Halloran Trust Lands, Callala Bay: Archaeological Report

FINAL REPORT

Prepared for Shoalhaven City Council

9 September 2020

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Glossary

ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
Consultation requirements	*Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a)
DA	Development Application
DECCW	Department of Environment, Climate Change and Water (now Heritage NSW)
DP	Deposited Plan
DPIE	Department of Planning, Industry and Environment
EP&A Act	*Environmental Planning and Assessment Act 1979*
GPS	Global Positioning System
GSV	Ground Surface Visibility
Heritage NSW	Heritage NSW of the Department of Premier and Cabinet
ICOMOS	International Council on Monuments and Sites
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
MGA	Map Grid of Australia
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service
NSW	New South Wales
PAD	Potential Archaeological Deposit
PASAs	Potential Archaeologically Sensitive Areas
SEPP	State Environmental Planning Policy
Study area	Defined as Lot 2 DP 775060, Lot 212 DP 1177757, Lot 11 DP 253793, Lots 599-628 DP 11388
the Code	*Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010)

Summary

Biosis Pty Ltd was commissioned by Shoalhaven City Council to undertake an Aboriginal Cultural Heritage Assessment (ACHA) of a proposed rezoning of land along Emmett Street, Callala Bay, New South Wales (NSW) (the study area). This Archaeological Report (AR) documents the findings of the archaeological investigations conducted as part of the ACHA. As required under Section 2.3 of The *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010) (the Code), the AR provides evidence about the material traces of Aboriginal land use to support the conclusions and management recommendations in the ACHA.

The study area is located approximately 1.5 kilometres west of Callala Bay town centre and approximately 16 kilometres south-east of the Nowra Central Business District CBD. It encompasses approximately 36 hectares of private land and the adjacent road reserves.

There are 27 Aboriginal cultural heritage sites registered with the Aboriginal Heritage Information Management System (AHIMS) register, within the vicinity of the study area. The majority of these sites are located to the east, along the coastal strip or in proximity to wetlands. This follows predictive modelling developed for the region, which states that Aboriginal sites will be located in close proximity to reliable sources of water and food resources.

Test excavations and a survey were conducted from 3 February to 6 February 2020 by two Biosis archaeologists and three representatives from the Jerrinja Local Aboriginal Land Council (LALC). The overall effectiveness of the survey for examining the ground for Aboriginal sites was deemed low. This was attributed to the high vegetation cover restricting ground surface visibility (GSV) combined with a low amounts of exposures.

A total of 29 test pits were excavated across the study area but no sub-surface deposits or Aboriginal sites were identified. It is highly unlikely that Aboriginal sites will be encountered within the study area, as it is not located in close proximity to any reliable resources, unlike the coastal foredune landforms located to the east and swamp/wetland landforms south of the study area, which will be the focus of Aboriginal sites.

There is low potential for proposed works to impact Aboriginal sites or areas of (archaeological) sensitivity.

Strategies have been developed based on the archaeological significance of cultural heritage relevant to the study area. The strategies also take into consideration:

- Predicted impacts to Aboriginal cultural heritage.
- The planning approvals framework.
- Current best conservation practice, widely considered to include:
  - The ethos of the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter.
  - (the Code).

The recommendations that resulted from the consultation process are provided below.

Management recommendations

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

Recommendation 1: No further archaeological assessment is recommended

No further archaeological investigation or works are required to be undertaken for the study area. In the event that unexpected finds, including human remains, are unearthed during any phase of the project please refer to Recommendations 2 to 4 below.

Recommendation 2: Discovery of unanticipated Aboriginal objects

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

Recommendation 3: Discovery of Aboriginal ancestral remains

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

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

Recommendation 4: Continued consultation with the registered Aboriginal parties

In accordance with the consultation requirements, it is recommended that the Applicant provides a copy of the final report to the RAPs. The Applicant should continue to inform these groups about the management of Aboriginal cultural heritage within the study area throughout the life of the project.

1 Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by Shoalhaven City Council to undertake an ACHA of the land owned by Halloran Trust, Callala Bay NSW for the purposes of rezoning. This AR documents the findings of the archaeological investigations conducted as part of the ACHA. The AR provides evidence about the material traces of Aboriginal land use to support the conclusions and management recommendations in the ACHA.

This AR will provide evidence to support the rezoning application of land north of Callala Bay from primarily DM – Deferred Matter to residential zoning. The study area (a representative sample of the area to be rezoned) itself contains DM land in the majority but a portion of the southeast corner is considered RU2 – rural landscape. The land area to be rezoned is larger than the study area, however, this AR and associated evidence will act as a representative study and examination of the area as a whole.

This investigation has been carried out under Part 6 of the NPW Act. It has been undertaken in accordance with the Code. The Code has been developed to support the process of investigating and assessing Aboriginal cultural heritage by specifying the minimum standards for archaeological investigation undertaken in NSW under the NPW Act. The archaeological investigation must be undertaken in accordance with the requirements of the Code.

It is stated in section 1.2 of the Code that where the ACHA report concludes that the proposed activity will result in harm to Aboriginal objects or declared Aboriginal Places, an application for an Aboriginal Heritage Impact Permit (AHIP) will be required. This application must be supported by an ACHA report.

The *Environmental Planning and Assessment Act 1979* (EP&A Act) includes provisions for local government authorities to consider environmental impacts in land-use planning and decision making. Each Local Government Area (LGA) is required to create and maintain a Local Environmental Plan (LEP) that includes Aboriginal and historical heritage items. Local Councils identify items that are of significance within their LGA, and these items are listed on heritage schedules in the local LEP and are protected under the EP&A Act and *Heritage Act 1977.*

1.2 Study area

The study area is located approximately 1.5 kilometres west of Callala Bay town centre and approximately 16 kilometres south-east of the Nowra CBD (Figure 1). It encompasses approximately 36 hectares of private land and the adjacent road reserves. It includes Lot 2 DP 775060, Lot 212 DP 1177757, Lot 11 DP 253793, Lots 599-628 DP 11388.

The study area is within the:

- City of Shoalhaven LGA.
- Parish of Wollumboola.
- County of St Vincent.

The study area is bounded by Callala Beach Road to the west, Emmet Street to the south, residential housing along Scott Crescent to the east, and undeveloped private land to the north.

1.3 Planning approvals

The proposed development will be assessed against Part 3 of the EP&A Act. Other relevant legislation and planning instruments that will inform this assessment include:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- NPW Act.
- NSW *National Parks and Wildlife Amendment Act 2010.*
- Infrastructure State Environmental Planning Policy 2007 (SEPP).
- Shoalhaven LEP 2014.

1.4 Objectives of the investigation

The objectives of the investigation can be summarised as follows:

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

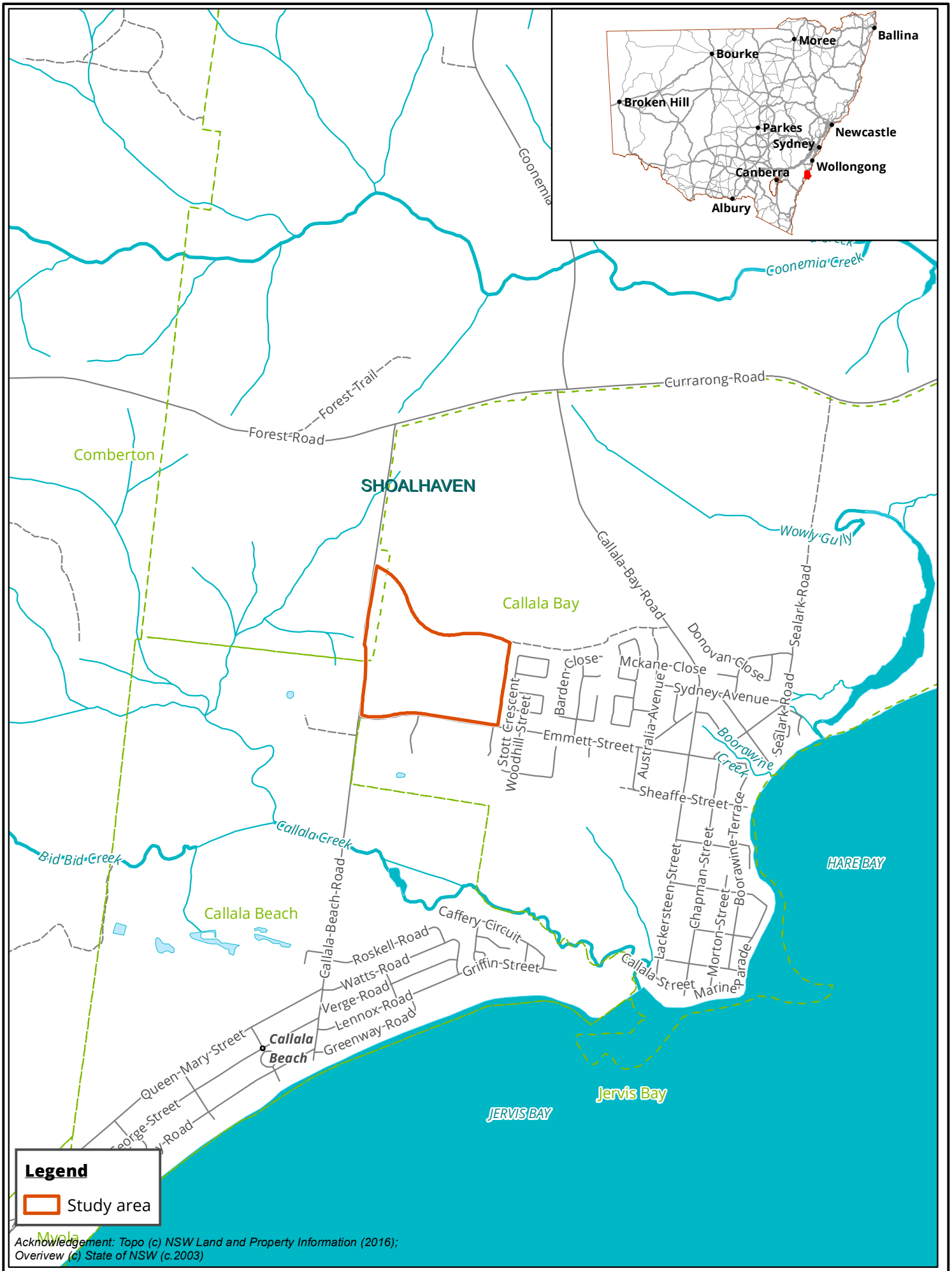
1.5 Investigators and contributors

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

Table 1 Investigators and contributors

Name and qualifications	Experience summary	Project role
Taryn Gooley BASc (Hons - Archaeology)	Taryn has over nine years' archaeological consultancy experience, as well as extensive volunteering experience on archaeological research projects overseas. Taryn has a strong background in project management, leading project teams and volunteer groups in heritage management projects throughout New South Wales and Western Australia. Taryn has been based in Newcastle since 2012 and has successfully completed numerous projects throughout the Newcastle, Port Stephens, Lake Macquarie, Hunter Valley, Liverpool Plains, and North Western NSW regions. Her areas of expertise include archaeological and heritage management advice, archaeological excavation and survey, artefact analysis, Aboriginal community consultation, technical report writing, and preparing cultural heritage management plans. Taryn is also accomplished in obtaining approvals under the NSW National Parks and Wildlife Act 1974.	• Quality assurance
Samantha Keats BA (Hons)	Samantha is an archaeologist with Biosis Wollongong office and has over four years of experience as an archaeologist. Samantha has had experience working as an archaeologist and project manager on a number of Aboriginal and European heritage projects across New South Wales, including water infrastructure and linear projects, residential development projects, renewable energy projects, and telecommunications projects. As part of these project Samantha has interacted with a diverse client base including Local Government, National Parks and Wildlife Service, Department of Primary Industry and Water, resource companies, architectural firms, engineering firms, and private developers.	• Project management
Mathew Smith BA/BSc (Hons)	Mathew is an archaeologist with 4 years' experience in the consulting industry. Mathew is currently based out of Wollongong and has extensive experience along the South Coast. Mathew specialises in Aboriginal archaeology and has successfully obtained project approvals for Aboriginal Heritage under the *NSW National Parks and Wildlife Act 1974*, including Aboriginal Heritage Impact Permits and State Significant Development approvals. Mathew's areas of expertise include project management, archaeological excavation and survey, Aboriginal community consultation, and preparation of technical reports. Mathew is also a specialist in Aboriginal artefact identification and analysis, being recognised as such by the Australian Association of	• Report writing • Archaeological survey • Test excavations

Name and qualifications	Experience summary	Project role
	Consulting Archaeologists Inc., and has undertaken stone artefact analysis for a number of Aboriginal sites across NSW and Victoria.	
Matthew Tetlaw BA (Hons)	Matthew completed his Bachelor of Arts with honours in 2018 and joined Biosis in their Wollongong office in 2019. Since employment at Biosis, Matthew has participated in a variety of Aboriginal and historic projects which has brought him in contact with test excavation, archaeological survey, artefact analysis, background research, legislative requirements	• Background research • Report writing • Test excavations • Aboriginal Consultation



Acknowledgement: Topo (c) NSW Land and Property Information (2016); Overivew (c) State of NSW (c.2003)

Figure 1 Location of the study area

Biosis Pty Ltd
Albury, Ballarat, Melbourne,
Newcastle, Sydney, Wangaratta & Wollongong

Matter: 30326
Date: 27 May 2020,
Checked by: MWT, Drawn by: AEDM, Last edited by: jturner
Location:P:\30300s\30326\Mapping\
30326_F1_Locality

0 250 500 750 1,000
Metres
N

Scale 1:25,000 @ A4, GDA 1994 MGA Zone 56

Legend

Study area

Lot

Figure 2 Study area detail

0 50 100 150 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56

N

biosis

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Newcastle, Sydney, Wangaratta & Wollongong

Acknowledgements: Basemap © Land and Property Information 2016

Matter: 30326
Date: 27 May 2020,
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30326_F2_StudyArea

2 Proposed development

The proposed development includes a planning proposal to rezone land at Emmett Street, Callala Bay. Rezoning of the study area would move its current status as Mostly Deferred Matter (DM) and partly Rural Landscape (RU2) in the south-west corner of the study area to R2 Low Density Residential and/or R3 Medium Density Residential Zones, RE1 Public Recreation and/or RE2 Private Recreation. The application was assessed via the Gateway process under Section 3.34 (2) of the EP&A, and a favourable determination to amend the Shoalhaven LEP was granted on 2 May 2019 by DPE, subject to conditions (DPE 2019, PP_2019_SHOAL_001_00). These conditions include the completion of an ACHA over the study area including test excavations.

3 Desktop assessment

The desktop assessment involves researching and reviewing existing archaeological studies and reports relevant to the study area and surrounding region. This information is combined to develop an Aboriginal site prediction model for the study area, and to identify known Aboriginal sites and/or places recorded in the study area. This desktop assessment has been prepared in accordance with requirements 1 to 4 of the Code.

3.1 Landscape context

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

3.1.1 Topography and hydrology

The study area is contained within the Wandrawandian formation, a siltstone layer of Permian age (299-251 mya). This formation is considered part of the Shoalhaven group and contains fine-grained quartz-lithic silty sandstone and siltstone. The topography of the study area comprises relatively flat landforms in the south of the study area, with slight rises to the north and centre. The landscape further south is considered flat while a small crest defines the northern point of the study area.

Stream order is recognised as a factor which assist the development of predicative modelling in Sydney Basin Aboriginal archaeology, and has seen extensive use in the Sydney region, most notably by Jo McDonald Cultural Heritage Management (Jo McDonald Cultural Heritage Management Pty Ltd 2005a, pp. 1, Jo McDonald Cultural Heritage Management Pty Ltd 2005b, Jo McDonald Cultural Heritage Management Pty Ltd 2006, Jo McDonald Cultural Heritage Management Pty Ltd 2008). Predictive models which have been developed for the region have a tendency to favour high order streams as the locations of campsites as they would have been more likely to provide a stable source of water and by extension other resources which would have been used by Aboriginal groups.

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

The nearest water source to the study area is a first order, non-perennial tributary of Callala Creek, located approximately 150 metres to the west of the study area. Callala Creek itself is located approximately 700 metres south-west. The study area is therefore unlikely to have been utilised by Aboriginal people as a camping ground as access to resources such as reliable water and food would have been limited.

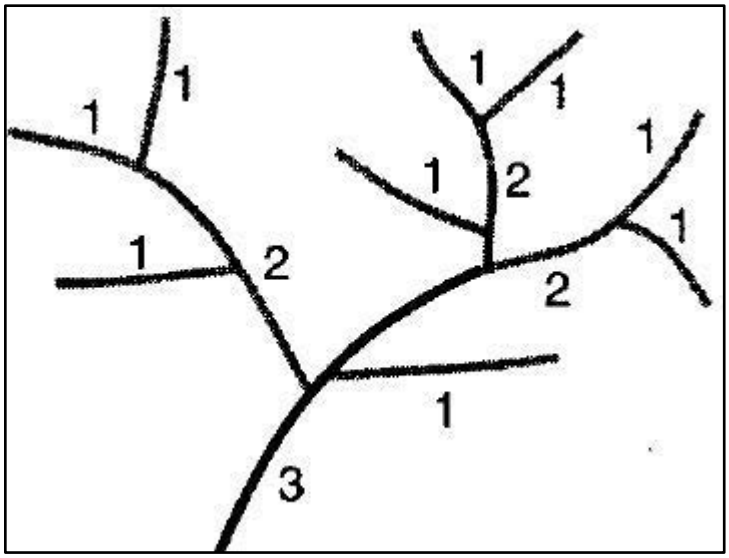


Plate 1 Diagram showing Strahler stream order (Ritter, Kochel, & Miller 1995)

3.1.2 Soil landscapes

The study area contains two soil landscapes (Figure 5). The Greenwell Point soil landscape covers the majority of the study area and consists of gently undulating rises on siltstone with small coastal cliffs. The relief is less than20 metres and slopes are less than3%. As described above, this soil landscape overlays the Wandrawandian siltstone formation containing mid grey to dark grey pebbly siltstone to poorly sorted pebbly lithic sandstone (Hazelton 1992). There is some moderate erosion on batters and moderate stream bank erosion in this soil landscape. The study area has been mostly cleared of low open-forest but some remnant vegetation remains.

Table 2 Greenwell Point soil landscape characteristics (Hazelton 1992)

Soil material	Description
Greenwell Point 1 (gp1) – Hard-setting brownish black silt loam	A brownish black to dark brown silty loam to loam and fine sand. Moderately pedal, 205 millimetre in size. This soil material is rough-faced and porous. There is some stone inclusions (<2%) ranging from 6 to 20 millimetre in size. They're quite disbursed within the material. pH is 6.5. Gp1 occurs as topsoil and there are few roots.
Greenwell Point 2 (gp2) – Yellowish brown strongly pedal sandy clay	Gp2 is a yellowish brown sandy clay. Strongly pedal in nature measuring 10-20 millimetre angular blocky peds. Stones are included at a frequency of 10-20% and ranging from 20-60 millimetres in size. pH is 5.5-7.0 and few roots are present. This material is subsoil.
Greenwell Point 3 (gp3) – Brown strongly pedal medium clay	A brown medium clay with a strongly pedal structure. The ped size is 20-50 millimetres and they are rough-faced and porous. pH is between 3.5-4.5 and stone inclusions (2%) ranging from 6-20 millimetres in size. No roots occur in this material. This material is subsoil.
Greenwell Point 4 (gp4) – Mottled massive bright reddish brown heavy clay	Bright reddish brown with orange and grey mottles of heavy clay define this material. The clay is interlaced with coarse sand which is very dense. pH is 4-4.5 and no stone or root inclusions can be seen. This material is subsoil.

The Seven Mile soil landscape is represented in a small portion of the study area. Quaternary marine sands and peat consisting of medium marine quartz sands and alluvium and peat of the same age in swamps underlies this soil landscape. Soils include deep (<150 centimetres) siliceous sands and podzols which occur on ridges. Acidic peats occur in swamps and humus podzols occur in swales. Surface topography includes a series of dune ridges and swales, swamps and lagoons. The relief is less than 5 metres and slopes are less than 5%. Proximity to the coast means the water table occurs at a depth of less than 200 centimetres. Erosion potential of topsoils is very low.. Vegetation communities consist of open-scrub, low open forest grading to tall open-forest. Additional pockets of closed-forest exist in sheltered areas.

Table 3 Seven Mile soil landscape characteristics (Hazelton 1992)

Soil material	Description
Seven Mile 1 (sm1) – Loose dull yellow sand	Dull yellow to light grey sand. This material is apedal and single-grained. pH is 4.5-6.0. There are no stones but roots are abundant. This material occurs as topsoil.
Seven Mile 2 (sm2) – Friable organic peat	Brownish black sandy peat. Its structure is massive apedal. pH is 5.5 and no stones are included but roots are common. This material is topsoil.
Seven Mile 3 (sm3) – Bright yellowish brown clayey sand	Bright yellowish brown clayey sand which is massive apedal in nature. The pH is 7.0. There are no root or stone inclusions. This material is subsoil.
Seven Mile 4 (sm4) – Brownish black soft sandy organic pan	Brownish black loamy sand. Its structure is massive apedal and sandy. pH is 5.5-7.0 and there are no stone or root inclusions. This material occurs as subsoil.
Seven Mile 5 (sm5) – Bright yellowish brown sandy iron pan	Bright yellowish brown loamy sand. Massive apedal and sandy. The pH is 5.5-7.0 and there are no stone or root inclusions. This material occurs as subsoil.
Seven Mile 6 (sm6) – Mottled bright yellowish brown clayey sand	Bright yellowish brown with orange and red mottles, this clayey sand is massively apedal. pH is 4.0 and there are no stone or root inclusions. This material occurs as subsoil.

3.1.3 Landscape resources

The coastal areas of the region would provide a number of resources used by Aboriginal inhabitants. A number of plant and animal species would have been available within the immediate coastal resource zone. Local Aboriginal groups would have access to an abundant range of marine, terrestrial and avian species, many of them being available during different seasons of the year. Both floral and faunal species were utilised by Aboriginal people in many ways. They were used not only as a food source, but also for making weapons, utilitarian objects and for ceremonial purposes.

The Nowra landscape has been generally cleared but still retains small stands of tall open-forest that include Turpentine, Grey Gum, Scribbly Gum, Spotted Gum, Sydney Peppermint, Thin-leaved Stringybark, Red Bloodwood, Forest Oak and Blackbutt. Understorey species comprise of Flaky-barked Tea-tree, Hairpin Banksia, Pine-leaf Geebung, Burrawang, and Decorative Paperbark (Hazelton 1992) In closer proximity to the coastal in dune systems, Coast Wattle, Tea-tree, Banksia and Blackbutt are common. (Dunn & Sahukar 2003).

These species would have provided a range of resources for Aboriginal people. The soft spongy bark of the Illawarra Flame Tree was used to make nets and fishing lines, sap from the Red Bloodwood tanned fishing nets and stained artefacts, while Mat-rush was a food, string, medicine and was an indicator for small marsupials and reptiles. Swamp Oak bark provided material for canoe making and Paperbark bark used for bedding and blankets (Wesson & New South Wales Government Office of Environment and Heritage 2009).

These species would have provided a range of resources for Aboriginal people. Food, tools, shelter and ceremonial items were derived from floral resources, with the locations of many campsites predicated on the seasonal availability of resources. Many of the plants found within the study area were important to Aboriginal people and were used for numerous purposes.

Native fauna that would have been present in the vicinity of the study area include: Eastern Snake-neck Turtle, Red-bellied Black Snake, Short-beaked Echidna, Brush-tail Possum, Sugar Glider, Common Wombat, frog, bats, cockatoos, kookaburra, and ducks. As well as being important food sources, animal products were also used for tool making and fashioning a myriad of utilitarian and ceremonial items. For example, tail sinews are known to have been used to make fastening cord, while 'bone points', which would have functioned as awls or piercers, are often an abundant part of the archaeological record. Animals such as possums were highly prized for their fur, with possum skin cloaks worn fastened over one shoulder and under the other (Attenbrow 2010).

3.1.4 Land use history

The earliest land grants around Callala were made to Michael Hindmand, a 208 acre plot (approximately 84 hectares), and William Creak who was granted 220 acres (approximately 89 hectares) in 1841(Feary 2013, pp. 52). Land on Callala Point was identified and thought suitable to construct the town called Central Jervis but alternative plans must have been made as this town does not exist today (Feary 2013).

Later in the 19th and 20th centuries, people acquired land around Jervis Bay for purposes of dairying and farming, subsequent land and vegetation clearing took place to support these activities. Nevertheless, the settlement at Canberra converted Jervis Bay to maritime outlet (Feary 2013). Plans outlined by Surveyor Henry Halloran, announced a vision for Jervis Bay as an industrial and urban centre (Plate 2). This can be seen in parish maps at the time, which shows the land surrounding Jervis Bay linked to this grand vision.

Land that included the study area was owned from at least 1892 by William Sheaffe (NSW Land Registry Services) and consisted of 200 acres (approximately 80 hectares). A parish map from 1917 shows roads have been designed towards the east and southern lots, including the town of Jervis, seem to have exclude Sheaffe's lot (Land Registry Services). By 1968, the study area has been subdivided in the southeast corner (Plate 3).

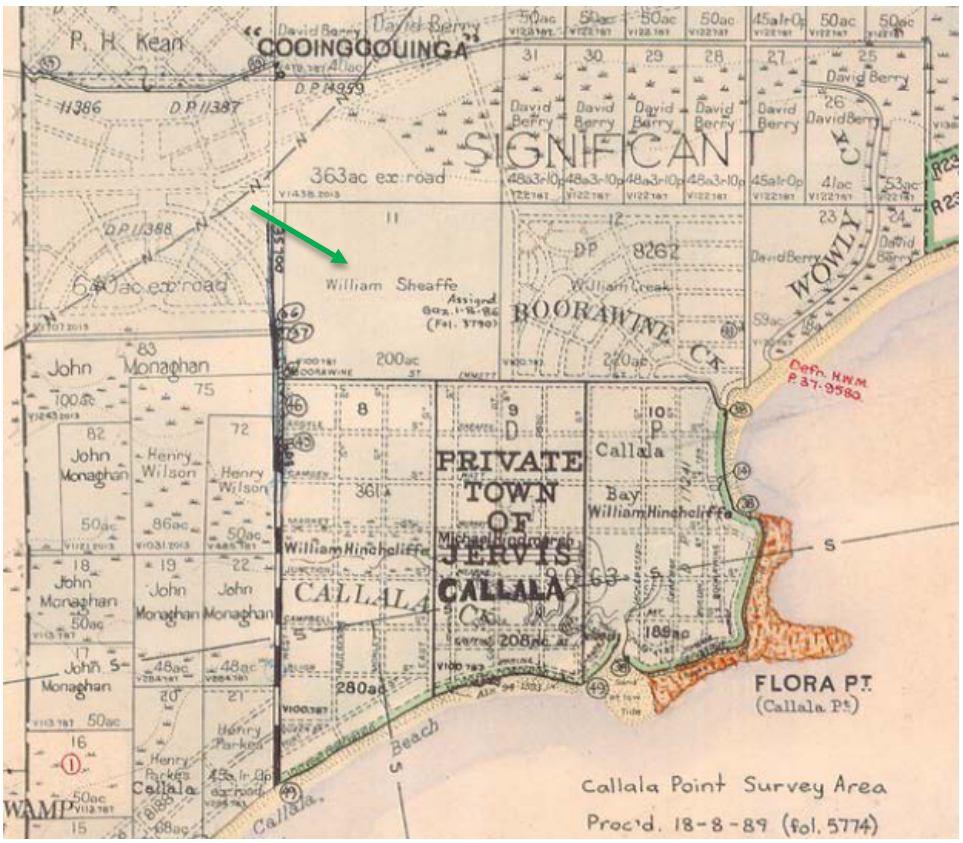


Plate 2 **1968 Parish map of land surrounding the study area. Green arrow marks William Sheaffe's lot (Source: NSW Land Registry Services)**

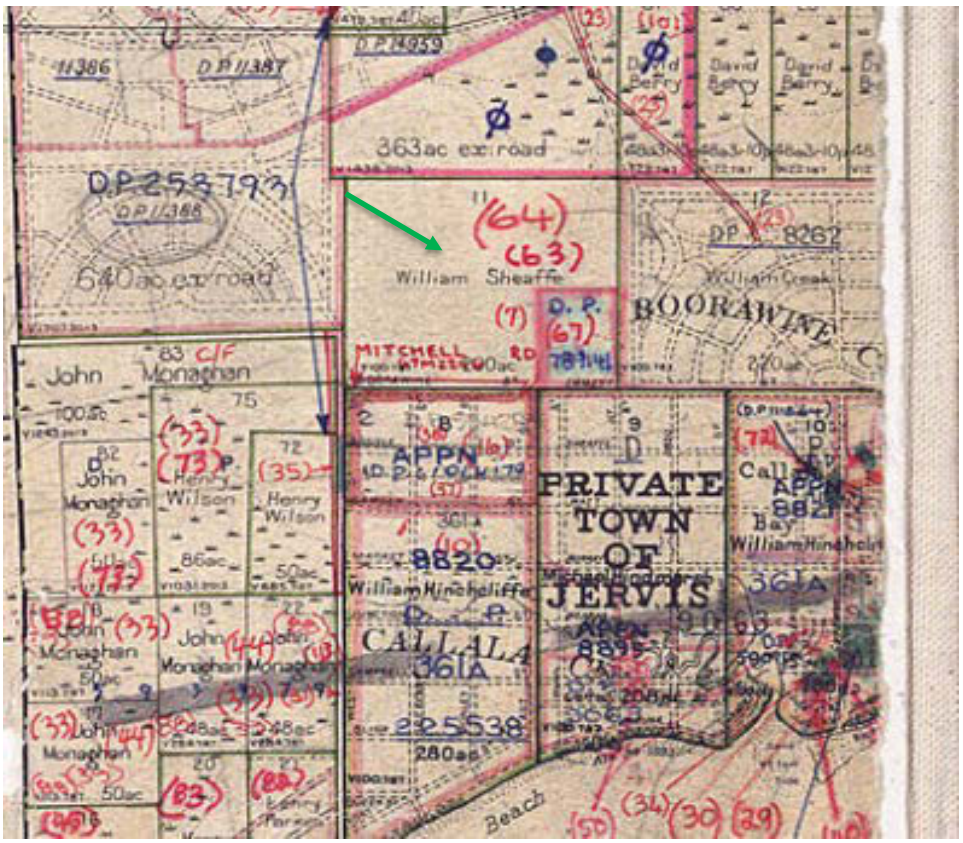
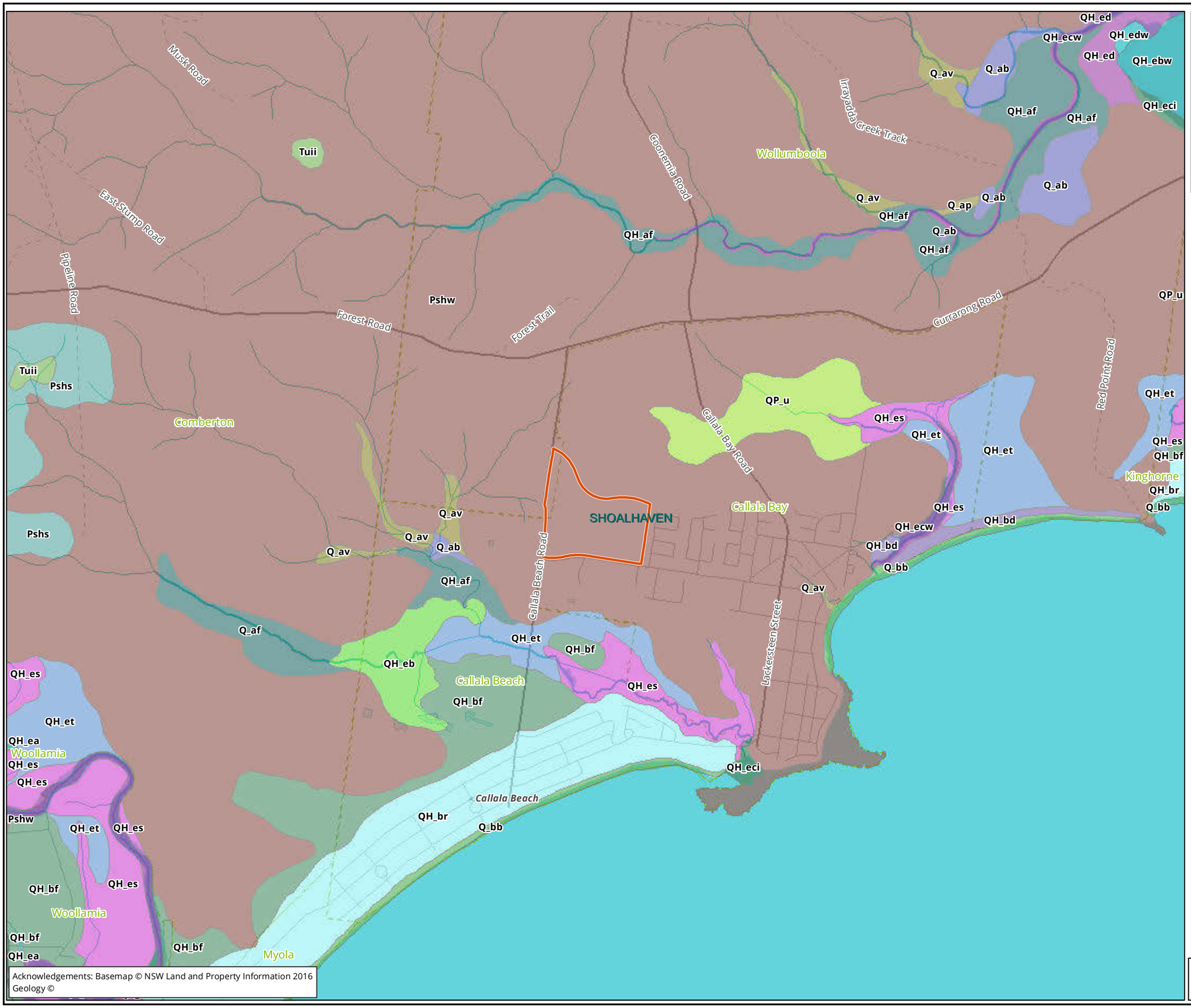


Plate 3 1968 Parish map with William Sheaffe's lot marked with green arrow. Note plans for subdivision in south-east corner and transistion to lot and DP system (Source: NSW Land Registry Services)

These additional plans for the development of the region around Jervis bay were considered, but local community opposition to these development didn't allow them to occur (Feary 2013, pp. 53). A current aerial does confirm these observations (Figure 2). The study area itself however, remains undeveloped consisting of remanet vegetation and trees. An access track can be seen on the eastern boundary abutting the modern subdivision. The construction of the track itself would have impacted artefacts on the surface, while tree removal and other vegetation clearing may have displaced subsurface material..



Legend

Study area

Geological units

- Alluvial backswamp deposits
- Alluvial floodplain deposits
- Alluvial palaeochannel deposits
- Alluvial valley deposits
- Central mud basin
- Coastal deposits- backbarrier flat
- Coastal deposits- beach facies
- Coastal deposits- beach ridge
- Coastal deposits- dune facies
- Currambene Dolerite
- Estuarine- fluvial delta front
- Estuarine- fluvial delta front (subaqueous)
- Estuarine basin and bay (subaqueous)
- Estuarine channel deposits (subaqueous)
- Estuarine in-channel bar and beach
- Estuarine palaeochannel fill
- Estuarine swamp
- Estuarine tidal-delta flat
- Pleistocene undifferentiated regolith
- Snapper Point Formation
- Wandrawandian Formation

Figure 4 Geological formations within the vicinity of the study area

0 250 500 750 1,000

Metres

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

Biosis Pty Ltd

Albury, Ballarat, Melbourne,
Sydney, Newcastle, Wangaratta & Wollongong

Matter: 30326,
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Checked by: MT, Drawn by: JPT, Last edited by: jturner
Location:P:\30300s\30326\Mapping
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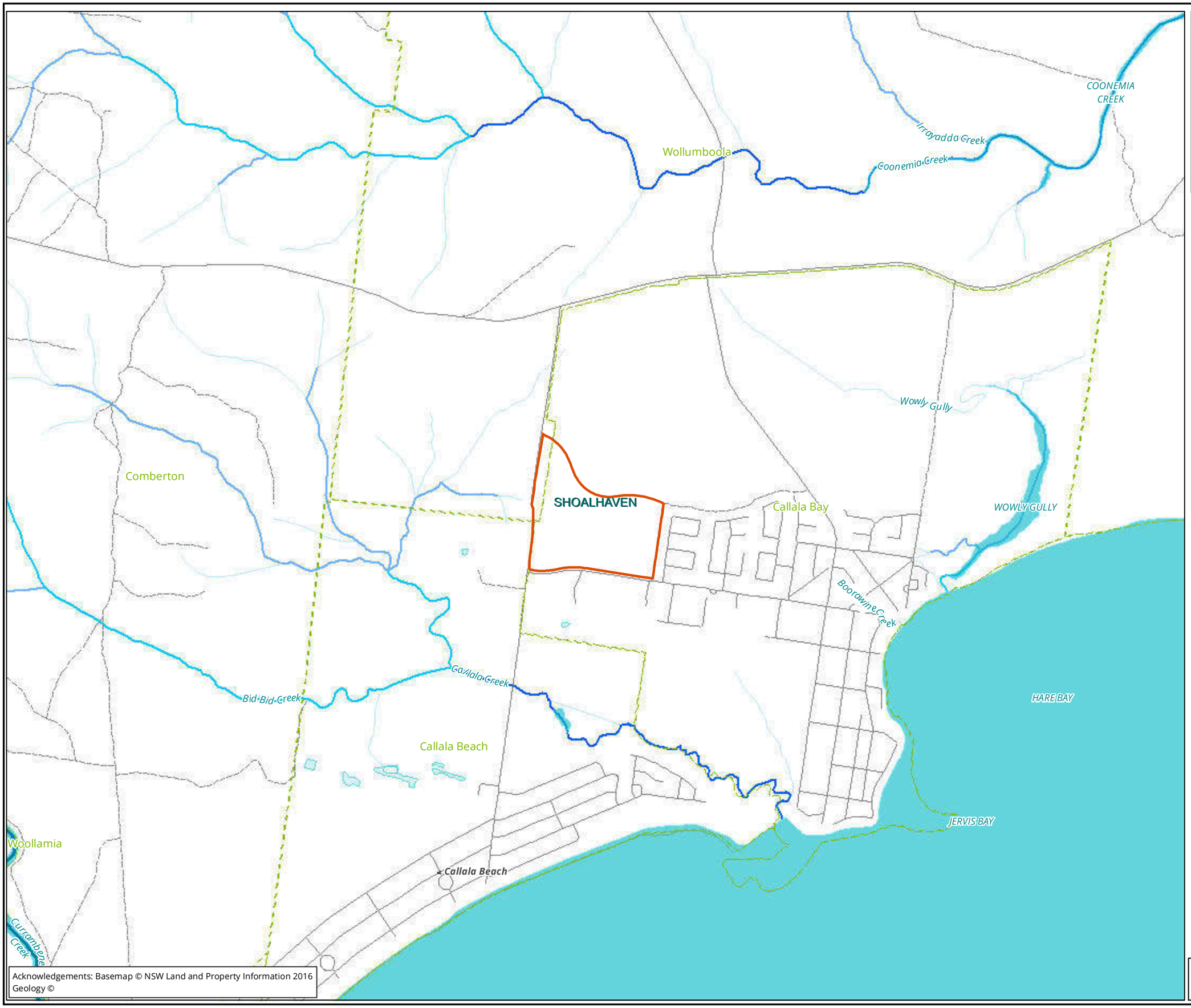
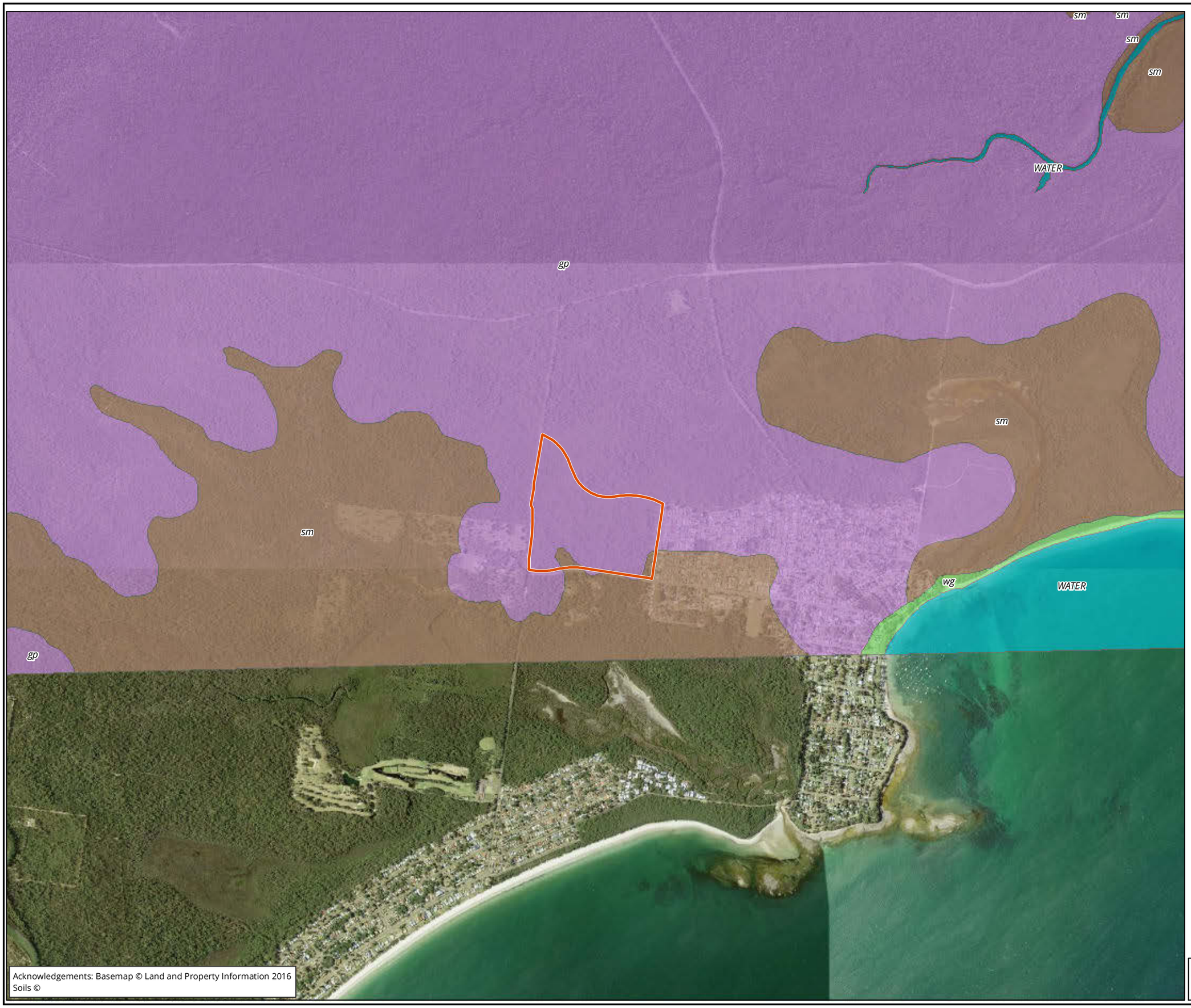
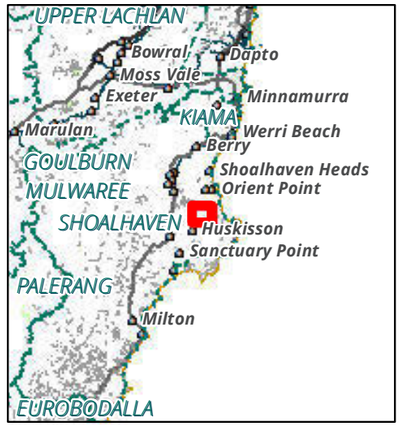


Figure 5 Hydrology within the vicinity of the study area





Legend

Study area

Soil landscape units

- GREENWELL POINT
- SEVEN MILE
- WATER
- WOLLONGONG

Figure 6 Soil Landscapes within the vicinity of the study area

0 250 500 750 1,000

Metres
Scale: 1:20,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56

N

Biosis Pty Ltd

Albury, Ballarat, Melbourne,
Sydney, Newcastle, Wangaratta & Wollongong

Matter: 30326,
Date: 27 May 2020,
Checked by: MT, Drawn by: JPT, Last edited by: jturner
Location:P:\30300s\30326\Mapping
30326_F6_Soils.mxd

3.2 Previous archaeological work

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

The majority of south coast Aboriginal sites date to the last 6,000 years when the sea-level stabilised following the end of the last Ice Age. Prior to this, sea levels were lower and the coast was located much further inland, about 14 kilometres to the east of its current position. Coastal sites older than 6,000 years are rare, as most would have been most likely inundated by the rising sea. Pleistocene-age Aboriginal sites on the south coast include a rock shelter at Burrill lake (located approximately 45 kilometres south of the study area) which has been dated to 20,830±810BP (ANU-138) (Lampert 1971, pp. 122) and a coastal midden at Bass Point dated to 17,010±650BP (ANU-536) (Bowdler 1970, pp. 254).

3.2.1 Regional overview

A number of Aboriginal cultural heritage investigations have been conducted for the Jervis Bay region. Models for predicting the location and type of Aboriginal sites with a general applicability to Callala Bay and thus relevant to the study area have also been formulated, some as a part of these investigations and others from cultural heritage investigations for relatively large developments.

Sefton (1980) completed the first regional review of Aboriginal archaeological sites and relics within the Illawarra Region which includes the study area. Geographic areas in the survey included the catchment areas of the Port Hacking, Wingecarribee, Wollondilly and Nattai Rivers, water catchment areas, northern Illawarra Escarpment, Bass point, Kangaroo Valley, Nowra and the lower reaches of the Shoalhaven River, Jervis Bay, McDonald State Forest, the upper reaches of the Clyde River and Murramurang Aboriginal Area (Sefton 1980, pp. 2). The report recommended the regional mapping and sampling of coastal shell middens within the area, due to their increasingly endangered status.

Clarke and Kuskie (2006) undertook a study to create a predictive model for archaeological sites in the Lower Shoalhaven Region. The assessment involved background research, predictive modelling, and a field survey. The predictive modelling undertaken suggested that the area could be divided into two resource zones, with the expected occupation patterns in each zone shown in Table 4.

Table 4 Resource zones in the Lower Shoalhaven (Clarke and Kuskie 2006, pp. ii)

Resource zone	Description
Primary	Primary resource zones were defined in terrain units in close proximity to the major Shoalhaven and Crookhaven Rivers. These zones have higher probability of containing evidence for a wide range of occupation types including congregations of large groups of people, community base camps, nuclear/extended family base camps, camping by small hunting and/or gathering (without camping) and transitory movement. Occupation is likely to have been regular and potentially longer in duration in the primary zones.
Secondary	Secondary resource zones were defined in terrain units in close proximity to higher order creeks and/or wetlands, including Bomaderry, Mundamia, Calymea, Flat Rock, Bengalee and Sandy Creeks and their associated flats, slopes and terraces. These secondary zones have a high probability of containing evidence of nuclear/extended family base camps, camping by small and/or gathering parties, hunting and/or gathering (without camping) and transitory movement. Occupation is likely to have been sporadic and relatively short in duration in secondary zones.
Areas outside Primary and Secondary zones	Areas outside the primary and secondary resource zones included terrain units distant from higher order creeks and/or wetlands, such as lower order drainage depressions and associated slopes and crests. Occupation in these areas is likely to have involved hunting and/or gathering (without

Resource zone	Description
	camping) and transitory movement and is likely to have been sporadic and very short in duration.

Navin Officer Heritage Consultants (NOHC) (2007, 2012, 2013) completed a series of assessments for the Princes Highway Upgrade between Gerringong and Bomaderry between 2007 and 2013. These assessments are the most comprehensive conducted in the local area, and include community consultation, literature review, survey, and test excavation along the proposed alignment.

Initial works consisted of a preliminary Aboriginal and historical assessment of the proposed alignment in order to map potential heritage constraints to the works. This consisted of a literature review and predictive modelling being undertaken for the entirety of the alignment between Gerringong and Bomaderry (Navin Officer Heritage Consultants 2007).

In creating the predictive modelling for the project, NOHC identified a number of topographic traits which may, alone or in combination, indicate the presence of Aboriginal sites:

- Low gradient or relatively level ground.
- A sheltered context from prevailing harsh weather conditions, such as wind or heat.
- The absence of significant surface rock or gravels.
- Proximity to a freshwater source.
- Proximity to resource zones (such as a littoral or freshwater shoreline).
- A well-drained and locally elevated context.

From this assessment, a list of archaeologically sensitive landforms were developed, including:

- Low gradient basal slopes (including colluvial deposits and alluvial fans) adjacent to the valley floor.
- The lower elevation or terminal section of major spurs and ridgelines where they adjoin or traverse the valley floor.
- Level or low gradient ground on the crests of spurs and ridgelines.
- The downslope margin of alluvial terraces.
- The banks of rivers and creeks where they are locally elevated and well drained.
- The locally elevated margins of wetland basins.
- Locally elevated sand bodies outside of coastal barrier or dune systems, such as fossil beach ridges on the margins and flats of infilled estuaries, and source bordering dunes ((Navin Officer Heritage Consultants 2007, pp. 49)).

Based on this broad scale mapping, the most common predicted sites in this large scale landform were likely to be subsurface artefact occurrences, which were considered likely to occur in varying densities, with the higher densities likely to occur in relative proximity to water (Navin Officer Heritage Consultants 2007, pp. 57).

In 2012, NOHC conducted further assessment in the form of field survey for the Berry to Bomaderry upgrade, refining their predictive modelling on the basis of investigations conducted between 2007 and 2012 for the Princes Highway upgrades at Gerringong and Foxground to Berry:

- The valley floors, and in particular the alluvial flats, are generally characterised by intermittent and low incidences of artefacts.
- Micro-topographic features such as locally elevated terraces and creek banks, within the broader valley floor context, tend to contain a higher incidence of artefacts.

- Valley floor contexts, on alluvium and which are not in the proximity of higher order (3rd or greater) riparian zones are likely to have low archaeological sensitivity.
- Locally elevated, well-drained and low gradient micro-topographies within 200 metres of known or predicted former wetland basins are likely to have high archaeological sensitivity.
- Higher artefact incidence and/or assemblage richness tends to coincide with major spurlines and low gradient basal slopes above, and set back from, the valley floor.
- The ridgeline crests and saddles tend to be characterised by intermittent and low incidences of artefacts, with higher incidences occurring in association with features such as low gradient knoll crests and break of slope interfaces.
- The archaeological sensitivity of ridge and spurline crests and slopes requires further investigation, especially with regard to variables such as possible cross-country travel routes and distance from lower catchment wetland basins.
- Riparian corridors associated with higher order streams require testing to better define archaeological sensitivity and possible geographical determinates of artefact incidence (Navin Officer Heritage Consultants 2012, pp. 44).

The survey recorded 18 Aboriginal sites within the envelope of the proposed upgrade including two artefact scatters and 16 'Potential Archaeologically Sensitive Areas' (PASAs). In addition to this, a number of Aboriginal cultural heritage values were identified, including two large old growth fig trees, and burial sites. The significance of these PASAs could not be determined without test excavation, which was included as a recommendation of the report.

Test excavations of these sites were subsequently carried out by NOHC (2013). Portions of PASA 1 and PASA 52 were tested as a part of the program.. A summary of the results of the testing program are presented in Table 5.

Table 5 Summary of the results for the testing program conducted by NOHC (2013)

Site	Number of pits excavated	Number of artefacts identified
PASA1	31	8
PASA2	26	9
PASA3	9	4
PASA4	15	15
PASA5	9	50
PASA6	17	18
PASA7	11	2
PASA8	17	30
PASA9	32	30
PASA10	29	54
PASA11	15	6
PASA45	7	0
PASA46	11	5
PASA47	33	10
PASA51	3	0

Site	Number of pits excavated	Number of artefacts identified
PASA52	13	2
Total	**278**	**243**

The majority of identified artefacts were complete and broken flakes (n=177), and flaked pieces (n=40), with small numbers of retouch flakes (n=12) and cores (n=12) found, as well as errailures (n=2) ((Navin Officer Heritage Consultants 2013, pp. 30). The majority of the assemblage was comprised of chert, with silcrete, quartzite, quartz, and volcanic materials also present in noticeable numbers. Smaller proportions of tuff, siliceous breccia, and siltstone artefacts were present, along with 10 artefacts where the raw material was unidentifiable.

An analysis of the vertical distribution of artefacts is presented in Table 6. It shows that the vast majority of artefacts were identified in the first two spits across all test pits conducted by NOHC, with spits three and four also containing considerable densities. Beyond this point, the densities drop off sharply. This is at least in part due to the method of excavation, with deeper pits being less common.

Table 6 Vertical distribution of artefacts in test pits excavated by NOHC (2013 p.39)

Spit	Number of artefacts
1	59
2	103
3	44
4	22
5	7
6	2
7	2
8	0
9	1
10	0
11	0
12	1

Based on the results of the test excavations, the predictive modelling for the area was further revised, suggesting that archaeologically speaking, the most sensitive landforms would be:

- Locally elevated landforms within valley floor contexts, on alluvium and which are in proximity of major streams and rivers (third order or higher drainage lines).
- The lower elevation or terminal section of major spurs and ridgelines where they adjoin or traverse the valley floor.
- Level or low gradient ground on the crests of spurs and ridgelines.
- The downslope margin of alluvial terraces.
- The banks of rivers and creeks where they are locally elevated and well drained.

- Locally elevated, well-drained and low gradient micro-topographies within 200 metres of known or predicted former wetland.
- Locally elevated sand bodies outside of coastal barrier or dune systems, such as fossil beach ridges on the margins and flats of infilled estuaries, and source bordering dunes (Navin Officer Heritage Consultants 2013, pp. 45).

Based on the results of the test excavations, NOHC identified a number of archaeological deposits within the PASAs. Within PASA1, the sites G2B A59 and G2B A60 were identified, and within PASA52, the site G2B A61 was identified. All of these sites were identified as having low significance within a local context based on the results of the test excavations.

Navin Officer Heritage Consultants (2006) conducted a program of subsurface testing for the Gerroa Sand Mine Extension. The program of testing was conducted using a mechanically driven auger, and included a total of 51 pits, 36 of which were 'primary' pits (40-45 centimetres in diameter) and 16 of which were 'secondary' pits (10 centimetres in diameter). 39 stone artefacts were recovered from five of the test pits, and shell material was recovered from 26 of the test pits. The recovered artefact assemblage was dominated by complete and broken flakes, with other artefact types being rare. In terms of raw material, the assemblage comprised mostly silcrete, quarts, and chert, with sandstone, chalcedony, and volcanic materials also present.

Kelleher Nightingale Consulting (2010) conducted an archaeological assessment for RMS ahead of the proposed North Nowra Link Road. The assessment involved Aboriginal consultation, background research, and survey of three proposed route options. The survey identified a total of 28 Aboriginal sites along the course of the three proposed routes. These included four artefact scatters, two isolated finds, one midden site, one grinding groove site, 19 rock shelter sites and one non-Aboriginal scarred tree, recorded to avoid confusion at a later date.

South East Archaeology (2012) undertook an assessment for a subdivision at West Culburra, around 12 kilometres south-east of Nowra. The assessment involved background research, Aboriginal consultation, and field survey. The survey identified three open artefact scatters immediately adjacent to the investigation area, containing a total of eight artefacts between them. The artefacts were primarily comprised of silcrete, acidic volcanic, quartz, and rhyolite, and contained one microblade core. Based on the results of the survey, the predictive modelling previously conducted by Kuskie was reassessed. It was considered that within a zone extending potentially up to 200 metres from the Crookhaven River, there was a high potential for subsurface archaeological deposits to be present.

Artefact Heritage (2015) undertook an assessment in advance of the construction of a resource recovery park at West Nowra. A total of five transects were walked across the survey area, which was located across a broad crest. The survey did not identify any sites or areas of potential. One of the possible reasons for this was that the survey area was located outside of the primary and secondary resource zones as outlined by Clarke and Kuskie (2006). The survey area was considered to have low archaeological potential.

3.2.2 Local overview

A number of Aboriginal cultural heritage investigations have been conducted within the region (within approximately 15 kilometres of the study area). Most of these investigations were undertaken as part of development applications and included surface and sub-surface investigations. These investigations are summarised below.

Dibden and Kuskie (1999) undertook an archaeological assessment at Red Point and Hammer Head Point, Jervis Bay approximately 4 and 7.5 kilometres east of the study area. The Red Point study area was located on the northern Shoreline of Jervis Bay, while Hammer Head Point was located across a two kilometre stretch of unconsolidated sand dunes connecting to the Beecroft Peninsula. Desktop assessment of past archaeological research and Aboriginal occupation in the surrounding area suggested that artefact scatters and middens had the highest potential of being within the study area. Ridge crests and spur crests within the Red Point landscape had moderate potential for artefacts while moderate artefact potential was also identified in fore-dune systems adjacent to rock platforms at Hammer Head point.

Subsequent transect survey of these areas identified six sites: three artefact scatters, two shell middens and one isolated artefact at Red Point. Two additional sites (one artefact scatter and one midden) were also identified at Hammer Head Point.

- Red Point 1 was an artefact scatter located on a gently inclined simple slope leading up to the coastal headland. The site contained 28 stone artefacts made of silcrete, quartzite and chert. Silcrete was the most abundant raw material, representing 78% of the assemblage at Red Point 1.
- Red Point 2 consisted of an isolated silcrete artefact located on a gently inclined slope leading to Red Point.
- Red Point 3 was an artefact scatter consisting of 19 artefacts. Similar to Repoint 1, silcrete made up the majority of the raw material types used (94%, n=18). This site was located on a broad ridge crest adjacent to wetlands.
- Red Point 4 consisted of an isolated silcrete artefact located on a simple slope adjacent to wetlands.
- Red Point 5 was consisted of a shell midden with stone artefacts located on the Red Point headland above a rock platform. Species of shell identified in the midden included *Austrocochlea spp*. Top Shells, *Patella spp.* Limpets, *Anadara spp.* Cockles, *Mytilus spp.* Mussels, *Nertita atramentosa* Nerita, *Thais orbita* Cartrut and *Turbo undulates* Turban. Three stone artefacts were also identified in the midden, one quartzite flake, one silcrete flake and one quartz 'chip'.
- Red Point 6 consisted of a shell midden located on the beach fore-dunes east of Red Point Headland. Shell species identified consisted of Top Shells, *Mytilus edulis* Blue mussel, *Saccostrea glomerata* Sydney Rock Oyster, Limpets, Nerita, Turban, Cockles, Cartrut, and *Ostrea angasi* Mud Oyster.

Two sites were identified at Hammer Head Point. Hammer Head 7 consisted of an artefact scatter of 8 artefacts with silcrete and quartz present. Hammer Head 8 consisted of a midden with three artefacts primarily of silcrete, which extends for 110 metres north-west along a fore dune. This midden contains predominantly oyster (*Saccostrea commercialis*) shell. Vehicular traffic through the dune system has caused heavy disturbance of the site (Dibden and Kuskie 1999, pp. 34).

Dibden and Kuskie's survey results suggest a generally low potential for artefacts to be present in the areas surveyed. Vehicle tracks presented much ground disturbance to the area. However, where landforms extend beyond areas of impact, archaeological potential rises from low to moderate (Dibden and Kuskie 1999, pp. 39).

Biosis (2015) provided Aboriginal due diligence advice 5 kilometres south-west from the study area in Woolamia for Shoalhaven city council. The area was subject to authorised disturbance which unearthed potential Aboriginal objects. . Subsequent ground survey identified various species of shell, none of which was determined to belong to an Aboriginal midden due to:

- A lack of raised habitation area in proximity to the site.
- Large proportions of non-edible and non-economic shell species suggesting a natural deposit associated with flooding events.

Biosis (2017) provided a due diligence report for Tata Consultancy Services approximately 9 kilometres from the study area at Currarong, NSW. Visual inspection of the study area found general ground visibility (GSV) to be generally low at 10%. Areas of exposure were similarly limited totalling 5%. No new Aboriginal objects or sites were located. Further investigation of AHIMS sites within the study area confirmed their presence within the study area but outside impact zones.

Feary (2017) undertook additional subsurface investigations at two previously recorded AHIMS sites (58-2-0144 and 58-2-0443) in Callala Bay approximately 2 kilometres from the study area. Previous test excavations revealed these two sites but further subsurface testing was needed to provide more accurate dimensions. Auger holes were placed along the periphery to determine spatial extent. In total, six auger holes were excavated for 58-2-0144 and 19 for 58-2-0443.

- 58-2-0144: Shell material was recovered from the auguring, as well as some stone artefacts. The midden extended to a depth of 33 centimetres. The densest material was recovered from Auger 5 associated with test pit 2. Four artefacts were also found at this site including silcrete, chert and quartz flakes.
- 58-2-0443: No bone or artefacts were recovered but an item of European heritage (a rusted piece of iron) was excavated from auger 14. Shell material was recovered from 11 of the19 holes, which found that the midden extended to 42 centimetres deep.

Feary's investigations suggests middens in the Callala Bay area have the potential to contain both shell and stone artefacts. They are also found at depths of between 30-40 centimetres.

Biosis (2019) completed a short due diligence advice for the Beercroft Weapons Range, approximately 12 kilometres from the study area. Desktop research followed by a site survey found visibility to be generally low (10%) across the entire area. This increased slightly along drainage channels, walkways and rock outcrop. Levels of exposure were limited to rock outcrops and drainage lines, as well as areas of modern disturbance. In total about 30% of the area was exposed. The inspection identified two chert flakes at PPL site 2 and the presence of historical material was also recorded.

3.2.3 AHIMS site analysis

A search of the AHIMS database (Client Service ID: 467389) identified 27 Aboriginal archaeological sites within a 10 by 10 kilometre search area, centred on the proposed study area. None of these registered sites are located within the study area (Figure 6). AHIMS search results are provided in Appendix 1. Table 7 provides the frequencies of Aboriginal site types in the vicinity of the study. The mapping coordinates recorded for these sites were checked for consistency with their descriptions and location on maps from Aboriginal heritage reports where available. These descriptions and maps were relied upon where notable discrepancies occurred.

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

Aboriginal sites within a given area. Some recorded sites consist of more than one element, for example artefacts and shell sites, however for the purposes of this breakdown and the predictive modelling, all individual site types will be studied and compared. This explains why there are 35 results presented here, compared to the 27 sites identified in AHIMS.

Table 7 AHIMS site type frequency

Site type	Number of occurrences	Frequency (%)
Artefacts	20	57
Shell	11	31.4
Modified tree	2	5.7
Burial	1	2.8
Non-human bone and organic material	1	2.8
Total	**35**	**100.00**

A simple analysis of the Aboriginal cultural heritage sites registered within the 5 kilometre buffer of the study area indicates that artefact sites are the most dominant site type at 57% (n=20). This is followed by shell sites, which account for 31.4% (n=11) of the sample. Other site types are also represented in the sample are modified trees at 5.7% (n=2), as well as burials and non-human bone and organic material, both of which account for 2.8% (n=1) of the sites surrounding the study area.

The dominance of artefact sites is unsurprising. The predictive modelling undertaken by NOHC suggests that areas of archaeological sensitively are likely to occur on slightly elevated landforms. These are common in the Greenwell Point soil landscape, which surrounds and includes the study area, itself consisting of gentle undulating rises. This explains the appearance of AHIMS sites around the study area. Additionally, the relatively high occurrence of shell sites is due to the location of the study area approximately 1.5 kilometres of Jervis Bay. Although none have been recorded in study area, shell sites and associated middens are likely to be found along coastal shores within soft sandy sediments.

It should be noted however that the recording of these sites is largely determined by archaeological assessment related to development projects. The distribution of AHIMS sites then does not totally describe Aboriginal occupation in the region.

Figure 3 Aboriginal sites located in the study area and within the vicninity

This page contains sensitive information and has not been included in this report.

3.3 Discussion

Previous archaeological research has identified the area surrounding Jervis Bay was intensely occupied by past Aboriginal people. Predictive models developed for the region by Clarke and Kuskie (2006) identified that resource zones were dependent on proximity to major water sources, with these zones decreasing with distance away from the Shoalhaven and Crookhaven Rivers. Likewise, NOHC's (2007, 2012, 2013) research over three years also suggested proximity to major water sources predicted the location and quantity of Aboriginal sites. NOHC also suggested that local elevations were important in these predictions.

Research closer to the study area has identified predominantly middens along the coastal areas of Jervis Bay (Feary 2017). Stone tools have also been found but only in small amounts (Dibden and Kuskie 1999). Additional survey's by Biosis (2015, 2017) has determined surface identification of artefacts in the area to be difficult due to low levels of ground visibility and few areas of exposure.

Although AHIMS sites have been recorded on the coast within two kilometres of the study area, flat landforms situated within the study area do not conform to the regional models, which prioritise elevation and proximity to permanent or reliable resources in the prediction of Aboriginal sites. The landforms associated with the study area are likely unsuitable for Aboriginal habitation with only a slight rise in elevations is present in the northern section of the study area. Furthermore, the middens associated with the coastal zone on the shores of Jervis Bay suggest that areas of occupation are likely to be close proximity to the coastal landforms. The study area may have been an intermediary zone where Aboriginal occupation was transitory and sparse. If occupation is present in close proximity to the study area, it would likely be closer to Callala Creek and its tributaries to the south and west.

3.3.1 Predictive statements

Predictive statements been formulated to broadly predict the type and character of Aboriginal cultural heritage sites likely to exist throughout the study area and where they are more likely to be located.

The statements are based on:

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

Based on this information, predictive statements have been developed, indicating the site types most likely to be encountered during the survey and subsequent sub-surface investigations across the present study area (Table 8). The definition of each site type is described firstly, followed by the predicted likelihood of this site type occurring within the study area.

Table 8 Aboriginal site prediction statements

Site type	Site description	Potential
Flaked stone artefact scatters and isolated artefacts	Artefact scatter sites can range from high-density concentrations of flaked stone and ground stone artefacts to sparse, low-density 'background' scatters and isolated finds.	Moderate: Stone artefact sites have been previously recorded in the region across a wide range of landforms as AHIMS sites. However, there are no recorded Aboriginal sites within the study area. Moreover, the study area contains few resource zones and landforms conducive to Aboriginal activity sites and subsequent deposition of artefacts.
Shell middens	Deposits of shells accumulated over either singular large resource gathering events or over longer periods of time.	Low: While shell middens have been recorded with two kilometres of the study area, the distance from bodies of permanent or semi-permanent water sources indicates there is a low potential for shell middens to be found within the study area.
Potential archaeological deposits (PADs)	Potential sub surface deposits of cultural material.	Low: PADs have been previously recorded in the region across a wide range of landforms including alluvial flats; however, the landforms within the study area do not indicate areas of PAD
Modified trees	Trees with cultural modifications	Low: Few modified trees have been recorded within 10 kilometres of the study area. None have been recorded within the study area.
Aboriginal ceremony and Dreaming Sites	Such sites are often intangible places and features and are identified through oral histories, ethnohistoric data, or Aboriginal informants.	Low: There are currently no recorded mythological stories for the study area.
Post-contact sites	These are sites relating to the shared history of Aboriginal and non-Aboriginal people of an area and may include places such as missions, massacre sites, post-contact camp sites and buildings associated with post-contact Aboriginal use.	Low: There are no post-contact sites previously recorded in the study area and historical sources do not identify one.
Aboriginal places	Aboriginal places may not contain any 'archaeological' indicators of a site, but are nonetheless important to Aboriginal people. They may be places of cultural, spiritual or historic significance. Often they are places tied to community history and may include natural features (such as swimming and fishing holes), places where Aboriginal political events commenced or particular buildings.	Low: There are currently no recorded Aboriginal historical associations for the study area.

Site type	Site description	Potential
Quarries	Raw stone material procurement sites.	Very Low: There is no record of any quarries being within or surrounding the study area.
Axe grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	Very Low: The geology of the study area lacks suitable horizontal sandstone rock outcrops for axe-grinding grooves. Therefore, there is low potential for axe grinding grooves to occur in the study area.
Burials	Aboriginal burial sites.	Very Low: Aboriginal burial sites are generally situated within deep, soft sediments, caves or hollow trees. Areas of deep sandy deposits will have the potential for Aboriginal burials. The soil profiles associated with the study area are not commonly associated with burials.
Rock shelters with art and / or deposit	Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground characterised by cliff lines and escarpments. These naturally formed features may contain rock art, stone artefacts or midden deposits and may also be associated with grinding grooves.	Very Low: The sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space exist, which are not present in the study area.

4 Archaeological survey

A field survey of the study area was undertaken on 27 January 2020 by Biosis archaeologist Mathew Smith. The field survey sampling strategy, methodology and a discussion of results are provided below.

4.1 Archaeological survey objectives

The objectives of the survey were to:

- Undertake a systematic survey of the study area targeting areas with the potential for Aboriginal heritage.
- Identify and record Aboriginal archaeological sites visible on the ground surface.
- Identify and record areas of PADs.

4.2 Archaeological survey methodology

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

4.2.1 Sampling strategy

The archaeological survey was conducted in line with requirements 5-10 of the Code. Due to low ground surface visibility the survey undertook a systematic survey with transects spaced 100 metres apart. This was done to characterise all landforms within the study area and where possible identify areas of exposure, landform specific disturbances and geomorphological conditions that would impact on the preservation of potential sites.

4.2.2 Survey methods

The archaeological survey was conducted on foot with a field team of one member who walked 100 metre spaced transects across the entire study area. Recording during the survey followed the archaeological survey requirements of the Code and industry best practice methodology. Information that was recorded during the survey included:

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

Where possible, identification of natural soil deposits within the study area was undertaken. Photographs and recording techniques were incorporated into the survey including representative photographs of survey units, landform, vegetation coverage, ground surface visibility (GSV) and the recording of soil information for each survey unit were possible. Any potential Aboriginal objects observed during the survey were documented and photographed. The location of Aboriginal cultural heritage and points marking the

boundary of the landform elements were recorded using a hand-held Global Positioning System (GPS) and the Map Grid of Australia (MGA) (94) coordinate system.

4.3 Archaeological survey results

A total of eight transects were walked across three landforms with the surveyor targeting areas of exposure wherever possible (Figure 7). No Aboriginal sites or areas of PAD were identified in the study area. The results of the field survey have been summarised in Table 9 below.

4.4 Constraints to the survey

With any archaeological survey there are several factors that influence the effectiveness (the likelihood of finding sites) of the survey. The factor that contributed most to the effectiveness of the survey was low GSV across the majority of the study area due to extensive vegetation cover which hampered the ability to identify potential surface artefacts.

4.4.1 Visibility

In most archaeological reports and guidelines visibility refers to ground surface visibility and is usually a percentage estimate of the ground surface that is visible and allowing for the detection of (usually stone) artefacts that may be present on the ground surface (NPWS 1997, Appendix 4). Visibility was broadly consistent throughout the study area, approaching nil to 10% in most areas due to widespread vegetation and humus ground cover. Several informal access tracks were present throughout the study area resulting in high visibility; however, these tracks were typically lacking in intact soils, with clay frequently present on the surface, Areas of higher visibility were also generally associated with exposures from uprooted trees.

Plate 4 Photo showing low ground surface visibility due to ground cover from vegetation and humic material

4.4.2 Exposure

Exposure refers to the geomorphic conditions of the local landform being surveyed and attempts to describe the relationship between those conditions and the likelihood the prevailing conditions provide for the exposure of (buried) archaeological materials. Whilst also usually expressed as a percentage estimate, exposure is different to visibility in that it is in part a summation of geomorphic processes, rather than a simple observation of the ground surface (Burke & Smith 2004, p.79, NPWS 1997, Appendix 4). Overall, the study area displayed minimal exposures as a result of geomorphic conditions, instead, small scale exposures were present where tree uprooting and human disturbances had removed ground cover.

Plate 5 Low exposures due to heavy ground cover

4.4.3 Disturbances

Disturbance in the study area is associated with both natural and human agents. Natural agents generally affect small areas and includes the burrowing and scratching in soil by animals, such as foxes, rabbits and livestock, and sometimes exposure from slumping or scouring. Disturbances associated with recent human action typically cover large sections of the land surface. These human agents may be associated with industrial and residential developments such as the construction of warehouses, housing roads and associated electrical and water services, farming practices including tree clearance for pastoralisation, ploughing for crops, and bulk earthworks for the construction of dams and channels

The most prevalent disturbance in the study area was not associated with human agents, which is typically the case, but rather occurred as a result of tree uprooting. Trees displayed evidence of burning likely associated with the 2019 bushfires and fire containment practices that occurred during them. As a result, there was a high number of fallen trees that had caused uprooting. Human disturbances were also present in the study area in the form of graded informal access tracks that have cut into natural soil profiles, often down to the clay B Horizon, however, these tracks occupied a very minor disturbance footprint.

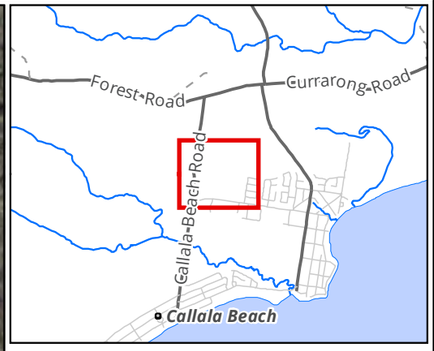
Plate 6 **Photo showing fallen tree trunk and area of disturbance where tree uprooting has occurred (red dotted line)**

Table 9 Survey coverage

Survey unit	Landform	Survey unit area (m²)	Visibility (%)	Exposure (%)	Effective coverage area (m²)	Effective coverage (%)
1	Flats	1360	5	5	3.4	0.25
2	Flats	1370	5	5	3.425	0.25
3	Simple slope	1394	5	5	3.485	0.25
4	Simple slope	1406	5	5	3.515	0.25
5	Simple slope	522	5	5	1.305	0.25
6	Simple slope	414	5	5	1.035	0.25
7	Hillock	311	5	5	0.7775	0.25
8	Hillock	188	5	5	0.47	0.25

Table 10 Landform summary

Landform	Landform area (m²)	Area effectively surveyed (m²)	Landform effectively surveyed (%)	No. of Aboriginal sites	No. of artefacts or features
Flat	114985	6.825	0.005936	0	0
Simple slope	207810	9.34	0.004494	0	0
Hillock	29535	1.2475	0.004224	0	0



Legend

- Study area
- Low archaeological potential
- Survey transect

Figure 7 Survey results

0 50 100 150 Metres

N

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

biosis

Matter: 30326,
Date: 27 May 2020,
Checked by: MS, Drawn by: JPT, Last edited by: jturner
Location: P:\30300s\30326\Mapping\30326_F7_SurveyResults.mxd

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4.5 Discussion of archaeological survey results

Low GSV and exposures were encountered during the survey, limiting the ability of the surveyor to identify any potential surface sites. The areas of highest visibility were found where grass cover was absent such as informal access tracks and in exposures where trees had fallen and caused uprooting of soils. No Aboriginal objects or areas of PAD were identified during the survey.

Three landforms were identified in the study area consisting of flats in the southern quarter of the study area, a very gently inclined simple slope forming the central portion and a small rise in the northern section of the study area representing a hillock landform. No landform features that would typically suggest the presence of Aboriginal sites, such as deep sandy soils, sandstone outcrops or sources of fresh water, were present in the study area and the results of the survey suggest there is a low potential that Aboriginal sites or areas of archaeological potential would be present.

Following the resource zone model developed for the south coast region by Clarke and Kuskie (2006), the study area falls into the 'areas outside primary and secondary resource zones' due to its distance from reliable resources. The 'areas outside primary and secondary resource zones' was likely to have been used for sporadic or very short term duration hunting or gathering (without camping) activities or as movement corridors to more resource rich areas. As a result of this land use there is low potential that Aboriginal object or sites will be present in this area.

It is more likely that sites will be clustered in secondary and primary resources zones. These zones are located in the coastal fore dunes approximately 1.5 kilometres east of the study area or on locally elevated landforms among the swampy low lying wetland areas associated with Callala Creek, approximately 600 metres south of the study area. These two zones would have provided easy access to a large range of high density resources making them the most likely places of occupation.

This interpretation of potential Aboriginal land use is also consistent with the locations of previously recorded sites along the extent of the south coast and in the vicinity of the study area. The majority of sites are located in beach fore dunes to the east and south east or in close proximity to permanent water sources such as wetlands or creeks (Figure 7).

5 Test excavation

Following the results of the field survey a test excavation program was undertaken to attempt to identify if sub-surface archaeological sites would be present in the study area. The sampling strategy, methodology and results of the test excavation program are discussed below

5.1 Test excavation objectives

The objectives of the sub-surface investigation were to determine if Aboriginal archaeological sites were present in the study area, and if so to determine their extent and nature. This methodology was chosen as the study area was deemed to contain low archaeological potential and no areas of potential were identified during the survey, which could be targeted by test excavations.

5.2 Test excavation methodology

Test excavations were conducted in accordance with requirement 16a of the Code.

- Test excavation units were placed on a 100 metre systematic grid in areas across the study area.
- Test excavations units were excavated using hand tools only.
- Test excavations were excavated in 50 by 50 centimetre or 1 by 1 metre units.
- Test excavations units were combined and excavated as necessary to understand the site characteristics; however, the maximum continuous surface area of a combination of test excavation units at any single excavation point conducted must be no greater than 3 metres square, with the maximum surface area of all test excavation units must be no greater than 0.5 per cent of the PAD or site being investigated.
- The first excavation unit was excavated and documented in 5 cm spits at each area, either PAD or site being investigated. Based on the evidence of the first excavation unit, 10 centimetre spits or sediment profile/stratigraphic excavation (whichever is smaller) may then be implemented.
- All material excavated from the test excavation units was sieved using a 5 millimetre aperture wire-mesh sieve.
- Test excavation units were excavated to at least the base of the identified Aboriginal object-bearing units, and must continue to confirm the soils below are culturally sterile.
- Photographic and scale-drawn records of the stratigraphy/soil profile, features and informative Aboriginal objects were made for each single excavation point.
- Test excavations units were backfilled as soon as practicable.
- For each test pit thatwas excavated, the following documentation was taken:
  - Unique test pit identification number.
  - GPS coordinate of each test pit.
  - Munsell soil colour and texture.
  - Amount and location of cultural material within the deposit.
  - Nature of disturbance where present.

  - Stratigraphy.
  - Archaeological features (if present).
  - Photographic records.
  - Spit records.
- Test excavation units were backfilled as soon as practicable.
- In the event that suspected human remains are identified works would immediately cease and the NSW Police and Heritage NSW will be notified.

Test excavations cease when enough information* had been recovered to adequately characterise the study area with regard to the nature and significance of potential Aboriginal sites. **Enough information is defined by Heritage NSW as meaning "the sample of excavated material clearly and self-evidently demonstrates the deposit's nature and significance. This may include things like locally or regionally high object density: presence of rare or representative objects: presence of archaeological features: or locally or regionally significant deposits stratified or not."*(DECCW 2010b, pp. 28).

5.3 Test excavation results

A total of 29 test pits were excavated across 8 transects within the study area using a systematic grid system with 100 metre intervals between test pits (Figure 8). Three of these test pits were excavated across the hillock landform, 17 across the simple slopes and nine across the flat landform. The soil profiles across all three landforms were highly congruent, with very little variation observed. No artefacts were identified across the study area.

This assessment has taken a 'study area approach' to the presentation of test excavation data rather than analysing results by landform or transect. This was done as the soil profiles identified throughout the entire study area were relatively homogenous, with only some minor differences in soils occurring where localised factors such as tree uproot had impacted soils. Individual test pit data is provided in Appendix 2 and landform testing results presented in Table 11.

Table 11 Test excavation results by landform

Landform	Area (m^2)	Area tested (m^2)	Area effectively tested (%)	No. of sites	No. of artefacts
Flat	114985	4	0.003478715	0	0
Simple slope	207810	2	0.000962418	0	0
Hillock	29535	0.75	0.00253936	0	0

Soils across the study area displayed minimal variation and consisted of a brown (10YR 4/3) loam A1 horizon with very high humic material including leaf litter, grass, and roots throughout. This context typically extended to a depth ranging from 30 to 110 millimetres depending on the thickness of the humic matter. This context was loosely consolidated and had a pH of 5.5. The loamy A1 horizon sat on top of a brown (10YR 5/3) to yellowish brown (10YR 5/4) silty A2 horizon. This deposit was moderately compacted and extended to depths of between 160 and 340 millimetres. This context had a pH of 5.5 and typically contained charcoal fragments and ironstone nodules. Several pits also contained peds of clay mixed into the A2 horizon, likely brought up from the B horizon as a result of disturbance from tree falls. Beneath context 2 was a highly compacted

yellowish brown (10YR 5/6) clay B horizon that was present across the entire extent of the study area (Plate 7, Plate 8 and Plate 9).

Plate 7 Soil profile along Transect 1 (flat landform)

Plate 8 Soil profile in Transect 4 (slope landform)

Plate 9 Soil proflle present in Transect 8 (hillock landform)

During the archaeological test excavations, Gerald (Jerrinja LALC representative) identified a surface rock which he noted had potential to be an artefact due to a slightly flat, concave surface and the fact that it was unusual for such rocks to be present at the location (Plate 10, Plate 11, and Plate 12). This rock was investigated by Mathew Smith to determine if it was an Aboriginal object.

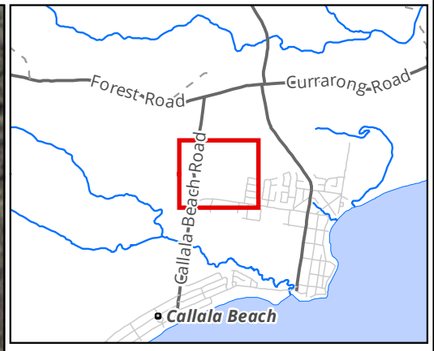
The rock was found pressed into one of the graded informal access tracks and measured 188 millimetres in length, 70 millimetres in width and 55 millimetres in thickness. It appeared to be a grey siltstone which forms the underlying geology of the region and is not a rock type typically used for grinding. The rock also contained some evidence of recent damage which appeared consistent with vehicle impacts. The smooth slightly concave surface on the rock appeared to be the result of natural processes such as weathering as it did not display the visible flattening of mineral grains that is typically found on grinding surfaces. The distance from sources of water or likely areas of occupation also suggest it is unlikely the rock was utilised by Aboriginal people. It is unlikely that this is an artefact given its appearance, the distance at which it was found from sources of water or likely areas of occupation, and the raw material type.

No Aboriginal sites were identified across any of the landforms present in the study area.

Plate 10 **Photo showing original orientation of rock as found on access track, note damage from vehicle impacts**

Plate 11 **Photo looking onto flat surface of rock, note damage for vehicle impacts on edges**

Plate 12 Photo looking down slightly concave surface of rock (red arrow)



Legend

- Study area
- Low archaeological potential
- Test pit - no artefacts

Figure 8 Test excavation results

0 50 100 150 N

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

biosis

Matter: 30326,
Date: 27 May 2020,
Checked by: MS, Drawn by: JPT, Last edited by: jturner
Location: P:\30300s\30326\Mapping\30326_F8_TestExcavation.mxd

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5.4 Discussion

An initial survey of the study area was undertaken by RPS as part of an unpublished constraints assessment to shoalhaven Council. RPS indicated the study area contained low archaeological potential as a result of unfavourable landform conditions. Background research and a survey undertaken by Biosis also assessed the study area with low potential to contain Aboriginal sites or areas of archaeological potential. This assessment was also made based on the nature of landforms within the study area and distance to useful resources. This survey and background research suggested the study area fit into Clarke and Kuskie's (2006) modelling as an 'area outside of primary and secondary resource zones'. These zones do not contain an abundance of resources and are unlikely to contain evidence of Aboriginal occupation due to the sparse and sporadic uses of such zones. AS a result the study area was assessed with low archaeological potential to contain archaeological sites.

Biosis then undertook test excavations in the study area to determine the accuracy of the hypothesis presented by RPS and Biosis that the study area contained low potential. A total of 29 test pits were placed across all three landforms in the study area in 100 metre transects.

The results of these test excavations identified uniform soils across all landforms within the study area. These soils consisted of a humic loam topsoil. Underlying this loam was a silt context containing ironstone nodules and charcoal flecks. The silt in turn sat on top of a heavy clay context. These soils were typically shallow, with an average thickness of less than 250 millimetres of soil overlying the clay context.

The soils identified across the study area were consistent with solodic soil profiles in heavily vegetated areas, containing a thick humic topsoil and the formation of ironstone nodules throughout the A2 horizon. These solodic soils are common throughout the Greenwell Point soil landscape and are frequently found across hill slope landforms. No soils associated with the Seven Mile soil landscape where identified within the study area, likely due to the study area's distance from the coastal and estuarine areas to the south and east.

The test excavations did not identify any sub-surface deposits and it is highly unlikely that they will be encountered within the study area. The study area is not located in close proximity to any reliable resources, unlike the coastal foredune landforms located to the east and swamp/wetland landforms south of the study area. Following Clarke and Kuskie's (2006) modelling, the study area is a located outside of primary and secondary resource zones suggesting it was not likely to have been used as an area of occupation. It likely that Aboriginal people travelled through the area in order to reach primary and secondary resources zones located along the coast; however, no archaeological evidence has been identified within the study area to support this statement.

6 Scientific values and significance assessment

The two main values addressed when assessing the significance of Aboriginal sites are cultural values to the Aboriginal community and archaeological (scientific) values. This report will assess scientific values while the ACHA report will detail the cultural values of Aboriginal sites in the study area.

6.1 Introduction to the assessment process

Heritage assessment criteria in NSW fall broadly within the significance values outlined in the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter (Australia ICOMOS 2013). This approach to heritage has been adopted by cultural heritage managers and government agencies as the set of guidelines for best practice heritage management in Australia. These values are provided as background and include:

- **Historical significance** (evolution and association) refers to historic values and encompasses the history of aesthetics, science and society, and therefore to a large extent underlies all of the terms set out in this section. A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the settings are substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of subsequent treatment.
- **Aesthetic significance** (Scenic/architectural qualities, creative accomplishment) refers to the sensory, scenic, architectural and creative aspects of the place. It is often closely linked with social values and may include consideration of form, scale, colour, texture, and material of the fabric or landscape, and the smell and sounds associated with the place and its use.
- **Social significance** (contemporary community esteem) refers to the spiritual, traditional, historical or contemporary associations and attachment that the place or area has for the present-day community. Places of social significance have associations with contemporary community identity. These places can have associations with tragic or warmly remembered experiences, periods or events. Communities can experience a sense of loss should a place of social significance be damaged or destroyed. These aspects of heritage significance can only be determined through consultative processes with local communities.
- **Scientific significance** (Archaeological, industrial, educational, research potential and scientific significance values) refers to the importance of a landscape, area, place or object because of its archaeological and/or other technical aspects. Assessment of scientific value is often based on the likely research potential of the area, place or object and will consider the importance of the data involved, its rarity, quality or representativeness, and the degree to which it may contribute further substantial information.

The cultural and archaeological significance of Aboriginal and historic sites and places is assessed on the basis of the significance values outlined above. As well as the ICOMOS Burra Charter significance values guidelines, various government agencies have developed formal criteria and guidelines that have application when assessing the significance of heritage places within NSW. Of primary interest are guidelines prepared by the Commonwealth Department of the Environment and Energy, Heritage NSW, and NSW Department of Planning, Industry and Environment. The relevant sections of these guidelines are presented below.

These guidelines state that an area may contain evidence and associations which demonstrate one or any combination of the ICOMOS Burra Charter significance values outlined above in reference to Aboriginal heritage. Reference to each of the values should be made when evaluating archaeological and cultural significance for Aboriginal sites and places.

In addition to the previously outlined heritage values, the Heritage NSW Guidelines (OEH 2011) also specify the importance of considering cultural landscapes when determining and assessing Aboriginal heritage values. The principle behind a cultural landscape is that 'the significance of individual features is derived from their inter-relatedness within the cultural landscape'. This means that sites or places cannot be 'assessed in isolation' but must be considered as parts of the wider cultural landscape. Hence the site or place will possibly have values derived from its association with other sites and places. By investigating the associations between sites, places, and (for example) natural resources in the cultural landscape the stories behind the features can be told. The context of the cultural landscape can unlock 'better understanding of the cultural meaning and importance' of sites and places.

Although other values may be considered – such as educational or tourism values – the two principal values that are likely to be addressed in a consideration of Aboriginal sites and places are the cultural/social significance to Aboriginal people and their archaeological or scientific significance to archaeologists. The determinations of archaeological and cultural significance for sites and places should then be expressed as statements of significance that preface a concise discussion of the contributing factors to Aboriginal cultural heritage significance.

6.2 Archaeological (scientific significance) values

Archaeological significance (also called scientific significance, as per the ICOMOS Burra Charter) refers to the value of archaeological objects or sites as they relate to research questions that are of importance to the archaeological community, including indigenous communities, heritage managers and academic archaeologists. Generally the value of this type of significance is determined on the basis of the potential for sites and objects to provide information regarding the past life-ways of people (Burke & Smith 2004, pp. 249, NPWS 1997), For this reason, the NPWS summarises the situation as 'while various criteria for archaeological significance assessment have been advanced over the years, most of them fall under the heading of archaeological research potential' (NPWS 1997, pp. 26). The NPWS criteria for archaeological significance assessment are based largely on the ICOMOS Burra Charter.

Research potential

Research potential is assessed by examining site content and site condition. Site content refers to all cultural materials and organic remains associated with human activity at a site. Site content also refers to the site structure – the size of the site, the patterning of cultural materials within the site, the presence of any stratified deposits and the rarity of particular artefact types. As the site contents criterion is not applicable to scarred trees, the assessment of scarred trees is outlined separately below. Site condition refers to the degree of disturbance to the contents of a site at the time it was recorded. Table 12 and Table 13 outline the site content and site condition ratings used.

Table 12 Site contents ratings used for archaeological sites

Rating	Description
0	No cultural material remaining.
1	Site contains a small number (e.g. 0–10 artefacts) or limited range of cultural materials with no evident stratification.

Rating	Description
2	Site contains a larger number, but limited range of cultural materials; and/or some intact stratified deposit remains; and/or are or unusual example(s) of a particular artefact type.
3	Site contains a large number and diverse range of cultural materials; and/or largely intact stratified deposit; and/or surface spatial patterning of cultural materials that still reflect the way in which the cultural materials were deposited.

Table 13 Site condition ratings used for archaeological sites

Rating	Description
0	Site destroyed.
1	Site in a deteriorated condition with a high degree of disturbance; lack of stratified deposits; some cultural materials remaining.
2	Site in a fair to good condition, but with some disturbance.
3	Site in an excellent condition with little or no disturbance. For surface artefact scatters this may mean that the spatial patterning of cultural materials still reflects the way in which the cultural materials were laid down.

Pearson and Sullivan (1995, pp. 149) note that Aboriginal archaeological sites are generally of high research potential because 'they are the major source of information about Aboriginal prehistory'. Indeed, the often great time depth of Aboriginal archaeological sites gives them research value from a global perspective, as they are an important record of humanity's history. Research potential can also refer to specific local circumstances in space and time – a site may have particular characteristics (well preserved samples for absolute dating, or a series of refitting artefacts, for example) that mean it can provide information about certain aspects of Aboriginal life in the past that other less or alternatively valuable sites may not (Burke & Smith 2004, pp. 247–8). When determining research potential value particular emphasis has been placed on the potential for absolute dating of sites.

The following sections provide statements of significance for the Aboriginal archaeological sites recorded during the sub-surface testing for the assessment. The significance of each site follows the assessment process outlined above. This includes a statement of significance based on the categories defined in the Burra Charter. These categories include social, historic, scientific, aesthetic and cultural (in this case archaeological) landscape values. Nomination of the level of value—high, moderate, low or not applicable—for each relevant category is also proposed. Where suitable the determination of cultural (archaeological) landscape value is applied to both individual sites and places (to explore their associations) and also, to the study area as a whole. The nomination levels for the archaeological significance of each site are summarised below.

Representativeness

Representativeness refers to the regional distribution of a particular site type. Representativeness is assessed by whether the site is common, occasional, or rare in a given region. Assessments of representativeness are subjectively biased by current knowledge of the distribution and number of archaeological sites in a region. This varies from place to place depending on the extent of archaeological research. Consequently, a site that is assigned low significance values for contents and condition, but a high significance value for representativeness, can only be regarded as significant in terms of knowledge of the regional archaeology. Any such site should be subject to re-assessment as more archaeological research is undertaken.

Assessment of representativeness also takes into account the contents and condition of a site. For example, in any region there may only be a limited number of sites of any type that have suffered minimal disturbance.

Such sites would therefore be given a high significance rating for representativeness, although they may occur commonly within the region. Table 14 outlines the site representativeness ratings used.

Table 14 Site representativeness ratings used for archaeological sites

Rating	Description
1	Common occurrence.
2	Occasional occurrence.
3	Rare occurrence.

Overall scientific significance ratings for sites, based on a cumulative score for site contents, site integrity and representativeness are provided in Table 15.

Table 15 Scientific significance ratings used for archaeological sites

Rating	Description
1-3	Low scientific significance.
4-6	Moderate scientific significance.
7-9	High scientific significance.

Each site is given a score on the basis of these criteria – the overall scientific significance is determined by the cumulative score. This scoring procedure will be applied to any Aboriginal archaeological sites identified during the sub-surface testing.

No Aboriginal sites or objects were identified during the archaeological survey undertaken as part of this assessment, therefore the scientific significance of the study area is assessed as low.

6.2.1 Statements of archaeological significance

The results of the survey and test excavations undertaken in the study area support the hypothesis that the study area contains low archaeological significance. No archaeological sites or areas of archaeological potential were identified in the study area and the scientific significance is considered to be nil.

7 Impact assessment

7.1 Predicted physical impacts

As previously outlined, the project proposes to rezone the study area from RU2 to R2, R3, RE1 and RE2. This rezoning will have no impacts on Aboriginal heritage.

7.2 Management and mitigation measures

Ideally, heritage management involves conservation of sites through the preservation and conservation of fabric and context within a framework of 'doing as much as necessary, as little as possible' (Marquis-Kyle & Walker 1994, pp. 13). In cases where conservation is not practical, several options for management are available. For sites, management often involves the salvage of features or artefacts, retrieval of information through excavation or collection (especially where impact cannot be avoided) and interpretation.

Avoidance of impact to archaeological and cultural heritage sites through design of development is the primary mitigation and management strategy, and should be implemented where practicable. The proposed works include rezoning of land, which will not have an impact on any potential archaeological and cultural heritage sites in the study area.

Biosis has undertaken background research, a survey of the study area and test excavations as part of the ACHA to identify and characterise any potential Aboriginal heritage constraints within the study area. No Aboriginal sites or areas of potential archaeological deposit were identified within the study area during the survey and test excavations failed to identify any sub-surface sites. As a result, the study area has been assessed with low archaeological potential to contain Aboriginal sites. No further archaeological investigation is recommended in the study area and it is recommended that the unexpected finds protocols set out in recommendations 2 and 3 are followed in order to mitigate potential impacts to unexpected Aboriginal sites if present.

8 Recommendations

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

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

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

Recommendation 1: No further archaeological assessment is recommended

No further archaeological investigation or works are required to be undertaken for the study area. In the event that unexpected finds, including human remains, are unearthed during any phase of the project please refer to Recommendation 2 to Recommendation 4 below.

Recommendation 2: Discovery of unanticipated Aboriginal objects

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

Recommendation 3: Discovery of Aboriginal ancestral remains

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

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

Recommendation 4: Continued consultation with the registered Aboriginal stakeholders

In accordance with the consultation requirements it is recommended that the Applicant provides a copy of the final report to the RAPs. The Applicant should continue to inform these groups about the management of Aboriginal cultural heritage sites within the study area throughout the life of the Project.

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Appendices

Appendix 1 AHIMS results

THE FOLLOWING APPENDIX IS NOT TO BE MADE PUBLIC.

Appendix 2 Test excavation results

Transect number	Test pit number	Context Number	Context depth (mm)	Munsell colour code	Compaction	Texture	Disturbance	Notes	Inclusions	PH
Transect 1										
1	**1**	1	0-90	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	90-320	10yr 5/3 brown	Moderate	Silt			roots	5.5
		3	320-400	10yr 5/6	Hard	Clay				5.5
	2	1	0-80	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	80-280	10yr 5/3 brown	Moderate	Silt			roots	5.5
		3	280-340	10yr 5/6	Hard	Clay				5.5
	3	1	0-50	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	50-260	10yr 5/3 brown	Moderate	Silt			roots, charcoal	5.5
		3	260-350	10yr 5/6	Hard	Clay				5.5
	4	1	0-80	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	80-270	10yr 5/3 brown	Moderate	Silt			roots, charcoal	5.5

Transect number	Test pit number	Context Number	Context depth (mm)	Munsell colour code	Compaction	Texture	Disturbance	Notes	Inclusions	PH
		3	270-300	10yr 5/6	Hard	Clay			roots	5.5
	5	1	0-70	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	70-260	10yr 5/3 brown	Moderate	Silt			roots, charcoal	5.5
		3	260-300	10yr 5/6	Hard	Clay			roots	5.5
	6	1	0-40	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	0-90	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		3	40-140	10yr 5/3 brown	Moderate	Silt			roots, charcoal	5.5
		3	140-260	10yr 5/6 light yellowish brown	Hard	Clay			roots	5.5
	7	1	0-90	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	90-280-	10yr 5/3 brown	Moderate	Silt			roots, charcoal	5.5
		3	26-3000	10yr 6/4 light yellowish brown	Hard	Clay			roots	5.5
Transect 2										

Transect number	Test pit number	Context Number	Context depth (mm)	Munsell colour code	Compaction	Texture	Disturbance	Notes	Inclusions	PH
2	1	1	0-120	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	120-300	10yr 5/3 brown	Moderate	Silt			roots	5.5
		3	300-340	10yr 5/6 light yellowish brown	Hard	Clay				5.5
	2	Did not excavate due to heavy vegetation ground cover								
	3	Did not excavate due to heavy vegetation ground cover								
	4	Did not excavate due to heavy vegetation ground cover								
	5	Did not excavate due to heavy vegetation ground cover								
	6	Did not excavate due to heavy vegetation ground cover								
	7	1	0-80	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	60-240	10yr 5/3 brown	Moderate	Silt			roots, charcoal 5%	5.5
		3	240-260	10yr 5/3 brown	Moderate	Silt			roots, charcoal	5.5
		4	260-300	10yr 6/4 light yellowish brown	Hard	Clay			roots	5.5
Transect 3										

Transect number	Test pit number	Context Number	Context depth (mm)	Munsell colour code	Compaction	Texture	Disturbance	Notes	Inclusions	PH
3	1	1	0-40	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	40-250	10yr 5/3 brown	Moderate	Silt			roots	5.5
		3	250-290	10yr 5/6	Hard	Clay				5.5
		Did not excavate due to heavy vegetation ground cover								
		Did not excavate due to heavy vegetation ground cover								
	4	1	0-60	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	60-240	10yr 5/3 brown	Moderate	Silt			roots, charcoal 5%	5.5
		3	240-250	10yr 5/6 light yellowish brown	Hard	Clay				5.5
	5	1	0-60	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	60-250	10yr 5/3 brown	Moderate	Silt			roots, charcoal 5%	5.5
		3	60-240	10yr 5/3 brown	Moderate	Silt			roots, charcoal 5%	5.5
		4	240-250	10yr 5/6 light yellowish brown	Hard	Clay				5.5

Transect number	Test pit number	Context Number	Context depth (mm)	Munsell colour code	Compaction	Texture	Disturbance	Notes	Inclusions	PH
		5	250-290	10yr 5/6 light yellowish brown	Hard	Clay				5.5
	6	1	0-70	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	70-210	10yr 5/3 brown	Moderate	Silt			roots, charcoal 5%	5.5
		3	210-310	10yr 5/6 light yellowish brown	Hard	Clay				5.5
	7	1	0-60	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	60-240	10yr 5/3 brown	Moderate	Silt			roots, charcoal 5%	5.5
		3	240-300	10yr 5/6 light yellowish brown	Hard	Clay				5.5
Transect 4										
4	**1**	1	0-80	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	80-260	10yr 5/4 yellowish brown	Moderate	Silt			roots	5.5

Transect number	Test pit number	Context Number	Context depth (mm)	Munsell colour code	Compaction	Texture	Disturbance	Notes	Inclusions	PH
		3	260-300	10yr 5/6 light yellowish brown	Hard	Clay				5.5
	2	1	0-60	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	60-160	10yr 5/4 yellowish brown	Moderate	Silt			roots, charcoal	5.5
		3	160-180	10yr 5/6 light yellowish brown	Hard	Clay				5.5
	3	1	0-40	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	40-210	10yr 5/3 brown	Moderate	Silt			roots, charcoal	5.5
		3	210-260	10yr 5/6 light yellowish brown	Hard	Clay				5.5
	4	1	0-80	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	80-160	10yr 5/3 brown	Moderate	Silt			roots, charcoal	
		3	160-210	10yr 5/6 light yellowish brown	Hard	Clay				5.5

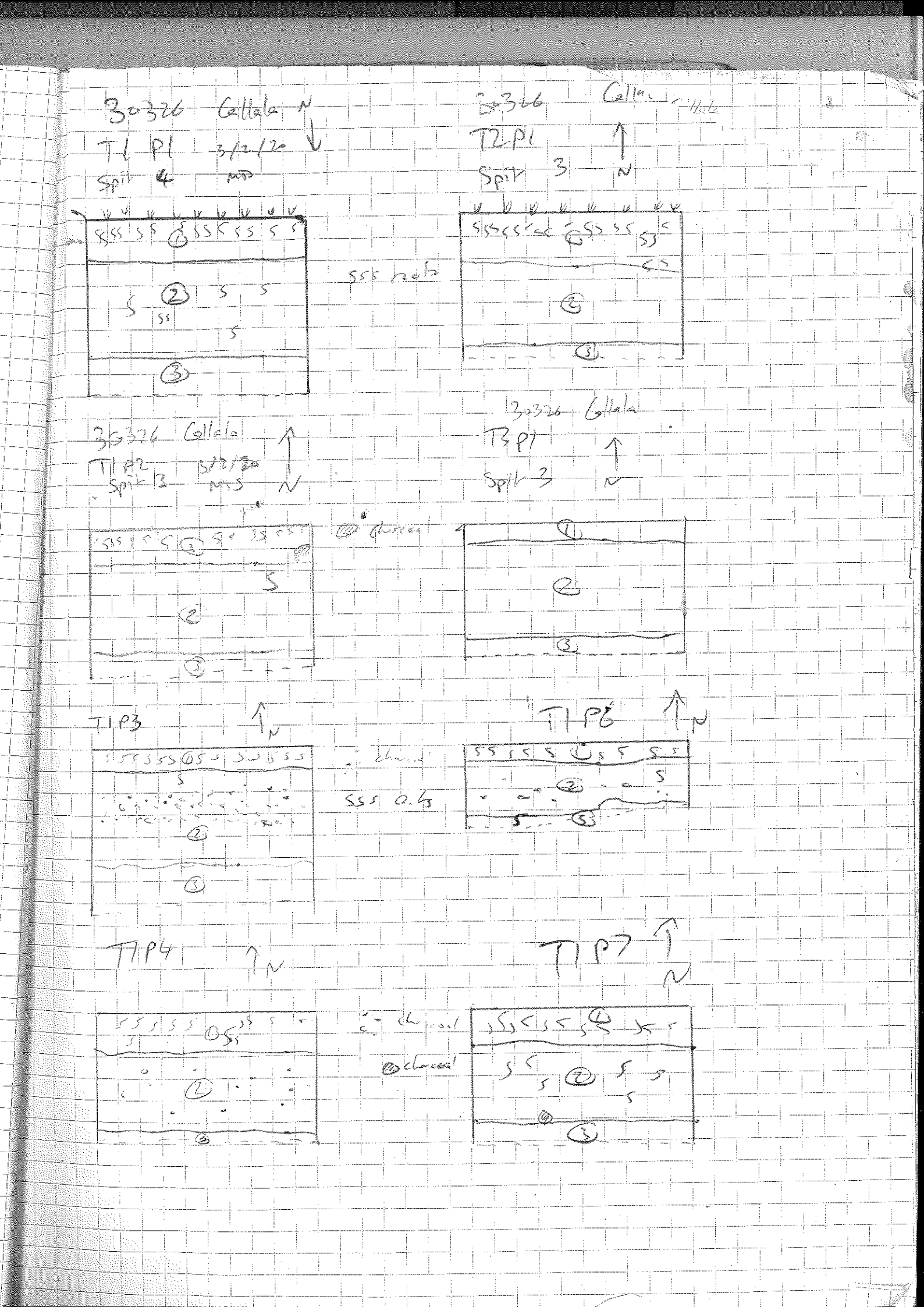
Transect number	Test pit number	Context Number	Context depth (mm)	Munsell colour code	Compaction	Texture	Disturbance	Notes	Inclusions	PH
	5	1	0-60	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	60-200	10yr 5/3 brown	Moderate	Silt			roots, charcoal 5%	5.5
		3	200-250	10yr 5/6 light yellowish brown	Hard	Clay				5.5
	6	1	0-60	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	60-180	10yr 5/3 brown	Moderate	Silt			roots, charcoal 5%	5.5
		3	180-320	10yr 5/6 light yellowish brown	Hard	Clay				5.5
	7	1	0-100	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5
		2	100-250	10yr 5/3 brown	Moderate	Silt			roots, charcoal 5%	5.5
		3	260-300	10yr 5/6 light yellowish brown	Hard	Clay				5.5
Transect 5										
5	**1**	1	0-90	10yr 4/3 brown	Soft	Loam			roots, lots of humus	5.5

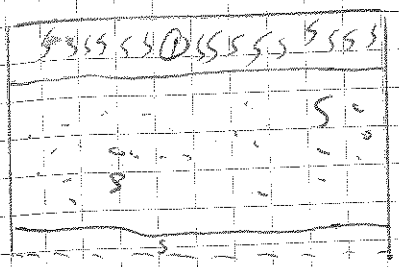
Transect number	Test pit number	Context Number	Context depth (mm)	Munsell colour code	Compaction	Texture	Disturbance	Notes	Inclusions	PH
		2	90-260	10yr 5/4 yellowish brown	Moderate	Silt			roots	5.5
		3	260-300	10yr 5/6 light yellowish brown	Hard	Clay				5.5
	2	1	0-30	10yr 5/2 greyish brown	Soft	Loam			roots, lots of humus	5.5
		2	30-190	10yr 7/2 light grey	Moderate	Silt			roots, charcoal 30% spread throughout	5.5
		3	190-270	10yr 5/6 light yellowish brown	Hard	Clay				5.5
	3	1	0-50	10yr 5/2 greyish brown	Soft	Loam			roots, lots of humus	5.5
		2	50-250	10yr 7/2 light gray	Moderate	Silt			roots, charcoal 5%	
		3	250-300	10yr 5/6 light yellowish brown	Hard	Clay				
Transect 6										
6	**1**	1	0-110	10yr 4/3 brown	Soft	Loam	yes	clay pieces mixed in to loam likely	roots, lots of humus, clay	5.5

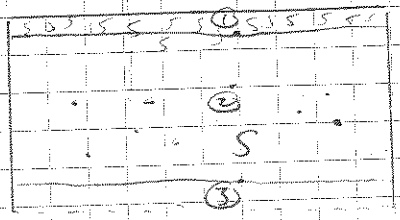
Transect number	Test pit number	Context Number	Context depth (mm)	Munsell colour code	Compaction	Texture	Disturbance	Notes	Inclusions	PH
								from tree burning.		
		2	110-240	10yr 5/4 yellowish brown	Moderate	Silt			roots, charcoal 30% spread throughout	5.5
		3	240-250	10yr 5/6 light yellowish brown	Hard	Clay				5.5
	2	1	0-50	10yr 4/3 brown	Soft	Loam	yes		roots, lots of humus,	5.5
		2	50-220	10yr 5/4 yellowish brown	Moderate	Silt			roots, charcoal 30% spread throughout	5.5
		3	220-290	10yr 5/6 light yellowish brown	Hard	Clay				5.5
Transect 7										
7	**1**	1	0-80	10yr 4/3 brown	Soft	Loam	yes		roots, lots of humus	5.5
		2	80-240	10yr 5/4 yellowish brown	Moderate	Silt			roots, charcoal 30% spread throughout	5.5
		3	240-260	10yr 5/6 light yellowish brown	Hard	Clay				5.5

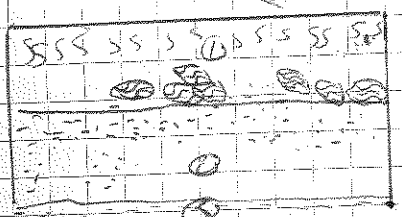
Transect number	Test pit number	Context Number	Context depth (mm)	Munsell colour code	Compaction	Texture	Disturbance	Notes	Inclusions	PH
	2	1	0-90	10yr 4/3 brown	Soft	Loam	yes		roots, lots of humus, charcoal 40%	5.5
		2	90-280	10yr 5/4 yellowish brown	Moderate	Silt			roots, charcoal 5% spread throughout	
		3	280-350	10yr 5/6 light yellowish brown	Hard	Clay				5.5
Transect 8										
8	**1**	1	0-30	10yr 4/3 brown	Soft	Loam	yes		roots, lots of humus	5.5
		2	30-220	10yr 5/4 yellowish brown	Moderate	Silt			roots, charcoal 10% spread throughout	5.5
		3	220-260	10yr 5/6 light yellowish brown	Hard	Clay				5.5

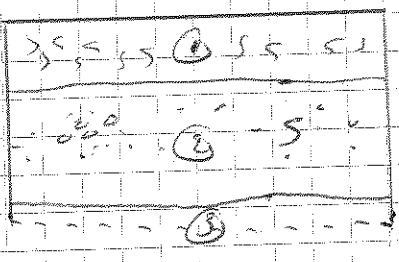
Appendix 3 Test pit section drawings

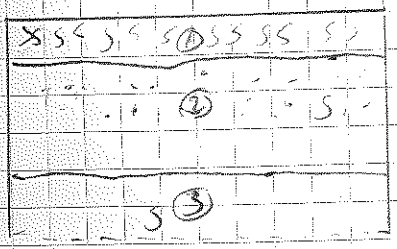


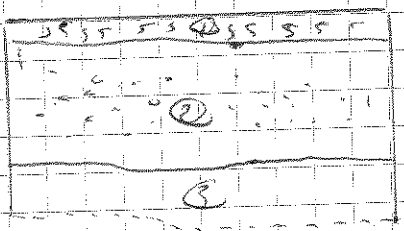


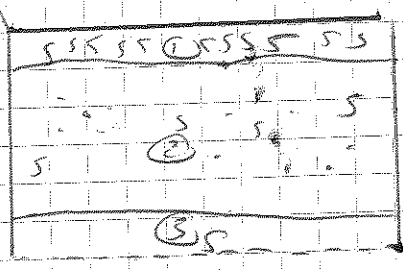


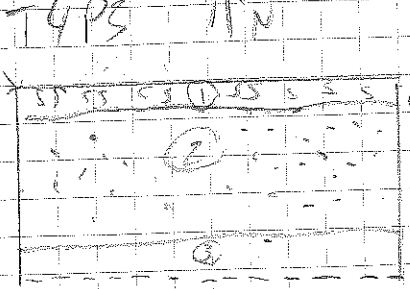












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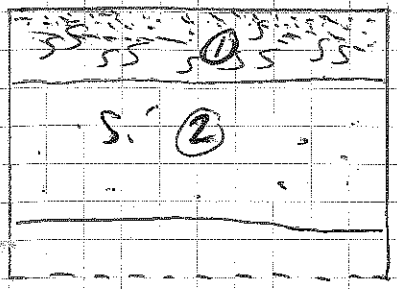

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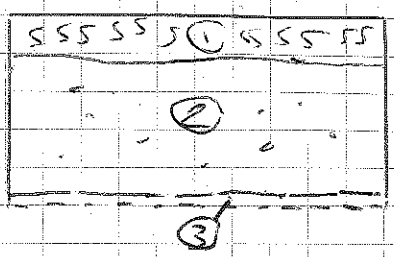

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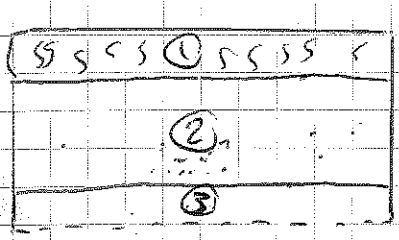

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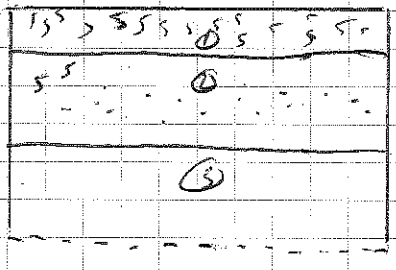

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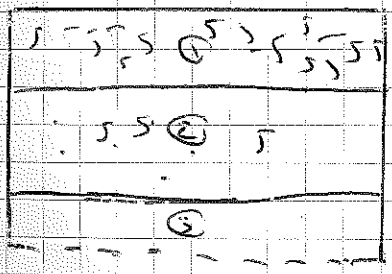

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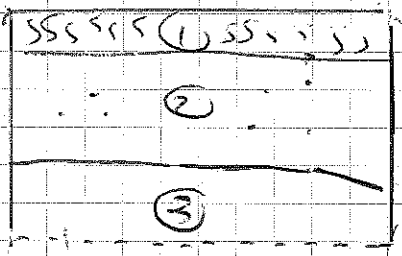

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