment through water and/or heat to leech the toxins.

The shell species included over 30 species from the rock platform and estuarine environments with the dominant species being rock oyster at 51% of the assemblage, followed by hairy mussel (21%), then Sydney cockle (10%). The majority of the faunal material comprised of macropods (swamp wallabies, eastern grey kangaroos) and larger mammals such as possums and dingos, but also included; gliders, echidnas, bandicoots, reptiles, amphibians, birds and crustaceans. Seventeen species of fish were also retrieved but snapper was the dominant species comprising 85% of the assemblage.

Overall, the assemblage provides evidence that Aboriginal people were occupying the southern part of Pittwater Peninsula since approximately 2,000 BP, but most probably closer to at least 5,000 years ago. The site appears to initially have been used as a burial ground around the same time that shell was been brought into the shelter. However, after this, it was used for more domestic purposes, as seen in the wide variety of plants, shell, faunal remains, stone implements and flakes. The locally available natural resources were gathered from the bush environment and ocean estuaries and rock platforms, which are approximately 1 km away. The quartz stone and veined chert may have been procured locally as small pebbles, but other stone would have been obtained through direct access or trade from further afield.

MARY DALLAS 1990

Mary Dallas conducted an archaeological survey near Narrabeen Lagoon, approximately 3 km to the northwest of the current study area. The investigation was to identify sites or areas of archaeological and Aboriginal significance. It was

undertaken for the Department of Housing and completed in consultation with the Metropolitan LALC.

The study area comprised 6 hectares of natural bushland within the catchment of Narrabeen Lagoon that were close to Cromer Golf Course. Dallas noted that previous investigations within the wider area, such as those undertaken by Campbell (1899), McCarthy (1983) and McDonald (1987), had been to identify specific site types within sandstone outcrops, such as rock engravings and rock art within rock shelters. Dallas also noted that Attenbrow (1980) had stated that even in rock shelters that have no apparent visible archaeology, there is a high potential for them to contain subsurface archaeology.

The survey relocated a kangaroo engraving site on a rock platform previously identified in 1983 by McCarthy. A rock shelter site was also identified on the western edge of Cromer Golf Club and contained a deposit 20 cm deep x 2 m wide, and 3 m long. Stone artefacts made from quartz and mudstone artefacts were located on the floor towards the front. Another rock shelter along Cromer Road was also identified but no archaeological material was found within in it. The floor of the shelter comprised of <5cm of soil washed in from upslope onto a rock base. It was not considered to be an Aboriginal site and it had no potential to contain archaeological deposit.

In consultation with the Metropolitan LALC it was recommended that although the site would not be impacted a management strategy should be implemented.

GUNN 1992

Gunn was engaged to undertake a study of Aboriginal sites within Garigal National Park. The area included approximately 1800 ha and included the greater part of Deep Creek and its catchment, and the lower valley of Middle Creek, approximately 6 km to the northwest of the study area. The aim of the study was to record a representative sample of the Park's archaeological sites so as to enable significance assessments of particular site types and the archaeological sensitivity of the region.

A review of the previous assessments found that the investigations tended to be directed towards ridge tops and upper slopes rather than lower slopes. It also found that a large number of rock engraving sites had been noted, along with a couple of axe grinding groove sites, a stone arrangement and a few rock shelters.

Garigal National Park is within sandstone country and is drained by two large creeks, Deep Creek and Middle Creek. Both trend eastward and feed Narrabeen Lake before emptying into the ocean. The upper reaches of Deep Creek are only 10 km from the ocean. It was noted that plants for making wooden implements included string and paperbark, *Xanthorrhoea* for spears and *Casuarina* for bark canoes and fibrous Kurrajong for fishing line. The Aboriginal people that once lived here would have enjoyed a coastal and estuarine economy.

The field work was conducted over 13 days in February 1992 and included a representative from Metro LALC and NPWS. It was suggested that as the park had already been walked over for a couple of previous archaeological surveys, it was unlikely that any major art sites or rock shelter with deposit had been overlooked. It was proposed to relocate the art sites and focus on trying to locate open artefacts scatters that are unrepresented in the Park.

A total of 17 sites were located. Twelve had been previously recorded and five were new sites. Of the other 23 sites previously recorded as being within the park, eight were considered to be unreliable and would require further investigation. All the sites occurred in only two landform units: ridge-tops and slopes. No sites were located in the creek-line or alluvial flats.

The most common rock engraving motif was mundoe (footprints) which accounted for 34%, followed by fish types 11%, macropod/bandicoot 9% and human 7% (one woman and ten men). Only 4.5% contained grinding grooves. The largest motif was the whale, which was 1.3 m long. The rock art within the four rock shelters consisted of red hand stencils, and black and white echidna, a line, and indeterminate motifs. The only stone artefact that was identified during the survey was a single quartz artefact.

Gunn proposed that the main habitation area for past occupancy would have been on the coastal headlands during the summer months, when food and water were plentiful. The Aboriginal people would have lived principally on a marine diet, but with occasional forays into the creek areas. Surprisingly Gunn doesn't mention the potential significance of so many engraving sites concentrated within Garigal National Park. He only states that they were probably etched during the summer months.

Various recommendations were made to protect the sites and it was also recommended that the Metropolitan LALC be involved at all stages of the management of the archaeological sites within the park.

CORKILL 2005

Tessa Corkill (2005) undertook a research project for the Australian Museum to identify potential rock sources that would have been used by Aboriginal people to make ground-edge hatchets that have been found within the Sydney Coast and hinterland Regions. Corkill inspected beaches and cliff lines from Palm Beach to Port Jackson and observed that, although there are basalt diatremes along this stretch of coast (located in Avalon and Bondi for example), no useful sources (bedrock and/or cobbles) were identified. Corkill proposed that the closest sites to source raw material for ground-edge hatchets would have been from cobbles found along the Hawkesbury/Nepean Rivers in Western Sydney, and/or at Bellambi Point in the Illawarra Region to the south, and bedrock from Kulnura (Peats Ridge/Popran Creek) in the Central Coast Region to the south.

FULLAGAR, MCDONALD AND DONLON 2009

In 2007 the skeletal remains of an adult Aboriginal male were accidently exposed during cable installations in a remnant sand due on Ocean Street, Narrabeen, approximately 4 km to the north of the current study area. The man's skeleton was dated to 3677 cal BP and seventeen stone artefacts were recovered during salvage.

Twelve of the stone artefacts made from quartz, silcrete and quartzite were found to be 'backed blades'. These are small stone implements that have a sharp edge and pointy end. They can be secured to an implement such as a wooden spear because the side opposite the cutting edge has been 'backed' to provide suitable surface area that aids with friction. One backed artefact was found lodged between two of the vertebras near the hip. Other backed artefacts were found adjacent to or lodged in other vertebrae further up the spine suggesting two spears had penetrated from the back.

The study also found that the use-wear on other backed blades within the grave indicate that this type of tool also probably functioned as the piercing, cutting and lacerating elements of spears and knives.

ATTENBROW 2012 (ONGOING)

In 2012 Val Attenbrow and her team from the University of New England and the Australian Museum commenced a long-term provenancing study in 2012 to match ground-edged artefacts (GEAs) that had been collected within the Sydney Basin area to their geological source. The assemblage included a number of GEAs that had been collected along the northern beaches, including within the Long Reef area. The geological reference collection comprised 368 specimens from 169 locations, stretching from southeastern Queensland to the Shoalhaven River in southern New South Wales. Over 100 geological specimens were from locations within and adjacent to the Sydney Basin.

Although the provenancing-study Geological Reference Collection included mainly basalts there are also other igneous rock types, such as dolerites, dacite and porphrytic volcanics, alkaline andesites, tinguaite and diorites. The metamorphic rock, hornfels, is also included in the collection. Most of the rocks came from primary sources of exposed bedrock in diatremes, dykes and extinct volcanoes. However, a number were also collected from secondary sources as cobbles that formed when bedrock has broken off, entered a waterway, and over time were smoothed into rounded cobbles. For example, hornfels occurs as bedrock in the Upper Coxs River Valley in the Blue Mountains, and in cobble form in the Nepean Gravels at the mouth of the Grose River between Yarramundi and Penrith. Rocks from the upper Shoalhaven River occur in cobble form at Shellharbour South Beach and Bellambi Point on the South Coast (Attenbrow et al. 2017:177).

So far, the published research has matched numerous ground-edged artefacts to bed rock sources to a basalt bedrock quarry at Popran Creek-Peats Ridge in the Central Coast, the Nepean River in western Sydney, along with sources in the Hunter

Valley, South Coast and Blue mountains. Preliminary results have also have matched a number of ground edged hatchets and stone skinning knives found along the Northern Beaches including Long Reef to basalt out crops at Popran Creek-Peats Ridge within the Central Coast (Attenbrow pers com December 2022).

ARTEFACT 2020

Artefact was engaged to undertake an Aboriginal heritage assessment for the Northern Beaches Hospital Precinct. The investigation included background research, a site inspection and consultation with Metropolitan LALC. Although no sites were previously identified as being within the study area, 34 sites registered as being on the surrounds. The entire area was considered to have cultural heritage value as part of a wider Aboriginal cultural landscape.

A site survey was conducted and the area was found to be heavily disturbed and there was considerable vegetation in areas not built on. No archaeological sites were found but two areas of potential archaeology were identified. One was to the northwest of the sports oval within Forest High School, and the other was in the eastern portion of the Northern Beaches hospital site.

It was recommended that all DAs submitted to Council for land within the study area should be accompanied by an assessment in accordance with the OEH 'Due Diligence Code of Practice'.

COAST HISTORY AND HERITAGE 2021

Coast History and Heritage undertook an Aboriginal Due Diligence assessment for NSW National Parks & Wildlife Services for proposed upgrade works within North Head, approximately 12 km south of the current study area. A review of previous archaeological investigations, consideration of the underlying geology and soli landscapes, as well as historical land disturbance were reviewed. The initial desk-top investigations highlighted that although no Aboriginal sites had been identified within the study area, there was a large number of important sites that had been identified within a 3 km radius of the study area. These included rock shelters with art and archaeological deposits, engravings, shell middens in open areas, and Aboriginal burials.

A pedestrian survey was undertaken in conjunction with a representative from Metropolitan LALC, Kevin Telford. The headland had recently been subjected to a severe fire that burnt through much of the headland. This led to a greater number of exposures being visible that would ordinarily have been obscured by dense vegetation. Most of the area was found to have been heavily impacted by historical disturbances through the construction of roads, lookouts, and the construction and subsequent demolition of buildings. No rock shelters were identified within the area of proposed works and none of the exposed sandstone contained visible engravings. No stone artefacts or culturally marked trees were found.

It was recommended that no further archaeological investigations were warranted, but a site induction be provided to the construction team that included an Aboriginal heritage information which outlines the unexpected finds procedure.

BRYANT 2023

Rebecca Bryant undertook a research project for her Master's thesis at Sydney University that analysed the morphological difference and similarities of 492 ground-edged artefacts (GEAs) that had been provenanced to five regions within the Sydney Basin in NSW, which included the Sydney Coast, Sydney Hinterland, Central Coast, Hunter Valley and Blue Mountains. The Sydney Coast Region included numerous GEAs found within the Northern Beach. Ten of these had been found between Narrabeen and Curl Curl, of which four were found at Long Reef.

A set of variables were used to investigate whether there are morphological similarities and differences of GEAs within these regions, and if any of the GEAs could be considered prestige items. The variables analysed included the preform of the raw material source (cobble, bedrock or indeterminate), measurements, shapes, and degree of damage and modifications to the GEAs, including pitting, flaking, hammerdressing (a labour-intensive form of pecking) and grinding. This data was then incorporated with the pXRF findings undertaken by Attenbrow et al. 2012 (discussed above) and with use wear results that have been conducted by Nina Kononenko in 2017.

The results for the GEAs from the Northern Beaches showed that the majority of them were made from a bedrock outcrop source in the Central Coast Region. This indicates that Aboriginal people occupying the Northern Beaches were either travelling to the Central Coast to obtain the raw material and make the hatchets locally, or they were obtaining complete items by trade.

The results also showed that eight of the ten GEAs found in proximity to the study area could be classified as hatchets that would have been hafted to a wooden handle and used for woodwork, such as chopping into trees to remove branches, or cutting footholds for climbing to obtain animals or honey. A number of the hatchets also had percussion pits on one or both faces which were used to process food such as *Macrozamia* nuts or to break stone apart. For example, a quartz pebble could be placed on the face of the hatchet and another rock was used to break a flake off. This is called the bipolar method and was used on small rock pieces that are most likely too small to efficiently handle and flake.

Two of the GEAs were also noted to be Bulga Knives. One was found at Curl Curl and one was found at Narrabeen. Bulga or skinning knives were made from pieces of bedrock or cobble that have been ground on the long side of the material and resemble the blade of a knife. These have been found through usewear analysis to have been used on soft material like animal skins.

The overall results for the research project also showed that although no large completely polished GEAs of a standardised shape were identified, as seen in international axe studies on prestige axes, there is evidence that GEAs were, and continue to be, socially and culturally valued. This is established in their presentation in rock art, and inclusion in Dreaming stories and ceremonial practices. Ground edged hatchets and Bulga Knives have also been found in Aboriginal burials in Balmoral Beach and Manly.

SUMMARY

In summary, a number of archaeological investigations have been undertaken within the Northern Beaches area including Long Reef Headland since the late 1800s. These have been for research projects and to fulfill statutory requirements prior to the construction of buildings and civil works. The results of these investigations have demonstrated that this resource-rich coastal area has been used by Aboriginal people for at least 4,000 years BP, but probably for much longer.

The excavations undertaken at the Angophora rockshelter in Avalon by McDonald in 1988 showed that the Aboriginal people that once lived in the Northern Beaches area for thousands of years used an extraordinarily wide-ranging selection of natural resources. This included shellfish collected from estuarine waterways and rocky coastal platforms that were eaten, and the shells modified to make implements such as fishhooks and scrappers. Native plants such as the *Xanthorrhoea* grass plant were processed to make resin to attach tools to wooden handle, twine was used to make baskets and nets, and seeds ground to make flour for food. Stone that was collected locally and brought into the area was used to make a wide variety of implements/weapons including, ground-edged artefacts (hatchets and Bulga knives), backed blades and scrapers. Small and large animals were caught for food and their bones were also sometimes used. For example, bone points were made by sharping one or both ends. Some were used as tips on pronged fishing spears, and the large ones used as needles to puncture holes through animal skins to make cloaks. The discovery of the skeleton of the Aboriginal man at Narrabeen who had been speared to death over three thousand years ago, showed that that small stone backed blades were also used to inflect harm and could cause death.

Although the sandstone along the coastal area of the Northern Beaches was noted by previous investigations as generally unsuitable for engraving, a large number of interesting engravings of animals, tools and implements are found a little more inland on the western side of Pittwater Road around the Narrabeen Lake/Wakehurst area, Terry Hills and Belrose. Axe grinding grooves were also found in these areas along the creeks. However there was limited evidence found for occupation of these areas. This suggests that perhaps people visited here for more ceremonial activities but lived along the coast.

With regards to the current study area, except for sections within the coastal perimeter of Long Reef Headland, and its eastern point, the area now comprises

Long Reef Golf Club. Prior to the construction of the golf club in the early 1920s, the area had been used for agricultural purposes since the early 1800s. These activities have resulted in large-scale disturbance and only a paucity of tangible evidence for previous Aboriginal visitation and/or occupation appears to remain. Eight of the nine sites currently registered as being within the headland are shell middens. The other is registered as a burial. Although another burial was noted to have been found during the construction of the Long Reef Golf Club on the northern side of the headland during construction, this has not been verified[1]. Additionally, the skull in the 'burial' was noted in 1940[2] to be eroding from an embankment on the northern side of the headland and registered as a site in 2005. However, there are no further details on the skull, including confirmation that it was a skull from an Aboriginal person.

4.2 AHIMS Results

An extensive search centred on the study area and covering a 5,000 m x 10,000 m was conducted on 3 July 2023. This resulted in the identification of 62 registered sites including one within the immediate study area. This is registered as AHIMS #45-6-0741 (QP3). The site features listed are 'shell' and 'artefact'.

Sites can be recorded as a particular site type: closed or open. For the 62 sites in the search area, 15 (24%) are registered as rock shelters and 47 (76%) are open sites. Rock shelters are generally present where bedrock outcrops in escarpments. Within the search area this landscape is seen in the elevated cliffs fringing the coast.

Sites are also recorded with one or more of a set of twenty-two site features specified by AHIMS. For the 62 sites in the search area, a total of 75 instances of six site features have been recorded (Table 3). The two site features that have been most commonly recorded are art (pigment or engraving), and shell, followed by stone artefacts. The site feature 'shell' generally indicates the presence of middens. Eight of the 18 midden sites are in rock shelters and the remaining tend are in open sites. There are four grinding groove sites that occur on exposed sandstone platforms. There are also two burials of Aboriginal people that have been recorded.

As mentioned above in the literature summary, there are nine registered sites within Long Reef Headland, eight of these are shell middens and one is a burial. All of the sites, except for the one mapped as being within the current study area, are on the northern side or far eastern point of the headland and at least 400 m away from the current study area.

[1] Rebecca Bryant from Apex Archaeology contacted Ben Russell, the General Manger of Long Reef Golf Club in August 2023 for more details. Ben advised he would pass on Rebecca's details to the authors to contact her. No communication from them has yet been received.
[2] The information relating to the skull was reported to the Aboriginal Heritage Office (AHO) in 2005 by a woman who saw the skull eroding in 1940.

A copy of the search results is appended in Appendix F and have been utilised for the AHIMS site mapping.

Table 3: Site features recorded for 62 sites within the 10 km x 5 km search area

Site Features	No. of instances	% of total
Art (Pigment or Engraved)	32	43
Shell	18	24
Stone artefacts	16	21
Grinding Grooves	4	6
Potential Archaeological Deposits	3	3
Burial	2	3
Total	**75**	**100**

Figure 9: AHIMS sites within the study area and immediate surrounds

FIGURE NOT INCLUDED IN PUBLIC REPORT

4.3 Predictive Model

Based on the results of previous archaeological investigations within the wider region, a number of predictions regarding Aboriginal use of the area can be made. These predictions focus on the nature, extent and integrity of the remaining evidence.

The landscape characteristics of the area influence the prediction of the nature of potential sites within the landscape itself. Disturbance is the predominant factor determining whether or not artefacts are likely to be identified within a landscape.

Surface sites are likely to have been impacted by pedestrian activity, vegetation clearance, the construction of water drainage and structures within the area over the historic period. Natural actions such as erosion and bioturbation are likely to have also impacted not only the surface, but also at least the upper levels of subsurface archaeological deposits. Whilst these actions may impact the integrity of stratigraphy within the deposit, this does not necessarily mean associated archaeological objects will also be disturbed.

In general, Aboriginal use of an area is based on a number of factors, such as:

- Proximity to permanent water sources – generally permanent or areas of repeat habitation are located within approximately 200m of permanent water;
- Proximity to ephemeral water sources – generally sites near ephemeral water sources were utilised for one-off occupation;
- Ease of travel – ridgelines were often utilised for travel during subsistence activities; and
- The local relief – flatter, more level areas were more likely to be utilised for long term or repeat habitation sites than areas of greater relief, especially if the slopes are at a distance from water.

Stone Artefacts

Stone artefacts can be identified on the ground surface or within subsurface deposits. Generally, artefact concentrations are representative of debris from knapping activities, which includes flakes, flake fragments, cores, and pieces likely to have been knapped but with no or inconclusive diagnostic features, referred to as flaked pieces. Modified artefacts can also be identified, including backed artefacts, scrapers, or edge ground axes, although these are generally a smaller proportion of the artefact assemblage. During excavation, very small debris (~3-5mm) can be identified within sieved material, and is referred to as debitage. This is indicative of *in situ* knapping activities.

As the detection of stone artefacts relies on surface visibility, factors such as vegetation cover can prevent their identification. Conversely, areas of exposure can assist in their identification. Stone artefacts have previously been identified within the site mapped within the current study. However, given the site has been subjected

to natural and man-made erosion since it was recorded in the 1980s there is a low possibility these same artefacts may still be present within the registered site. However other stone artefacts may be present in a disturbed context elsewhere within the study area.

Quarry and Procurement

Exposures of stone which can be exploited for the production of lithics are referred to as quarries or procurement sites. Quarries generally have evidence of extraction visible, while procurement sites can be inferred through the presence of artefactual material made from raw material sources present within the area.

The underlying geology of the study area is sandstone which often contains small conglomerates of rock including quartz pebbles, which was used by Aboriginal people to make implements and weapons. It is unlikely the study area would have been an active quarrying site, but pebbles and gravels may be located here.

Middens

Middens are concentrations of shell, and may also contain stone artefacts, bone and sometimes human burials. These sites are generally recorded along coastal areas. Middens are formed through the exploitation of locally available species by humans for resources, and accumulation of the shell material within a specific location. Middens can range in size from small, discrete deposits, to deposits covering a large area.

Generally, middens reflect the species available in the local area. In estuarine regions, estuarine species will dominate the composition of the midden, while around headlands, rock platform species tend to dominate. A midden has been recorded as being within the current study area and others have been recorded within Long Reef Headland. As such, it is likely that the area contains midden material, and additional material may be identified.

Burials

Aboriginal people across Australia utilised a range of burial forms, which depended on the customs of the individual tribes. Common burial practices included inhumation, cremation, desiccation, and exposure. In the wider Sydney area burials have been found within coastal Holocene sand bodies, in association with shell middens, and in rockshelters. Burials have been recorded within sand dunes, and remnant sand dunes, and rock shelters within the Northern Beaches. However, they are generally not identified during field survey as there is usually minimal surface expression of this type of site.

To date, there appears to be no records of human burials being identified within the specific study area itself. However, it was noted during the background research for this current project that Aboriginal bones were unearthed during the construction of the Long Reef Golf Club, but no actual date was specified (Lanes and Mellowes 2012:2012). A skull was also noted to have been eroding out of an embankment on the northern side of Long Reef headland in 1940 and reported in 2005 to the

Aboriginal Heritage Office. However, there is no more information on this and the Aboriginal Heritage Office have noted in their report on the site that no other remains or cultural material has been found in the area where the skull was reportedly eroding from (AHO 2016).

The level of disturbance present within the study area suggests that intact burials are unlikely to occur within this area.

ROCK SHELTERS

Rock shelters are formed by rock overhangs which would have provided shelter to Aboriginal people in the past. Often, evidence of this occupation can be found in the form of art and/or artefacts. Shell, midden material, grinding grooves, pictographs (rock engravings), artworks including stencils and paintings, and potential archaeological deposits (PAD) are common features of rock shelter sites.

The available mapping of the underlying geology within the study area is sandstone. However, no rockshelters have been recorded within Long Reef Headland. It is considered unlikely that this site type will occur with the study area.

GRINDING GROOVES

Grinding grooves are formed on sandstone exposures through the creation and maintenance of ground edge tools, such as axes and spears. Usually, stone was ground to form a sharp edge, although bone and shell were also ground to create sharp points.

Generally, fine grained sandstone was favoured for these maintenance activities, and the presence of a water source nearby or overflowing the sandstone was also favoured. Grinding grooves range from individual examples through to hundreds of grooves within an area, sometimes arranged in a specific pattern. Horizontal sandstone was generally preferred, although there are examples of vertical grooves.

There is outcropping sandstone near the study area, but no grinding grooves have previously been recorded within or near the study area. It is considered unlikely that this site type occurs within the study area.

SCARRED AND CARVED TREES

Scarred and carved trees are created during the removal of back from a tree for a range of reasons, both domestic and ceremonial. This type of site can be identified within areas containing trees of the correct species and appropriate age. Deliberately scarred trees can be difficult to differentiate from naturally occurring damage to trees, and specific criteria must be considered when assessing a scar for a cultural origin.

No scared or carved trees have been recorded as being in or within the study area. Given the large-scale vegetation clearance that has been undertaken within the study area, there is a low potential for this site type to occur.

Ceremonial Sites

Specific places were used for ritual and ceremonial purposes, including initiation and burial practices. Secret rituals were also undertaken at specific places by specific individuals, such as at water holes and by clever men.

The landscape itself was also considered to hold significance to Aboriginal people, and the understanding of this is referred to as a sacred geography. This includes natural features which were associated with spirits or creation beings. The meaning attributed to the landscape provided Aboriginal people with legitimacy regarding their role as guardians of the places which had been created by the spiritual ancestors (Boot 2002).

Many areas within the Northern Beaches are considered to be sacred to the original inhabitants. There are no known recorded areas within the study area, although this does not preclude these values from existing within this location.

Contact Sites

Contact sites contain evidence of Aboriginal occupation concurrent with initial colonisers in an area. This could include evidence such as flaked artefacts formed on glass, or burials containing non-Aboriginal grave goods. Often Aboriginal camps would form around newly built towns, allowing for employment (or exploitation) of the Aboriginal people by the colonists, and also for trade to exist between the two communities. Contact sites can also occur around Aboriginal mission sites, where Aboriginal children were taken from their families to raise in the European manner. Families often camped around the mission boundaries to try to catch a glimpse of their children.

There is no known evidence of initial contact between Aboriginal people and colonists within the study area.

5.0 Field Work

5.1 Sampling Strategy

A sampling strategy was developed and provided to the Registered Aboriginal Parties (RAPs) as part of the consultation process completed for the ACHA. The strategy included assessment of all landforms within the study area that have the potential to be impacted by the proposed development. Areas considered likely to have archaeological potential were closely scrutinised, although the entire study area was considered.

The sampling strategy included consideration of the entirety of the study area due to the nature of the development proposal, in order to provide an accurate assessment of the study area in relation to the proposed impacts.

5.2 Site Inspection

A site survey was undertaken on 21 July 2023 by Leigh Bate, Jenni Bate and Rebecca Bryant from Apex Archaeology, and Justine Coplin from Darug Custodians Aboriginal Corporation.

5.3 Survey Coverage

The survey was conducted on foot within the study area and immediate surrounds to identify Aboriginal cultural material and areas that have the potential for subsurface cultural material to be present. It also provided an opportunity to access the ground disturbance that was identified in historical aerials and the documented land-use history of the area.

The survey was undertaken in accordance with the sampling strategy prepared for the project and included the entirety of the study area. It was undertaken by three participants. The area assessed is within a sand dune landform that has been subjected to extensive erosion from wind, water and historic land-use disturbance. Large sections have eroded to the point that it has exposed the underlying geology and the remaining areas are either covered in vegetation or present as exposed patches of sand. The study area was considered to consist of one land form that had eroded to the point that the underlying geology was exposed. As such it was assessed as one survey unit (Table 3Table 4).

Table 4: Survey units

Unit name	Landform Element	Number of participants	Total Length
ATU 1	Sand Dune/Disturbed Terrain	3	377 m

During the survey completed by Apex Archaeology the study area was inspected for Aboriginal archaeological evidence. An assessment of landform element and slope was made for the study area, with the results presented in Table 5.

Table 5: Survey unit results

Survey Area #	Landform Element	Slope	Vegetation	Detection Limiting Factors	Ground Disturbance
ATU 1	Sand Dune	Level-very gentle (<1.45°)	Coastal Dune/Cleared	Vegetation/Sediment	High

The total survey coverage (meaning the areas physically inspected for archaeological evidence) was approximately 2,262m^2. The total area of the development impact is approximately 2,500m^2. A range of factors were considered and recorded during the survey, including the surface visibility (percentage of bare ground within a survey unit); archaeological visibility (amount of bare ground within an area in which artefacts could be expected to be identified if present); exposure type (B soil horizon/underlying geology (G)) and calculations of how effective the survey coverage was. The results of the survey coverage are presented in Table 6.

Table 6: Survey coverage results

Survey Area #	Total Area Surveyed (m²)	Surface Visibility (%)	Arch Vis (%)	Exposure Type (B)	Effective Coverage (m²)	% Total Effective Survey Coverage of Context
ATU 1	2,262	40	30	B/G	271.4	12

Surface visibility across the study area was limited due to vegetation cover. Total effective survey coverage of the survey transect was 12%. Total effective survey coverage for the entire study area was 10% (Table 7).

Table 7: Total effective survey coverage results

Survey Area #	Total Area of Study Area (m²)	Total Area Effectively Surveyed (m²)	Surface Visibility (%)	Arch Vis (%)	Exposure Type (A/B)	% Effective Survey Coverage of Context (Total Area)
ATU 1	2,500	271.4	40	30	B/G	10.8

PO Box 236
NOWRA
NEW SOUTH WALES 2541

0 30 60
metres

Projection:
MGA Zone 56 (GDA 94)
Base Map:
NearMaps 2023
Image Date: 21/10/2023
Final - Version 1

Figure 10: Survey transect within the study area.

N

5.4 Survey Results

The survey centred on four main areas where the proposed works will be undertaken. These were; the land either side of the existing board walk; the section where the registered Aboriginal site AHIMS #45-6-0741 (AP3) has been mapped; the drainage area onto Long Reef Beach from the man-made creek that drains the golf course; and the areas on the greens within Long Reef Golf Course around the woman's and men's tees on the 17th hole.

The current walking track of Long Reef Golf Club within the study area is made of wood, except for a small portion in the eastern and western portions that are paved in concrete (Plate 11). The original dune landscape on the northern side of the walking track, and both sides of the track around the bridge has been severely impacted by wind, wave and pedestrian erosion. This has resulted in the exposure of the underlying sandstone, claystone and dark peat areas. It has also compromised the structural integrity of the wooden track within the path (Plate 12 and Plate 13).

The section on the northern side of the wooden track where the registered Aboriginal site AHIMS #45-6-0741 (AP3) has been mapped was closely inspected. This area has been subjected to extensive erosion and the construction of the boardwalk since it was recorded in the 1980s, and it is highly unlikely that the area retains an intact soil profile from that time. The current exposed areas were observed to comprise approximately 30 cm of a mixed-sand profile below the vegetation cover (Plate 14). This overlayed a sticky clayey peat-like profile that is part of the underlying geology. There was no evidence that a shell midden was still within the site. No shell, stone artefacts, charcoal and/or faunal remains were observed, and the site was considered to have been destroyed by natural actions in the more than 30 years since it was originally recorded.

The area around the existing bridge over the man-made creek that drains onto Long Reef Beach comprises introduced fill mixed with what was probably the original dune sand. The base of the drainage line has been shored up by sandstone boulders and the exposed sides showed sand mixed with vegetation and rubbish (Plate 15 and Plate 16). No intact stratification was evident and an exposed area on the southwestern side of the drainage line showed a burn event with a large amount of rubbish (Plate 17) including an old bottle with '1957' imprinted on the base (Plate 18).

The portions within the greens on the golf course, including the 17th fairway, the women's and men's 17th tees, and the 'rough' area to the south of the fairway were inspected (Plate 19). These areas were found to be heavily modified from the construction of the golf course and concrete path. These works would have included shallow, moderate and deep subsurface excavation, and the reworking and contouring of the original sand dune systems. Fill may have also been brought into the area from external sources or other areas within the headland.

Plate 11: View south east along the existing section of Long Reef board work that is to be replaced and a new board walk constructed approximately 10 m to the north (to the right in the image).

Plate 12: View north of western section of Long Reef boardwalk showing the exposed underlying geology on the south side of the boardwalk, and disturbed sand dunes profile on the north side.

Plate 13: View north of eastern section of Long Reef boardwalk showing the exposed underlying geology on the south side of the boardwalk, and disturbed sand dunes profile on the north side.

Plate 14: View north of exposed area where AHIMS #45-6-0741 was recorded.

Plate 15: View south of existing bridge over man-made creek that drains the golf course. The east and western banks bordering the drainage line comprise natural and introduced fill.

Plate 16: View north within drainage line showing introduced sandstone boulders.

Plate 17: View north showing exposure of a burn even and protruding rubbish at the southwest corner of drainage channel.

Plate 18: View north showing close up of exposure showing base of bottle with 1957 date stamp.

Plate 19: Facing east over green near tees for the 17th hole and walking path to the right of the image.

Plate 20: Facing east over green overlooking the tee box for the 17th hole and walking path to the right of the image.

5.5 Discussion

The survey inspection confirmed the high level of land disturbance that has been noted in historical images and information in Section 3.2 of this report. The areas either side of the board walk have been subjected to ongoing natural erosion processes through wind and wave action, as well as the impacts from continuous pedestrian activity. This has affected large portions of the study area to the point that underlying geology is exposed. The areas around the bridge including the drainage channel have been built up from redeposited dune sand which is mixed with historic rubbish. Evidence of this is notable in the exposed portion of the dune in the southwest portion of the drainage opening facing the beach. The disturbance within the golf course that was detailed in historic documents and seen in historical imagery was also confirmed in the site survey.

The AHIMS #45-6-0741 (QP3) shell midden site that was registered as being within the study had been recorded in 1987 and noted on the site card as being in 'poor, eroding badly' condition (Plate 21). The shell was recorded as being along 22 m of the eroded bank and within the interface of a darker soil layer, and lighter soil layer with a house brick in it. Two artefacts were also noted on the site card as being within the gullied and sheet washed area. The site inspection could not relocate the shell midden in the area where it had been mapped (Plate 22). There was no evidence of shell, stone artefacts or faunal remains in the exposed areas. It is suggested that the site has been destroyed by ongoing erosion and possible impacts from the construction of the coastal walk.

Overall, it is highly unlikely that any of the original A1 and A2 soil horizons, where cultural material would be expected to be found would survive in an intact profile within the study area. There has been heavy and consistent land disturbance since the 1800s that has included natural erosion from wind and wave activity, as well as deep excavations for drainage lines around the bridge area and within the golf course. The deliberate or unintentional introduction of fill into the sand dunes landscape has also caused further disturbance. Additionally, the construction of the boardwalk would have also impacted the original landscape, and the constant pedestrian traffic that continues on and off the walkway has further damaged the area bordering the cliff line and within the golf course.

The results of the pedestrian survey coupled with the historical documented evidence were discussed with Justine Coplin from Darug Custodian Aboriginal Corporation during the survey and afterwards. Justine agreed that the study area is highly disturbed and has limited potential to contain an intact soil profile with cultural archaeological material. Furthermore, there is no evidence that any part of the registered AHIMS #45-6-0741 (QP3) still exists.

Plate 21: QP3 as recorded in 1987

Plate 22: Location of QP3 during current assessment

6.0 Scientific Values and Significance Assessment

6.1 Introduction

The *Aboriginal cultural heritage consultation requirements for proponents 2010* acknowledge that:

- Aboriginal people have the right to maintain their culture, language, knowledge and identity
- Aboriginal people have the right to directly participate in matters that may affect their heritage
- Aboriginal people are the primary determinants of the cultural significance of their heritage

Undertaking consultation with Aboriginal people ensures that potential harm to Aboriginal objects and places from proposed developments is identified and mitigation measures developed early in the planning process.

6.2 Archaeological Significance

Archaeological or scientific significance relates to the value of archaeological objects or sites as they are able to inform research questions considered important to the archaeological community, which includes Aboriginal people, heritage consultants and academic researchers. The value of this type of significance is determined on how the objects and sites can provide information regarding how people in the past lived their lives. The criteria for archaeological significance assessment generally reflect the criteria of the ICOMOS Burra Charter.

6.3 Criteria

Archaeological significance is assessed based on the archaeological or scientific values of an area. These values can be defined as the importance of the area relating to several criteria. Criteria used for determining the archaeological significance of an area are as follows:

- **Research potential:** Can the site contribute to an understanding of the area/region and/or the state's natural and cultural history? Is the site able to provide information that no other site or resource is able to do?
- **Representativeness:** is the site representative of this type of site? Is there variability both inside and outside the study area? Are similar site types conserved?
- **Rarity:** is the subject area a rare site type? Does it contain rare archaeological material or demonstrate cultural activities that no other site can demonstrate? Is this type of site in danger of being lost?
- **Integrity/Intactness:** Has the site been subject to significant disturbance? Is the site likely to contain deposits which may possess intact stratigraphy?

Further, an assessment of the grade of significance is made, based on how well the item fulfils the assessment criteria. The Heritage Branch of the Department of Planning (now Heritage NSW) 2009 guideline *Assessing Significance for Historical Archaeological Sites and 'Relics'* defines the grading of significance as follows:

Table 8: Grading of significance, from Heritage Branch 2009

Grading	Justification
Exceptional	Rare or outstanding item of local or State significance. High degree of intactness. Item can be interpreted relatively easily.
High	High degree of original fabric. Demonstrates a key element of the item's significance. Alterations do not detract from significance.
Moderate	Altered or modified elements. Elements with little heritage value but which contribute to the overall significance of the item.
Little	Alterations detract from significance. Difficult to interpret.
Intrusive	Damaging to the item's heritage significance.

Whilst this was developed for the assessment of significance of historical items, the criteria are applicable to archaeological significance assessments as well. It is important to note that the below assessment is specific to Aboriginal cultural heritage and does not consider the non-Aboriginal significance of the site.

6.4 Significance Assessment

Research Potential

The study area is highly disturbed, and the previously recorded site (AHIMS #45-6-0741) is considered to no longer exist. There may be more intact shell material and cultural material within subsurface deposits on the northern and eastern side of the Long Reef Headland which may have the potential to reveal information about Aboriginal occupation within the Long Reef Headland area. Overall, the study area is considered to have limited research potential.

Representativeness

The site (AHIMS #45-6-0741) is not considered to be a reliable representation of a midden deposit within the Long Reef Headland as it is considered to no longer exist. A more intact midden with clear stratigraphic deposits has been found within the rock shelter excavated in Angophora Reserve in Avalon within the Northern Beaches. This site is considered to offer a more detailed and reliable representation of former Aboriginal cultural material within Northern Beaches area. Overall, the study area is not considered to be a representative example of an Aboriginal shell midden deposit.

Rarity

The site is not considered to have value under this criterion.

Integrity/Intactness

The site assessed within the study area is considered to have been highly disturbed, and no longer exists. Therefore, it is not considered to have integrity, nor be intact.

6.5 Statement of Archaeological Significance

Overall, the archaeological significance of the area assessed within the registered site is considered to be low due to heavy disturbance and lack of archaeological evidence. There has been a high level of historic and current, man-made land disturbance, as well as natural erosion through wind and wave action.

7.0 Impact Assessment

7.1 Proposed Development

The study area is located on the southern side of Long Reef Headland. The Long Reef boardwalk and bridge within the study area have been subjected to a high volume of use by the community and unusually large ocean swells that have caused significant structural damage to the lower section of the foreshore boardwalk. Approximately 120 m of the existing the existing boardwalk and bridge require replacement. To ensure the new structures do not succumb to the same impacts it is proposed to reposition them further north up the dune face.

The proposed works will require sections of the dune to be flattened by the removal of sand to accommodate the boardwalk. This will involve a cut of approximately 23 m long and a max depth of 1.2m into the sand dune on the section west of the drainage line, and a cut approximately 22 m long with a maximum depth of .8 m deep on the eastern side of the drainage line. The proposed works will also move the northern section of the woman's and men's 17th tees approximately 2 m north, as well as the realignment of a section of the concrete path that runs parallel to the tees. This will involve excavations up to 30 cm below the current surface level.

7.2 Potential Impact

The proposed works will involve the removal of sections of the sand dune within the vegetated mound on the north side of the current board walk and areas around the 17th tees within Long Reeg Golf Course (detailed in the previous section). The whole of the study area has been assessed as highly disturbed with negligible potential for subsurface intact Archaeological material to be present. The Aboriginal site that is registered as being within the study area is considered to have been destroyed. Therefore, it is considered unlikely that the proposed works will impact on a registered Aboriginal site and it is unlikely that they will impact on intact cultural material within an original stratified context.

8.0 Management, Mitigation and Recommendations

8.1 Guiding Principles

Wherever possible and practicable, it is preferred to avoid impact to Aboriginal archaeological sites. In situations where conservation is not possible or practicable, mitigation measures must be implemented.

The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013 (The Burra Charter) provides guidance for the management of culturally sensitive places. The Burra Charter is predominantly focussed on places of built heritage significance, but the principles are applicable to other places of significance as well.

The first guiding principle for management of culturally significant sites states that "places of cultural significance should be conserved" (Article 2.1). A cautious approach should be adopted, whereby only "as much as necessary but as little as possible" (Article 3.1) should be changed or impacted.

Mitigation measures depend on the significance assessment for the site. Cultural significance of sites should also be considered in consultation with the Aboriginal community during community consultation.

8.2 Harm Avoidance or Mitigation

One previously identified shell midden site is registered within the current study area (AHIMS #45-6-0741). The previous assessments of the site in 1988 noted at the time that it had been subjected to erosion and in poor condition. It was determined to be of low archaeological significance and no further archaeological investigations were considered warranted at the time of recording.

The current assessment of the site has concluded that it has been subject to heavy natural erosion since it was recorded and man-made impacts to the extent that there is no evidence that it still exists. The remainder of the study area has also been assessed as heavily disturbed and modified though current and former land use, and natural erosion. It is unlikely that any intact cultural material would survive these impacts Therefore no avoidance or mitigation measures are considered warranted.

No impact beyond that described in this report should occur within this area.

The site card for AHIMS Site #45-6-0741 should be updated to reflect the destruction of the site by natural processes.

It is noted that the Aboriginal Heritage Office suggested that monitoring of initial earthworks should occur, in order to identify any cultural material (including burials) that may be present in the area. Given the level of disturbance that has been identified across the site, this is not considered necessary on archaeological grounds; however, Northern Beaches Council may wish to engage with the Aboriginal Heritage Office and/or the RAPs for the project to monitor initial works on site.

8.2.1 INTERPRETATION

There is an abundance of Aboriginal archaeological sites within the coastal areas of the northern beaches, including Long Reef Headland, that provide valuable evidence on the lives of past Aboriginal people who inhabited the area for thousands of years before the arrival of Europeans in 1788. Unfortunately, even if these sites are not in public-accessible areas, they are particularly vulnerable to increasing sea level rises and erosion.

In consultation with the Darug Custodian Aboriginal Corporation who participated in the field work, and the Aboriginal Heritage Office, it is recommended that information on some of these sites be included in interpretive boards that could be constructed along the new board walk, or appropriate viewing areas.

These panels could include information on shell middens in the region. This site type often contains shells, stone artefacts, and faunal remains. Although the majority of shells and faunal remains within the middens are remnants of past meals some types of shells were also modified to be used as tools and implements., e.g. a part of the turban shells (T*urbo torquata*) were made into hooks for fishing. Sydney cockles (*Anadara trapezia*) have found to have been used as scrapers for wood work, and. animal bone points sharped to a point to stitch animal skins together. Stone artefacts such as ground-edged hatchets, scrapers and spear tips have also been found in shell middens and burials within the Northern Beaches.

9.0 RECOMMENDATIONS

The following recommendations are made on the basis of:

- The statutory requirements of the NP&W Act 1974;
- The requirements of Heritage NSW;
- The results of the cultural and archaeological assessment;
- An assessment of the likely impacts of the proposed development; and
- The interests of the registered Aboriginal stakeholders and the cultural heritage record.

It was found that:

- There was one previously identified Aboriginal site located within the study area (AHIMS #45-6-0741).
- The study area was considered to be highly disturbed by man-made and natural impacts from review of the historical documents and aerial images. This assessment was confirmed during the pedestrian survey and no evidence of AHIMS #45-6-0741 or any other cultural material was identified during the physical inspection of the area.
- As there is no evidence of AHIMS #45-6-0741 present within the study area, and given the significant impact to the area by erosion and natural factors, the site is now considered destroyed.
- The proposed work required within the study area will involve the removal of sections of the existing dune on the northern side of the current board walk and within areas around the 17th tees within the Long Reef Golf Cub.

As such the following recommendations have been made.

RECOMMENDATION 1: NO FURTHER ARCHAEOLOGICAL ASSESSMENT REQUIRED

The Aboriginal archaeological potential of Long Reef Boardwalk, Collaroy, NSW has been assessed as negligible. No further archaeological assessment is required for the site prior to the commencement of proposed development activities. No Aboriginal Heritage Impact Permit (AHIP) is required prior to works commencing.

RECOMMENDATION 2: ABORIGINAL HERITAGE SITE INDUCTION

An Aboriginal heritage site induction should be presented to the site workers by a suitably qualified person. This induction will include the possible kinds of Aboriginal archaeological remains that may be contained within the sand bodies and it will outline the 'unexpected finds policy'.

RECOMMENDATION 3: INSTALLATION OF INTERPRETATION

It is recommended that consideration is given to installation of interpretive signage along the boardwalk to explain the Aboriginal history of the place and the continuing connection to Country.

Recommendation 4: Development Boundaries

The proposed development works must be contained within the assessed boundaries for this project. If there is any alteration to the boundaries of the proposed development to include areas not assessed as part of this archaeological investigation, further investigation of those areas should be completed to assist in managing Aboriginal objects and places which may be present in an appropriate manner.

Recommendation 5: Reporting

One digital copy of this report should be forwarded to Heritage NSW for inclusion on the Aboriginal Heritage Information Management System (AHIMS).

One copy of this report should be forwarded to each of the registered Aboriginal stakeholders for the project.

Recommendation 6: Stop Work Provisions

Should unanticipated Aboriginal archaeological material be encountered during site works, all work must cease in the vicinity of the find and an archaeologist contacted to make an assessment of the find and to advise on the course of action to be taken. Further archaeological assessment and Aboriginal community consultation may be required prior to the recommencement of works. Any objects confirmed to be Aboriginal in origin must be reported to Heritage NSW.

Human remains of Aboriginal people have previously been recorded in sand bodies in coastal bays and open beaches within Sydney area including Long Reef headland. In the unlikely event that suspected human remains are identified during works, all activity in the vicinity of the find must cease immediately and the find protected from harm or damage. The NSW Police and the Coroner's Office must be notified immediately. If the finds are confirmed to be human and of Aboriginal origin, further assessment by an archaeologist experienced in the assessment of human remains and consultation with both Heritage NSW, the Aboriginal Heritage Office and the RAPs for the project would be necessary.

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