

Cleary Bros (Bombo) Pty Ltd

ABN: 28 000 157 808



CLEARY BROS

Albion Park Quarry Extraction Area Stage 7 Extension

Archaeological Report

Prepared by

Biosis Pty Ltd



August 2021

**Specialist Consultant Studies Compendium
Part 5**

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Albion Park Quarry Extraction Area Stage 7 Extension

Archaeological Report

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Glossary

ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
AR	Archaeological Report
CBD	Central Business District
Consultation requirements	<i>Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010</i> (DECCW 2010a)
DA	Development Application
DECCW	Department of Environment, Climate Change and Water
DP	Deposited Plan
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
GPS	Global Positioning System
GSV	Ground Surface Visibility
Heritage NSW	Heritage NSW, Department of Premier and Cabinet (DPC)
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	<i>National Parks and Wildlife Act 1974</i>
NPWS	National Parks and Wildlife Service
NSW	New South Wales
PAD	Potential Archaeological Deposit
SEPP	State Environmental Planning Policy
Study area	Defined as parts of Lot 1 DP 858245 and Lot 7 DP 3709
the Code	<i>Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW</i> (DECCW 2010)

Summary

Biosis Pty Ltd was commissioned by Cleary Bros (Bombo) Pty Ltd to undertake an Aboriginal Cultural Heritage Assessment (ACHA) of a proposed extension of the current extraction area at the Albion Park Quarry, 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 2010a) (the Code), this report 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 on private land in the locality of Croom, approximately 20 kilometres south of the Wollongong Central Business District (CBD). The study area incorporates parts of Lot 1 DP 858245 and Lot 7 DP 3709, and is bounded by Stage 5 and Stage 6 of the current extraction area to the west, and by farmland to the north, east and south.

There are 92 Aboriginal cultural heritage sites registered with the Aboriginal Heritage Information Management System (AHIMS) register within the vicinity of the study area. There are no recorded Aboriginal sites located within the study area.

The Aboriginal community was consulted regarding the heritage management of the Project throughout the scoping and assessment process. Consultation has been undertaken as per the process outlined in the Department of Environment Climate Change and Water document (DECCW) document, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010b) (consultation requirements).

The survey was conducted on 13 August 2020 by Biosis Consultant Archaeologist Samantha Keats and Tracey Henry from the Illawarra 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 vegetation cover restricting ground surface visibility (GSV) combined with a low amount of exposures.

No previously unrecorded Aboriginal cultural heritage sites or areas of (archaeological) sensitivity were identified during the field investigation.

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 required

No further archaeological work is required in the study area due to the entire study area being assessed as having low archaeological potential.

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 knowingly disturb an Aboriginal site without a consent permit issued by the Heritage NSW, Department of Premier and Cabinet (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 the 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 stakeholders

As per the consultation requirements, it is recommended that the proponent provides a copy of this final report to the Aboriginal stakeholders and considers all comments received. The proponent should continue to inform these groups about the management of Aboriginal cultural heritage sites within the study area throughout the life of the Project.

1 Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by Cleary Bros (Bombo) Pty Ltd to undertake an Aboriginal Cultural Heritage Assessment (ACHA) of the proposed extension of the current extraction area at the Albion Park Quarry, NSW (the study area). This Archaeological Report (AR) documents the findings of the archaeological investigations conducted as part of the ACHA and provides evidence about the material traces of Aboriginal land use to support the conclusions and management recommendations in the ACHA. The Project is classified as a State Significant Development (SSD) under Part 4, Division 4.7 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This investigation has been carried out under Part 6 of the *National Parks and Wildlife Act 1974* (NPW Act) in accordance with *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a) (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.

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 on private land in the locality of Croom, approximately 20 kilometres south-southwest of the Wollongong CBD (**Figure 1**). It encompasses 20 hectares of private land.

The study area is within the:

- Shellharbour LGA.
- Parish of Terragong.
- County of Camden.

The study area incorporates parts of Lot 1 DP 858245 and Lot 7 DP 3709, and is bounded by Stage 5 and Stage 6 of the current extraction area to the west, and by farmland to the north, east and south (**Figure 2**).

1.3 Planning approvals

The proposed development will be assessed against Part 4, Division 4.7 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).
- NSW NPW Act.

- NSW *National Parks and Wildlife Amendment Act 2010*.
- Shellharbour Local Environmental Plan 2013 (LEP).
- Shellharbour Development Control Plan.

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 Illawarra Local Aboriginal Land Council (LALC) as described in the ACHA.
- 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
Amanda Markham BA Hons (Anthropology/Sociology), PhD (Anthropology), Grad. Cert (Archaeology)	Amanda Markham has over 20 years' experience in Anthropology and Archaeology throughout Australia, including extensively in remote outback Australia. Her project experience includes working for Aboriginal representative bodies, mining and exploration companies, Commonwealth, state and territory government agencies, community groups and	• Quality assurance

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	Indigenous stakeholder groups. Over her career Amanda has developed a deep understanding of Aboriginal people and culture and has extensive experience providing advice on Aboriginal cultural heritage management. Amanda's particular areas of expertise include cultural heritage management field work in remote areas with Aboriginal Traditional Owners, conducting heritage assessments under state and territory legislation, skeletal remains assessment and conducting archaeological and anthropological surveys and assessments. Amanda has proven staff and project management skills and ability to simultaneously oversee multiple large complex projects to deliver client outcomes within tight time frames and budget constraints. Amanda's excellent communication and negotiation skills have seen her easily managing and building relationships between Aboriginal people and senior government and corporate figures.	
Samantha Keats BA (Hons)	Samantha has over five years' experience as an archaeologist, with a particular research focus on rock art assemblages and ochre in the north-west Kimberley region of Australia. Samantha has experience in conducting desktop assessments, archaeological survey and Aboriginal and historical excavation as well as consulting with Traditional Owners. She has participated in a number of European historical excavations and monitoring programs in NSW and has authored several Statement of Heritage Impact reports and Heritage Assessments. Samantha has also authored multiple Aboriginal cultural heritage assessment report and participated in multiple Aboriginal archaeological excavations and survey.	• Project manager • Field investigation • Report author
Madeleine Lucas BA (Hons) Archaeology BSC	Madeleine joined Biosis at the Newcastle Office as a Research Assistant – Heritage in 2019. She completed her Honours in Archaeology in 2018, having written a thesis on the analysis of faunal remains to investigate meat cuts and meals from a Colonial barracks in Triabunna, Tasmania. Madeleine has undertaken fieldwork in England and Australia as an undergraduate volunteer. She has experience in Historical excavations and database entry, processing and interpretation. Madeleine also has zooarchaeological skills in identification of faunal remains and taphonomic analysis. Since joining Biosis, Madeleine has gained experience in Aboriginal consultation practices and report preparation.	• Aboriginal community consultation • Background research

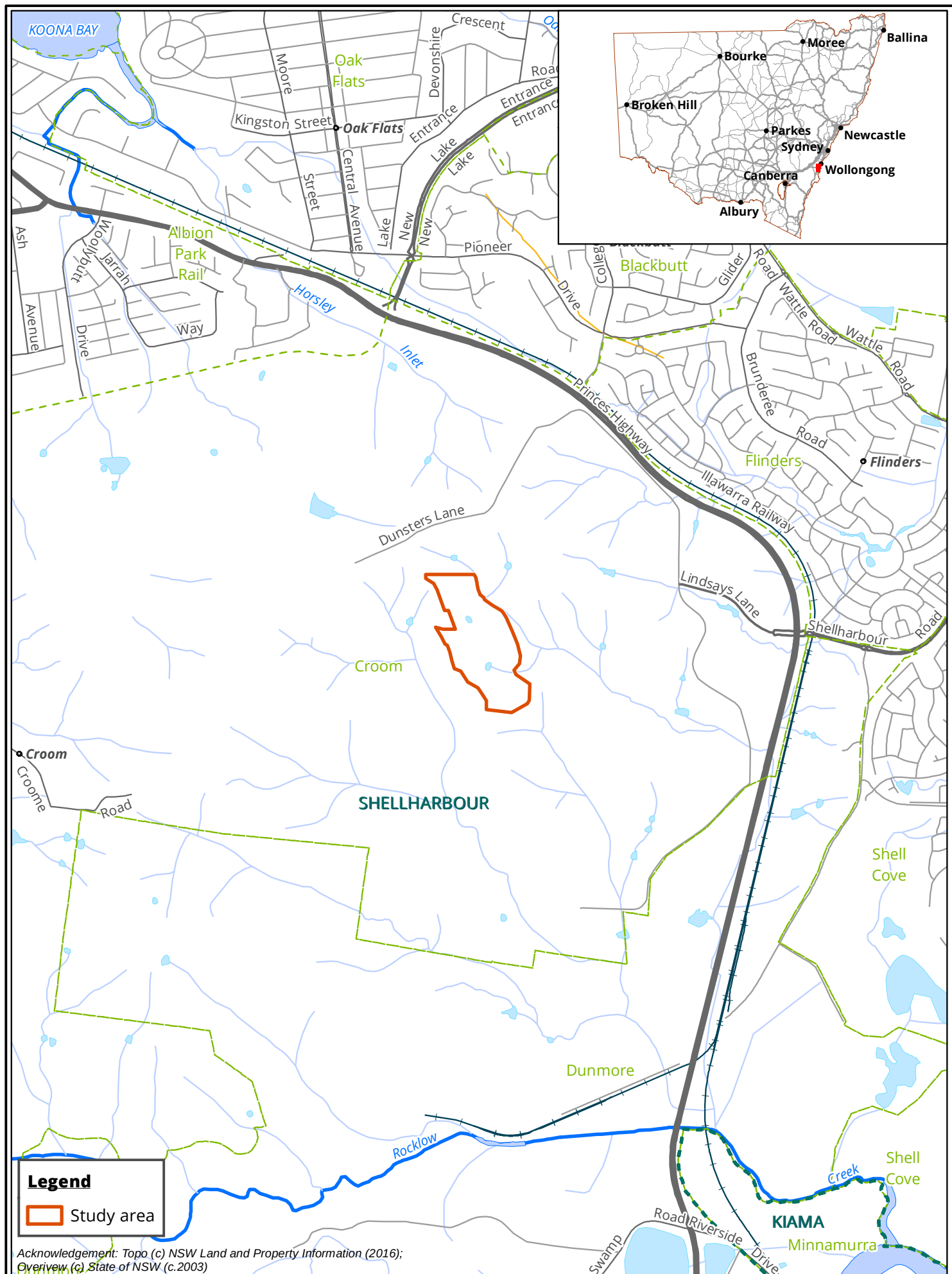
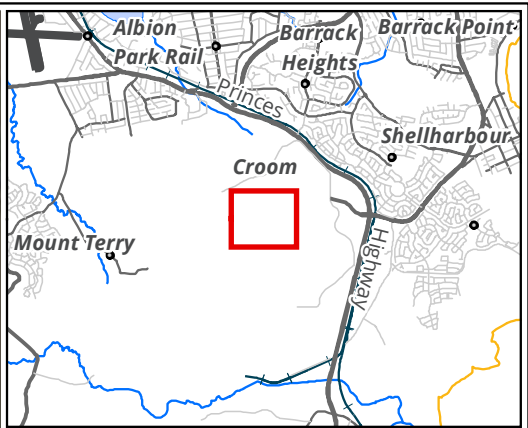
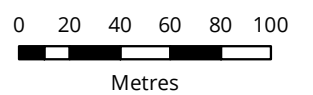


Figure 1 Location of the study area



- Legend**
- Study area
 - Lot

Figure 2 Study area detail



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2 Proposed development

Cleary Bros propose to extend the current extraction area within the Albion Park Quarry by applying for a new development consent under Part 4, Division 4.7 of the EP&A Act. The current extraction area was approved on 21 February 2006 by the Land and Environment Court (Development Consent 10639/2005) and has been modified in 2009, 2015 and 2017. The proposed extension area will be located beyond the current extraction areas of Stages 5 and 6 into an area identified as Stage 7 (**Figure 3**). The annual production limit of 900,000 tonnes per annum will be maintained and there will be no modifications to the extraction procedures although a new crushing and screening plant would be used on a continuous basis within the extraction area throughout the Project life.

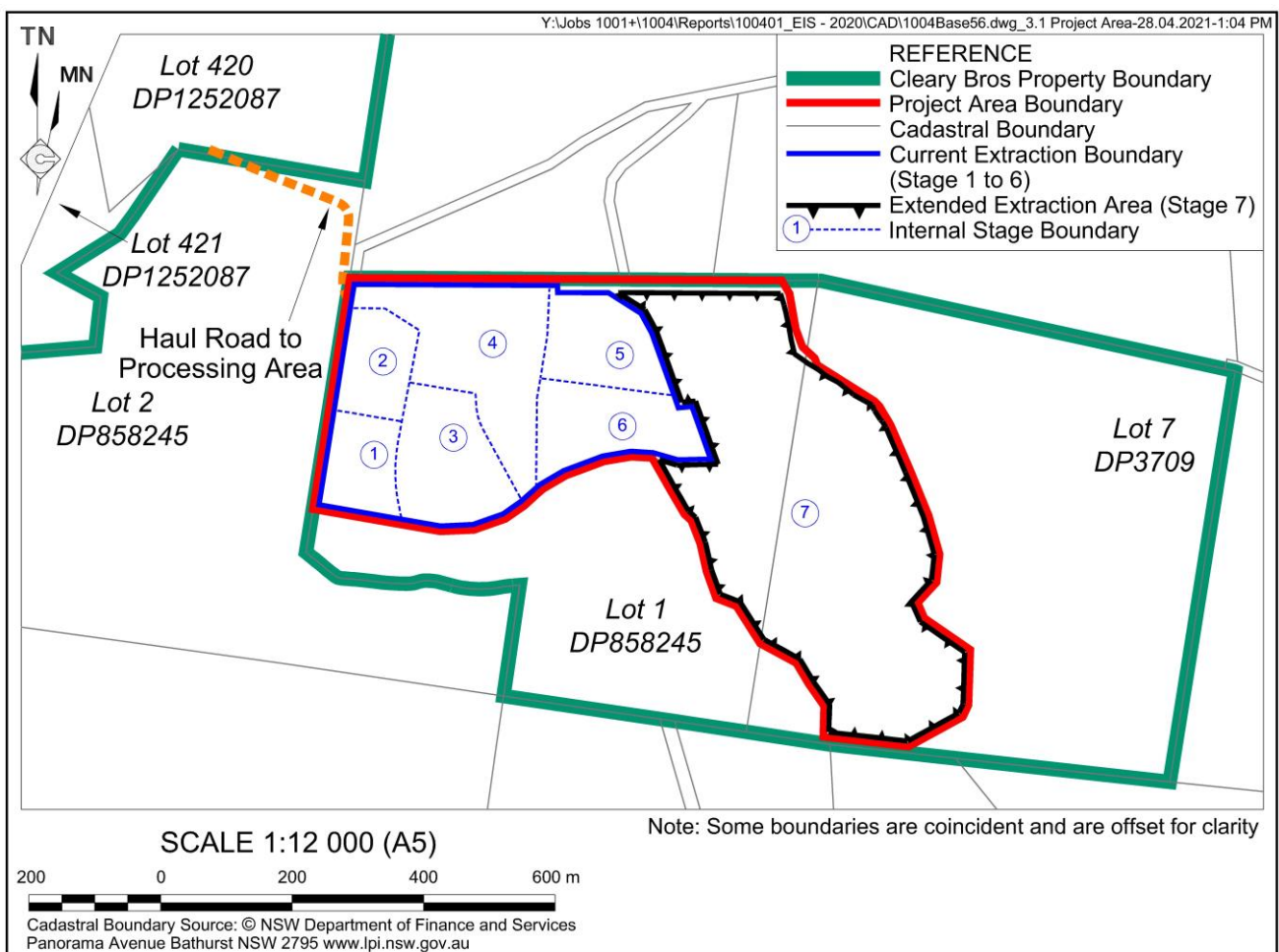


Figure 3 Proposed development

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, geology and hydrology

The study area lies within the Coastal Plain physiographic region that is located between the Illawarra Escarpment and the ocean (Hazelton 1992, p.2). It consists of the gentle rises of the Illawarra Coal Measures, rolling to steep low hills of volcanic materials, moderate to steep slopes of Berry Siltstone and undulating Budgong Sandstone and Quaternary alluvium. The Coastal Plain is characterised as a mosaic of foothills, ridges, spurs, hillocks and floodplains with slopes varying from very gently inclined to steep with the occasional low cliff. It is dissected by easterly flowing streams at intervals that become more frequent towards the north (Fuller 1982, p.18). It is widest at the points where the Macquarie Rivulet has entrenched into the Plateau at Macquarie Pass and where other waterways provide the catchment area of Lake Illawarra (Bowman 1971).

The Bumbo Latite Member geological formation is the most frequently occurring formation within the local area and covers the entire study area (**Figure 4**). The formation belongs to the Gerringong Volcanics and comprises two distinct flows separated by a tuffaceous agglomerate and underlain by a grey tuffaceous sandstone. A total of 9.8% of all artefact scatters recorded in the local area are associated with this formation. Likewise, 8.3% all shell and 100% (n=1) of all modified tree sites were recorded in association with this geological formation. Subsequently, the formation is the least archaeologically rich in comparison to geological formations in the region.

Bumbo latite topography includes the undulating slopes of the Budgong Sandstone, and the Estuarine Tidal Delta Flats (Hazelton 1992, pp.43–45). The landform in the study area consists of a natural amphitheatre with a spur that extends towards the south. Steep slopes drop from the spur lines to creeklines that flow south east towards Minnamurra River. The study area is located within a spur and upper slope landform pattern associated with second order creek line that flows south-east towards Rocklow Creek and the Minnamurra River.

Stream order is recognised as a factor which assists in the development of predictive modelling within NSW (Jo McDonald Cultural Heritage Management 2000, Jo McDonald Cultural Heritage Management 2005, Jo McDonald Cultural Heritage Management Pty Ltd 2005, Jo McDonald Cultural Heritage Management 2006, Jo McDonald Cultural Heritage Management 2008). Predictive models, which have been developed for the region, have a tendency to favour higher order streams as having a high potential for campsites as these

types of streams 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 stream order increases, so does the likelihood that the stream would be a perennial source of water.

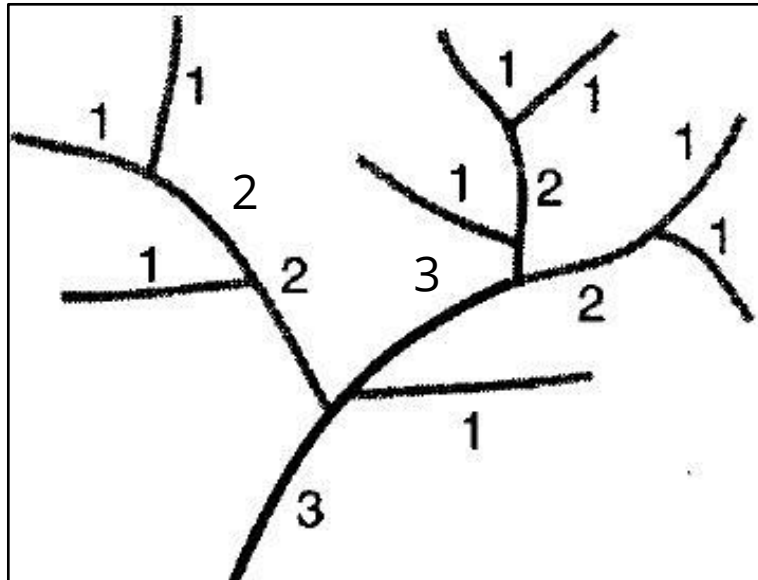


Plate 1 Diagram showing Strahler stream order (Ritter et al. 1995, p.151)

Hydrology within the study area includes a number of watercourses (**Figure 5**). A first order non-perennial water course is located within the south eastern portion of the study area. It is a tributary of a second order non-perennial water course that transects the north eastern portion of the study area. A confluence of this water source into two first order, non-perennial water courses can also be seen in the north eastern portion of the study area.

3.1.2 Soil landscapes

Soil landscapes have distinct morphological and topological characteristics that result in specific archaeological potential. Because they are defined by a combination of soils, topography, vegetation and weathering conditions, soil landscapes are essentially terrain units that provide a useful way to summarise archaeological potential and exposure.

Soil landscape mapping for this area was conducted by Hazelton (1992) and was accessed via the NSW Government's eSpade online portal. The area covered by the Stage 7 extension is wholly mapped as the Bombo Soil Landscape (**Figure 6**). Key features of the Bombo Soil Landscape are in **Table 2**.

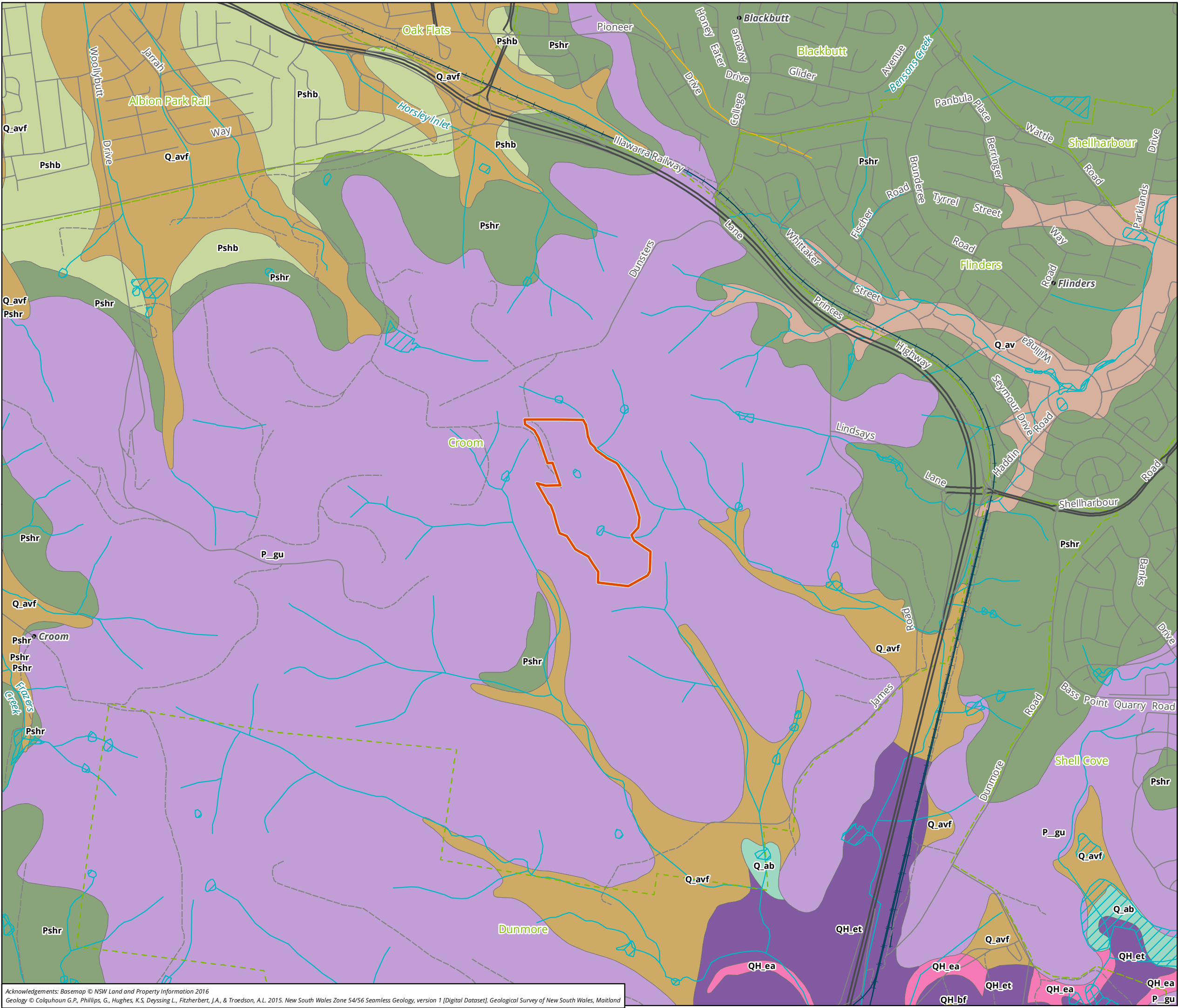
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Table 2 Bombo soil landscape characteristics (Hazelton 1992)

Feature	Description
Landscape description and geology	Rolling low hills with benched slopes on Bombo Latite
Typical topography	Slope gradients 15 to 25% with narrow crests and long, convex ridges. Moderately-inclined to steeply-inclined slopes with narrow incised drainage lines and occasional springs.
Soils	Shallow, structured loams associated with rock outcrop and steep slopes. Krasnozems and Red/brown Podzolic Soils (Red and Brown Ferrosols) occur in all other areas.
Soil characteristics	• Highly organic topsoils. • Moderate fertility. • Potential sodicity/dispersion. • Low wet bearing strength (topsoils). • Acidic soils (localised). • High reactivity (shrink/swell potential) (localised).
Landscape characteristics	• Localised steep slopes. • Localised mass movement (slumping) hazard. • Localised rockfall hazard. • Rock outcropping.
Land capability	• High to severe limitations for cultivation. • Low to moderate limitations for grazing. • Inferred Land Capability Class III to VI.

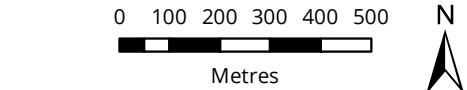
A soil and water report was prepared for the Project by Strategic Environmental & Engineering Consulting (SEEC) (2021), who described the soils within the study area as 'shallow, structured loams associated with rock outcrop and steep slopes'. A series of 12 soil investigation pits were excavated across the study area, which were representative of the typical landform elements that occur. SEEC identified four soils units within the study area. Soil Type 1, located along the spur, consists of 0 to 200 millimetres of topsoil overlaying up to 900 millimetres of subsoils; however, subsoils are composed of well-structured medium to heavy clays. Soil Type 2, 3 and 4 consist of deeper topsoils between 200 and 400 millimetres; however, the landform is relatively steep with localised mass movement hazards.

The Bombo soil landscape is an erosional soil landscape, which are characterised as having a high to very high erodibility rating and would therefore be susceptible to frequent soil movement and result in poor preservation of archaeological material at shallow depths but would potentially lead to exposures of any deeper archaeological deposits where topsoil has eroded away. Site surveys have shown locally deep soil profiles up to 140 centimetres that assists the preservation of subsurface archaeological deposits, particularly in areas of low disturbance (Biosis 2019).



- Legend**
- Study area
- Geological units**
- P_gu - Bumbo Latite Member
 - Pshb - Berry Siltstone
 - Pshr - Broughton Formation
 - Q_ab - Alluvial backswamp deposits
 - Q_av - Alluvial valley deposits
 - Q_avf - Alluvial fan deposits
 - QH_bf - Coastal deposits-backbarrier flat facies
 - QH_ea - Estuarine palaeochannel fill
 - QH_et - Estuarine tidal-delta flat

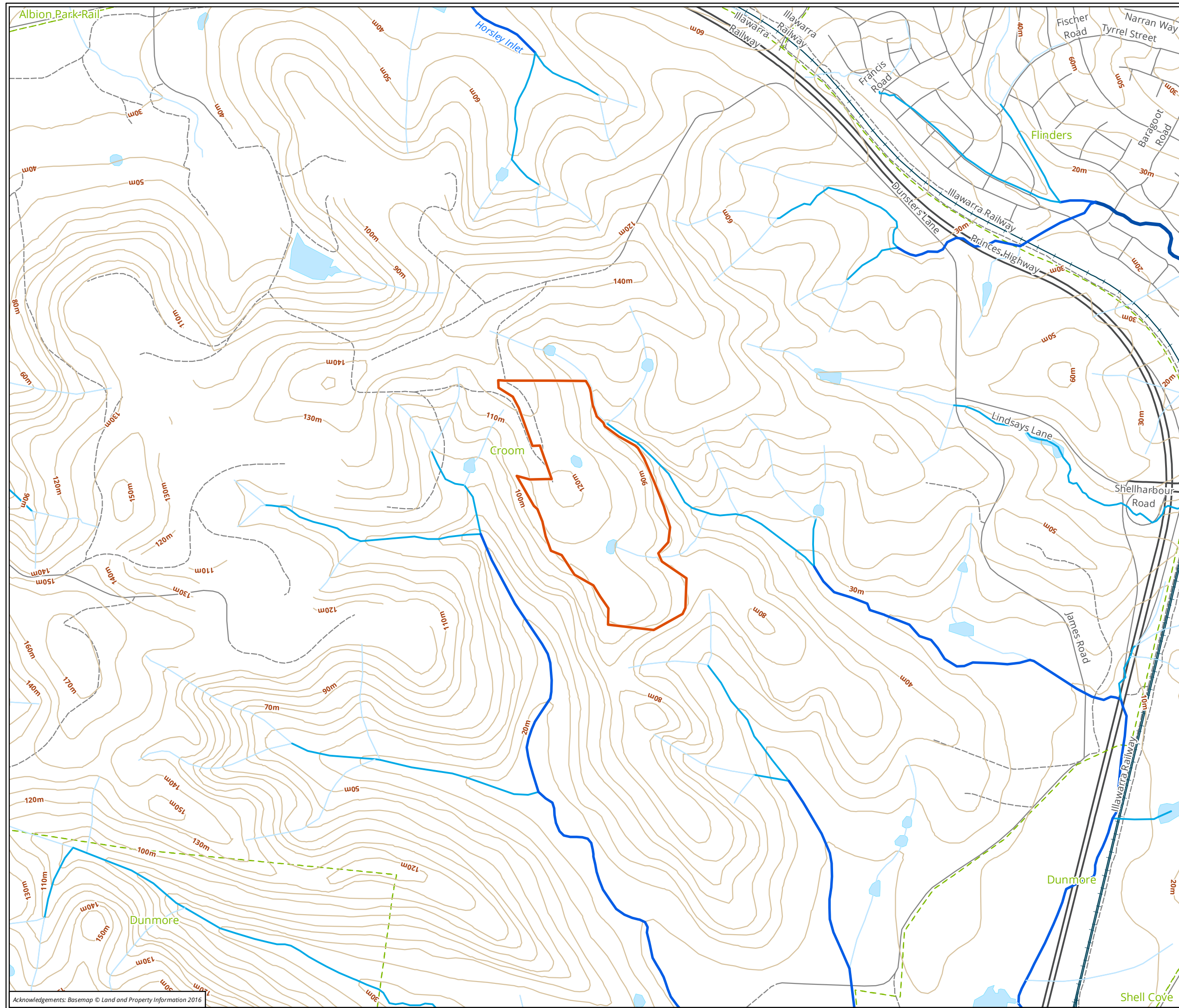
Figure 4 Geological units within the vicinity of the study area



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Legend

 Study area

 Contour (10m)

Strahler Order

 1

 2

 3

 4

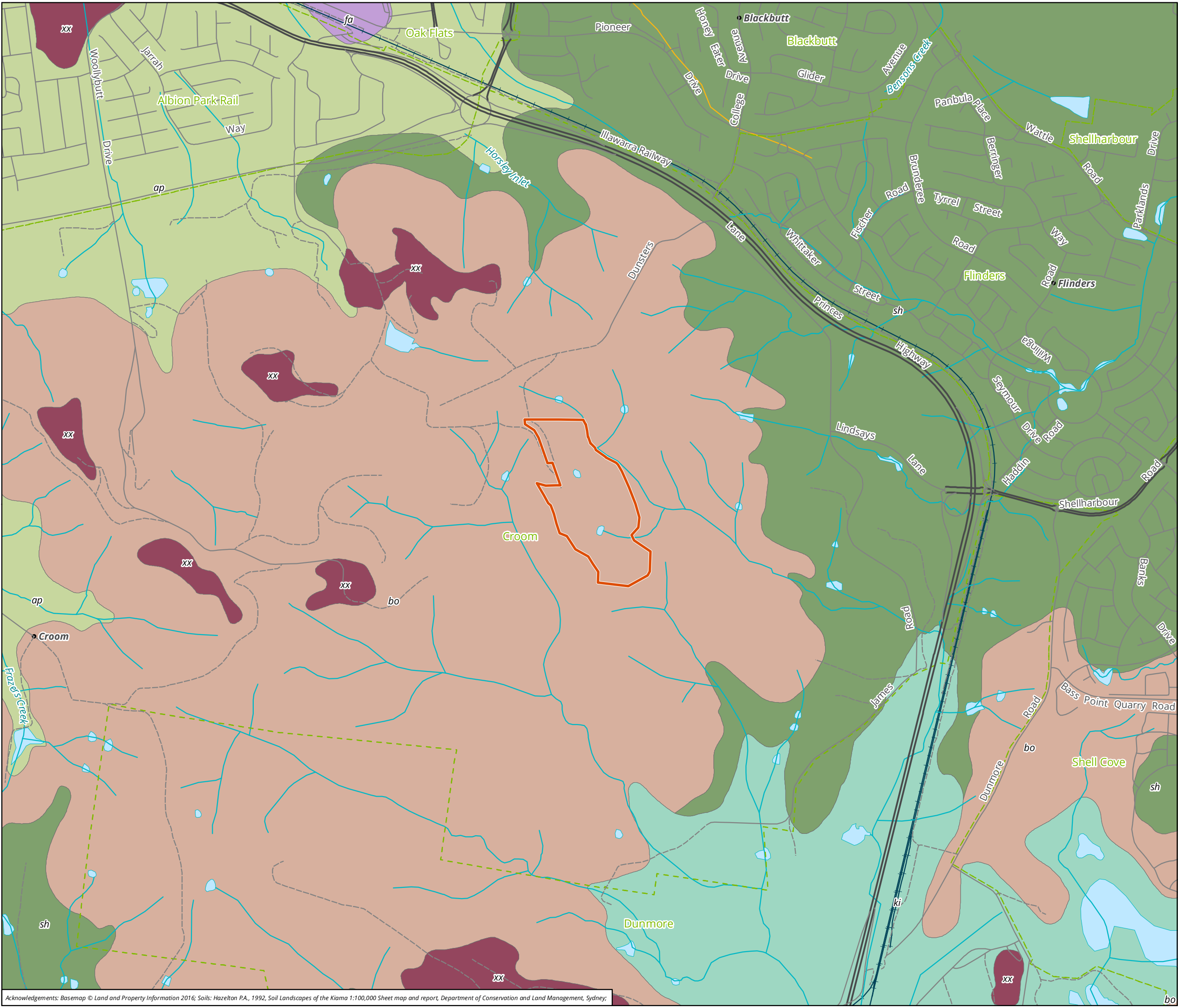
Figure 5 Hydrology and topography in the vicinity of the study area

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- Legend**
- Study area
- Soil Landscape units**
- ap - ALBION PARK
 - bo - BOMBO
 - fa - FAIRY MEADOW
 - ki - KILLALEA
 - sh - SHELLHARBOUR
 - xx - DISTURBED TERRAIN

Figure 6 Soil landscapes within the vicinity of the study area

0 100 200 300 400 500
Metres

Scale: 1:15,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56

biosis

Matter: 30305
Date: 24 February 2021,
Checked by: MEL, Drawn by: AEDM, Last edited by: Iharley
Location: P:\30300s\30305\Mapping\30305_AR_F6_Soils.mxd

Acknowledgements: Basemap © Land and Property Information 2016; Soils: Hazelton PA, 1992, Soil Landscapes of the Kiama 1:100,000 Sheet map and report, Department of Conservation and Land Management, Sydney;

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3.1.3 Landscape resources

The wider Illawarra region includes distinct ecological zones, from tall forest and rainforests to frontal dunes closer to the coastline. Closer to the study area, sclerophyll forest would have been common, and is still present in patches today, along with remnant rainforest growth (Navin Officer 2002, p.13). Each ecological zone hosts a different array of floral and faunal species, many of which would have been utilised according to seasonal availability. Aboriginal inhabitants of the region would have had access to a wide range of avian, terrestrial and aquatic fauna and repeated firing of the vegetation would have opened up the foliage allowing ease of access through and between different resource zones.

The study area was extensively cleared during the nineteenth century when it was developed for dairying, with some remnant stands of closed forest and open-tall forest, much of which has re-appeared as re-growth. The Bombo landscape typically supports Cabbage Tree Palm *Livistona australis*, Bastard Rosewood *Dysoxylum fraserianum*, Red Cedar *Toona ciliata*, White Cedar *Thuja occidentalis*, Brush Cherry *Syzygium paniculatum*, Moreton Bay Fig *Ficus macrophylla*, Turpentine *Syncarpia glomulifera*, Grey Ironbark *Eucalyptus paniculata*, and Sydney Blue Gum *E. saligna* (Hazelton 1992, pp.40–44).

Plant resources were used in a variety of ways. Fibres were twisted into string, which was used for many purposes, including the weaving of nets, baskets and fishing lines. String was also used for personal adornment. Bark was used in the provision of shelter; a large sheet of bark being propped against a stick to form a gynyah (Attenbrow 2002).

Fauna species likely present within the study area include Eastern Spinebill *Acanthorhynchus tenuirostris*, Common Myna *Acruditheres tristis*, Short Beaked Echidna *Tachyglossus aculeatus*, Common Ringtailed Possum *Pseudocheirus peregrinus*, Common Wombat *Vombatus ursinus*, and Swamp Wallaby *Wallabia bicolor* (Atlas of Living Australia 2019).

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. Animals such as Brush-tailed Possums were highly prized for their fur, with possum skin cloaks worn fastened over one shoulder and under the other. Kangaroo teeth were incorporated into decorative items, such as head bands (Attenbrow 2002).

3.1.4 Land use history

The study area is situated within a 1,850 acre portion of land granted to D'Arcy Wentworth on the 9 January, 1821. Wentworth was a medical practitioner from County Armagh, Ireland, who arrived in the Colonies on 28 June 1791 as a convict, but soon after was moved to Norfolk Island for his medical skills, becoming superintendent of convicts on the island. Wentworth returned in February 1796 and was appointed as an assistant surgeon of the colony in April, and continued to work in medicine in Sydney, Parramatta and Norfolk Island until he was made principal surgeon of the Civil Medical Department in 1809 (J. J. Auchmuty 1967).

D'Arcy Wentworth went on to acquire 13,050 acres in Illawarra, which became the Peterborough Estate, of which the study area formed a part. Upon his death in 1827, D'Arcy Wentworth's lands partitioned into five portions and distributed among his children Martha (Reddall), Sophia (Towns), Catherine (Bassett/Darley), Mary Ann (Addison/Hollings) and Robert (Gillis 2009). The study area is located within the land inherited by Catherine, who married Benjamin Darley in 1847, and later William Bassett in 1867 (Bayley 1959). The study area was part of a lease to the Dunster family from around 1859, which became a prominent dairying family in the Shellharbour district over time.

In March 1906, Samuel Hercules McDonald, a farmer from Albion Park, acquired Lot 6 from Walter Dunster. Samuel McDonald became a prominent community member, being elected to the Shellharbour Municipal

Council in 1928, 1934 and 1948, and was one of the original signatories on the petition to establish the Shellharbour Municipal Council. McDonald also campaigned for the area containing the Belmont Estate to be called Indigo Range; this name appears on several late-19th and early 20th-century maps.

It is believed the main house at Belmont was built around this time, being a weatherboard dwelling constructed in a Victorian and Edwardian style with a hipped corrugated iron roof with gables, a bullnose verandah, decorative valance and finial chimneys. There are also a series of stone walls, which are believed to date to c.1912 (Hynd 2004). Samuel Hercules McDonald leased Lot 6 to John McDonald and Richard McDonald, farmers from Albion Park, in February 1930, which expired in October 1937. In the same year, the property was transferred to Mary Jane McDonald, wife of Samuel Hercules McDonald.

Life at Belmont at this time is described by Gertrude Russell (née McDonald) as part of an oral history of her life. The dairy cows were milked by hand, and prior to electricity arriving at the outlying farms, they used kerosene lamps. Gertrude's father would take the milk from the Belmont dairy and other neighbouring farms to the Illawarra Dairy Co-operative at Albion Park using an old army truck. The farm also produced crops including corn, cut and spread out by hand to feed the dairy cows (Shellharbour Museum n.d.). During the 1930s and 1940s, there was a downturn in the Illawarra dairy industry, with an estimated 2,000 dairy cows sent out of the Shellharbour district by August 1940. In April 1956, Lot 6 was acquired by the government from John Henry Bell McDonald and Samuel Richard McDonald. As part of this, a Crown plan was prepared which records not only structures and fencelines, but also the vegetation, geology, topography and the agricultural use different parts of the study area had been subjected to at this date (Plate 2).

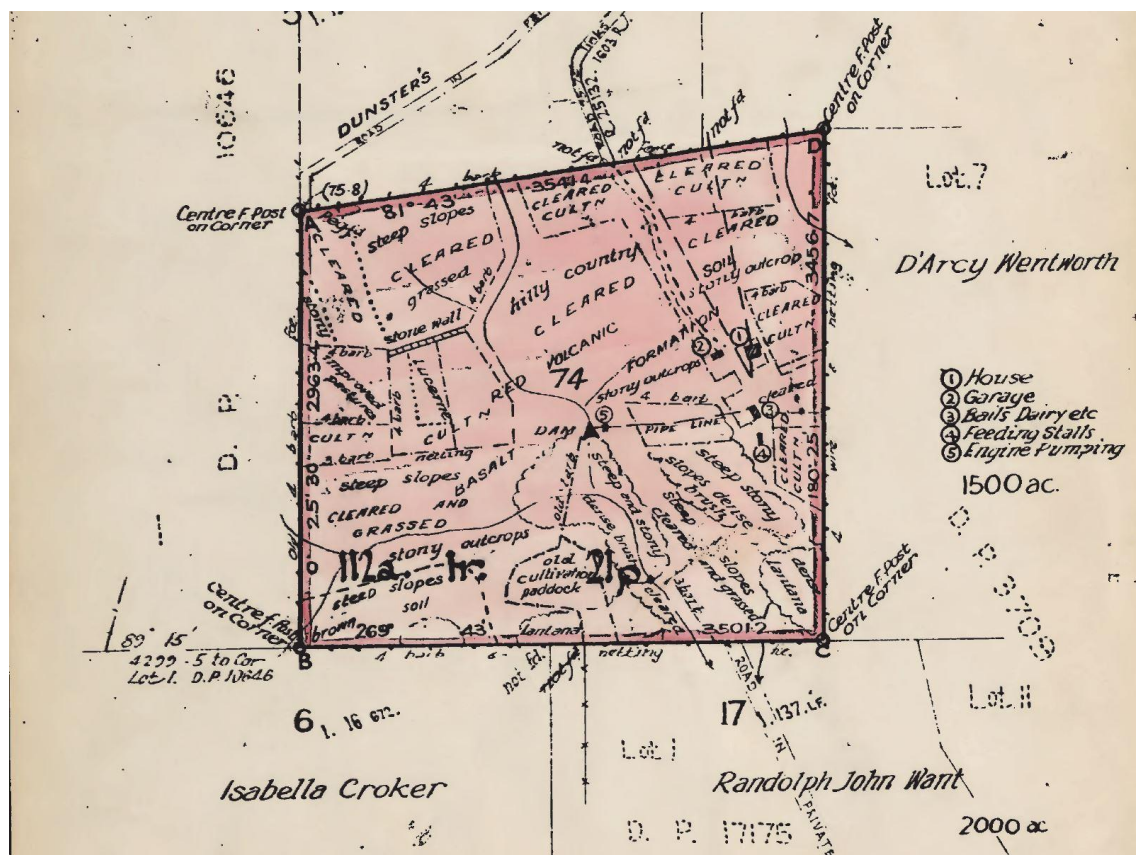


Plate 2 1956 Crown plan of the Belmont Estate (Source: NSW Land Registry Services)

The Belmont Estate was occupied by R.J. Carpenter in 1961, with the pasture lands within the Belmont Estate were leased to the Dunster family, who owned the neighbouring property, The Hill (Hynd 2004). In 1985, Doris Lucy Cody acquired the property from the Crown. A further subdivision took place between this purchase and 1996, but it has not been possible to obtain the plan for this change. The most recent subdivision took place in 1996, which established the property's current configuration. Cleary Bros acquired the Belmont Estate from the McDonald family in 1991. Lorna Brown, the daughter of Samuel Hercules McDonald, continued to live on the property until 2003.

3.2 Previous archaeological work

A large number of cultural heritage surface (surveys) and sub-surface (excavations) investigations have been conducted throughout the Illawarra of 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 awareness of Aboriginal cultural heritage.

The majority of south coast Aboriginal sites date to the last 6000 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 seaward about 14 kilometres to the east of its current position. Coastal sites older than 6000 years are rare, as most would have been inundated by rising sea levels. Pleistocene-age Aboriginal sites on the south coast include a rock shelter at Burrill lake (located approximately 150 kilometres south of the study area) which has been dated to 20,830±810BP (ANU-138) (Lampert 1971, p.122) and a coastal midden at Bass Point dated to 17,010±650BP (ANU-536) (Bowdler 1970, p.254).

3.2.1 Regional overview

A number of Aboriginal cultural heritage investigations have been conducted for the Illawarra region. Models for predicting the location and type of Aboriginal sites with a general applicability to the Lake Illawarra region 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.

Navin Officer (2005) conducted test excavations on part of a potential archaeological deposit (PAD) (AHIMS 52-5-0431) at the Tullimbar Village development on the eastern side of Hazelton Creek located approximately 7 kilometres north-west of the current study area. The PAD (PAD3) consisted of two discontinuous areas of subsurface potential identified along the margins of Hazelton Creek. For the purposes of the assessment, only the northern portion of the PAD was subject to test excavation. The excavations identified a total of 12 artefacts, recovered from five of the 14 test pits excavated. All artefacts were identified in the pits excavated nearest the drainage lines. Five of the artefacts identified were composed of chert, three of silcrete, three of a volcanic material, and one of tuff. Overall, it was concluded that PAD3 was an area of low significance, partially due to the relatively low density of the finds and commonality of the site, but primarily due to the heavy disturbance in the top 20 centimetres of the soil profile, which was indicative of earthmoving activity nearby and within the site.

AMBS (2006) completed an Aboriginal Heritage Management Plan for the West Dapto Release Area (WDRA), located 10 kilometres north of the study area. From the initial survey program, a total of 24 archaeological sites, 13 open camp sites, six isolated finds, and five scarred trees, were located within the boundaries of the WDRA project area. These were positioned on all landforms including creek lines (6), alluvial flats (3), spanning creek lines and alluvial flats (3), hillslopes (8) and spur crests (4). A second stage of assessment comprised subsurface testing of a 100 square metre area. One hundred 1 metre by 1 metre test pits were excavated across all representative landforms of the Mullet, Duck and Marshall Mount Creeks catchment area. A third stage of testing was carried out at Darkes Road Town Centre and Bong Bong Road Town Centre.

A total of 425 artefacts (353 from within < 20 centimetres of deposit) were recovered from the following landscape contexts:

- Hillslopes (158, of which 146 were from one test pit).
- Alluvial flats – Pleistocene and Holocene terraces more than 10 metres away from stream channels (118).
- Streams – edges of Pleistocene and Holocene terraces within 10 metres of stream channels (86).
- Spur crests (63).

A range of raw materials were represented including, chert, quartz, quartzite, silcrete, silicified tuff and fine-grained siliceous rock. Artefact types included broken flakes, flakes, flaked pieces and cores. The range of raw materials and artefact types is considered characteristic of the region.

AMBS concluded that from known site patterning it is likely that additional archaeological sites may occur throughout all landforms of the WDRA – although at varying site and artefact densities – and subsequently all parts of the project area were considered to have some archaeological potential. In general, the highest artefact density was encountered along second-order streams, followed by the first order streams, spur crests and then hillslopes. Although artefact numbers recovered from individual test pit was low, high artefact recovery across all the landforms illustrate that the use of WDRA area was widespread, but not intensive. It was concluded that low density artefact scatters would be relatively common within the entire WDRA area.

Austral Archaeology (2010) undertook an Aboriginal archaeological and cultural heritage assessment of the Calderwood Part 3A Project, located approximately 10 kilometres north-west of the current study area. An initial desktop assessment was followed by fieldwork, resulting in the discussion of the archaeological and Aboriginal cultural sensitivity of the Calderwood project area. The Aboriginal archaeological and cultural heritage field assessment was undertaken over nine days in December 2009 and January 2010, involving representatives from the Illawarra LALC. Thirty-four new Aboriginal archaeological sites, containing at least 189 surface artefacts, were identified during the field assessment. They consisted of 18 isolated finds (52.94%), 11 open artefact scatters (32.35%), four open artefact scatters with associated PAD (11.78%) and one PAD without surface material (2.94%). The dominant raw material was silcrete, followed by chert, mudstone, petrified wood, quartz, basalt and river cobble. Flakes or flake fragments were the most common artefact types, followed by cores, flaked pieces, and a single instance each of a hand axe head, a milling stone or pestle, and a possible broken hammerstone.

AHMS (2012) was commissioned by Stockland to undertake an ACHA for the proposed residential subdivision within two parcels of land, referred to as 'McPhail Lands', north of Bong Bong Road in West Dapto, located 10 kilometres north of the study area. Two registered Aboriginal sites were located in the assessed area: AHIMS 52-2-3779/WDSY1 and AHIMS 52-2-3778/WDSY2. An additional survey was undertaken for both sites, and test excavations of site WDSY1. A total of 546 artefacts were recovered from 75 test pits. Most artefacts were located within the western part of the eastern terrace and it was determined that the site extended to the spur crest. Division of the test excavation results according to AMBS landform definitions, illustrated that the highest density of artefacts occurred within alluvial flats, followed by hillslope and then spur lines. Site WDSY1 was assessed as having high archaeological significance due to its rarity in the area, high number of artefacts and its research potential for obtaining a maximum age for the deposit using the underlying fluvial deposits. Salvage was recommended for site WDSY1 prior to ground disturbance works associated with the proposed development.

Biosis Pty Ltd (2014) undertook an Aboriginal archaeological and cultural heritage assessment for the proposed large lot precinct for the Wongawilli Neighbourhood Master Plan development proposal, located 12 kilometres north of the study area. A survey was completed that resulted in mapping areas of high, moderate

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and low archaeological sensitivity. Areas deemed as having high archaeological sensitivity were a hill crest where a recorded Aboriginal site AHIMS# 52-2-3281/WDRA_AX_17 was identified during a program of sub-surface investigation by AMBS in 2006. Moderate sensitivity was determined for upper hill slopes, and low in other landforms due to the levels of previous disturbance. Further archaeological testing was recommended and was completed by Biosis Pty Ltd in 2013. The site extent of the site AHIMS# 52-2-3281/WDRA_AX_17 was determined and a new site, AHIMS# 52-2-4103/Wongawilli Village 1 was identified within the upper hill slope. Both sites were low density artefact scatters that are most likely remnants of people traversing the area or represent short-term camping grounds. The most suitable locations for short-term occupation for those travelling along the ridge line are likely to be on hill crest and gently sloped sections of the side slopes due to the more level gradient of these locations. Occupation within these landforms would have been transient, isolated events that might have been frequent in the hill crest as it offers the most expansive vista including views to the west that are not possible from the east of the crest. An AHIP was issued in order to impact on both sites prior to the proposed development.

Biosis Pty Ltd (2017) was commissioned by MMJ Real Estate to undertake an Aboriginal heritage assessment to inform the preparation of a Neighbourhood Master Plan for two properties in the suburb of Horsley, NSW, located 10 kilometres north of the study area. The assessment identified two previously recorded sites, AHIMS# 52-2-3283/WDRA_AX_2 and AHIMS# 52-2-3284/WDRA_AX_21, as well as four additional sites. The assessment identified areas of high and moderate potential associated with alluvial flats and ridgelines associated with Robins Creek. The assessment concluded that flat, levelled ground above flood level, as well as extensive views towards the escarpment, would have made the place ideal for long-term occupation. Swampy soils across the alluvial flats are aggrading, indicating that any archaeological material would have been buried and retained. Recent land use activities in the area would not have resulted in removal or displacement of soil layers, other than the very surface soils. Further assessment of high and moderate potential landforms was recommended as part of any future approvals.

3.2.2 Local overview

A number of Aboriginal cultural heritage investigations have been conducted within the region (within approximately 10 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.

Bonhomme (1985) was engaged by the Shellharbour Municipal Council to conduct an archaeological survey of the Shellharbour Waste Disposal Depot at Dunmore, approximately 2.7 kilometres south-east of the current study area. The proposed development consisted of sand mining operations on degraded grazing land, which would be later used for waste and effluent disposal. The archaeological survey identified an open midden site located at the edge of a metal and concrete dump area. Shell material extended over an area of 25 metres by 25 metres but was concentrated in the existing dune formation. The face of the dune demonstrated severe erosion and the site boundaries were affected by the depot operations and likely extended over a greater area. Six flaked stone artefacts were found in the dune face, approximately 10 metres south of a single tree within the dune, and consisted of three silcrete flakes, one volcanic flaked piece, one quartzite flaked piece and one sandstone flaked piece. All shell material was degraded and the shell deposit did not appear to have great depth of stratification. Bonhomme concluded that there was a low likelihood of further sites occurring due to the past disturbances from sand mining, dumping activities, and pastoral grazing.

Silcox (1990) undertook an archaeological survey to identify and assess the significance of any Aboriginal or European sites that would be affected by the corridor of the north Kiama by-pass between Dunmore and Bombo, Kiama, located 2 kilometres east of the study area. The survey identified four Aboriginal sites, three of which had been previously identified (AHIMS# 52-5-0253, 52-5-0251 and 52-5-0072) and one new site.

AHIMS# 52-5-0253 consisted of 15 artefacts located in a spoil heap from an animal burial, AHIMS# 52-5-0251 contained 5 artefacts and shell fragments, while AHIMS# 52-5-0072 was recorded but not described in the report. The new site (KB1) consisted of a sparse scatter of shell fragments and two stone artefacts that covered an area of 10 metres by 10 metres. The site was located on the eastern side of a sand mine directly opposite AHIMS# 52-5-0072.

The survey also resulted in the identification of two potential campsite locations (KBx and KBy). KBx consisted of a terrace surface in the vicinity of AHIMS# 52-5-0253, while KBy involved a low ridge further south. Due to poor surface visibility no artefacts were evident and the existence of the campsites could only be established through test excavation. Silcox recommended that no further archaeological investigations were needed for AHIMS# 52-5-0251, an AHIP for a consent to destroy be obtained for KB1, and limited test excavations be carried out at the campsite locations.

Navin Officer Archaeological Resource Management (1992) undertook an archaeological survey and assessment as part of the DA for the Croome Farm extension of Dunmore Quarry, located approximately 1.8 kilometres south-west of the current study area. AHIMS# 52-2-1791/Dunmore Quarry 1(DQ1) was a low density artefact scatter situated on the broad crest of a spurline shoulder. Fifteen artefacts were recorded in track exposures over an area approximately 200 metres by 150 metres. No artefacts were observed off the tracks. Artefacts were predominantly of chert including flakes, flaked pieces, angular fragments, a core and a scraper. It was noted on the site card that a similar low density of artefacts was "probable" outside the track exposures for a distance of up to 100 metres either side of the main east-west ridgetop track. AHIMS# 52-2-0300/Dunmore Quarry 2 (DQ2) was a scarred tree recorded approximately 250 metres south of artefact scatter DQ1, south of a drainage line running down slope from the north-west. The tree was a mature Eucalypt located within a group of relict mature trees within the sheltered drainage gully. Two scars were identified on opposite sides of the trunk. The larger scar faced south east and had maximum dimensions (including regrowth) of 155cm x 75cm. The second scar faced north-west and had maximum dimensions (including regrowth) of 150cm x 70cm. Both scars were symmetrical in outline with relatively even regrowth. Both ends of each scar were enclosed and not continuous with the ground level. Some fire damage to the tree was evident but considered to postdate the creation of the scars. The similarities of morphology, size, context and absence of features considered to indicate a European origin supported the classification of the scars as Aboriginal in origin. Archaeological significance was assessed as moderate to high. Both sites have since been destroyed under s90 permits.

Hamm (1993) was commissioned by Telecom Australia to undergo a heritage assessment for their proposed installation of an optical fibre cable between Kiama and Jamberoo, approximately 7.5 kilometres south of the study area. The survey was carried out with Mr Jim Davis of the Illawarra LALC. No Aboriginal sites were located along the proposed route. It was recommended that Telecom Australia proceed with their project, with no further archaeological investigation; however, two creek crossings at Spring Creek and Jerrara Creek were recommended to be monitored.

Robert Paton Archaeological Studies (1998) undertook this investigation in support of Cleary Bros rezoning application of Albion Park Quarry. The aims of the study were to locate and record any Aboriginal sites, consult with the local Aboriginal community, and identify any Aboriginal heritage constraints on the quarry expansion. A thorough field survey was undertaken that involved the systematic walking of all transects and areas where GSV was present. Areas of less visibility were also traversed and inspected in detail. No Aboriginal sites were discovered during the survey, although Paton noted that the GSV was very poor, being approximately 1-5 percent.

Paton developed a predictive statement based on previous archaeological studies and the local environment, which predicted sites would occur on ridgelines, on flatter areas adjacent to creek lines, and that large and more complex sites would occur in close proximity to permanent fresh watercourses. Paton recommended

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that further archaeological investigation be undertaken to include test excavation of three areas of archaeological sensitivity (two ridge lines and the creek confluence) and some limited areas outside of these sensitive zones.

Navin Officer Heritage Consultants (NOHC) Pty Ltd (2000) were commissioned by Dunmore Sand & Soil Pty Ltd to undertake a program of subsurface testing on a remnant beach ridge, Dunmore, located approximately 3 kilometres south-east of the current study area. The ridge is located with a larger area of proposed sand extraction and the proposed road interchange that forms part of the North Kiama Bypass. Twenty backhoe test pits were excavated in a grid pattern across the ridgeline and all but one contained artefacts. Only one test pit contained disturbed soil profiles and the remaining test pits contained soil profiles of a sandy matrix of aeolian or beach origin. A total of 939 stone artefacts were recovered from the test pits. The artefact assemblage was dominated by flakes at 79.6%, and the raw material types contained chert, silcrete, quartz, chalcedony and volcanic stone. Some small quantities of midden shell and fauna bones remains were also recovered.

The assemblage suggested that a wide range of stone sources were used to procure flakeable stone and that the beach ridge was a site at which Aboriginal people knapped in order to rejuvenate their stone tool kit, which was based around backed blades, microliths and scrappers. Some changes over time were noted within the assemblage, which consisted of the earlier technology of the manufacture of a wide range of artefacts using a limited number of raw resources followed by a more recent period that appears to be reversed. NOHC concluded that the artefactual material is indicative of a short term base camp for a small family group. Coring and dating of the ridge sediments indicated that the basal formation of the remnant beach ridge dates to around 4,500 years, while occupation of the ridge may have occurred within the last 2000 years.

Dominic Steele (2000) undertook an Aboriginal archaeological assessment at Albion Park for a water supply upgrade, located approximately 3.5 kilometres west of the study area. The initial assessment of the survey area noted that there were a number of tracks, buildings and paddocks which had caused disturbance in the area. The terrain varied between gently undulating and steep grassland, largely cleared of timber. The predictive modelling employed noted the potential for the discovery of middens and stone artefacts. The survey did not identify any artefacts or sites within the area studied; however, survey units one and two were determined to be areas of potential archaeological sensitivity. Within survey unit one, it was noted that there was greater exposure to the north, caused by vehicle and animal tracks. The southern portion of the survey unit was steeper and more heavily grassed. The conclusions of the report noted that this southern portion had moderate potential sensitivity, with some potential to retain intact deposits, unlike the area further to the north, which had been disturbed by recent land use practices.

Mary Dallas Consulting Archaeologists (2001) undertook an Aboriginal archaeological survey and assessment report for a proposed extension at Albion Park Quarry. This investigation was undertaken as part of the preparation of the local environmental study (LES) for Cleary Bros rezoning proposal. The aims of this study were to:

- Revisit the site with representatives from the Illawarra LALC and initiate contact with the Wodi Wodi Tribal Elders Corporation to determine their interest.
- Survey the area to identify and record any Aboriginal sites present and assess the likelihood for unrecorded sites to occur.
- Undertake background research and prepare a predictive model of the potential for unrecorded sites.

Dallas undertook a comprehensive survey accompanied by a representative from the Illawarra LALC, who was also the spokesperson for the Wodi Wodi Tribal Elders Corporation. Poor surface visibility was evident in some parts of the study area; however, Dallas noted that locations most likely to contain Aboriginal sites had exposed surfaces with good visibility due to erosion, rock exposure, animal and vehicle tracks, cuttings and dam construction. Dallas also reinspected Paton's (1998) areas of archaeological sensitivity and found these to be disturbed with exposures of bedrock and little to no soil development. She also noted that Paton's description of his archaeologically sensitive ridgeline was in fact a spur and as such was reassessed to have low to minimal archaeological potential.

Dallas also noted that the poorly watered, steep rocky terrain and shallow soils of the Shellharbour and Dunmore latite hills strongly suggest that the landforms would have low archaeological potential and that only low density artefact scatters may be present within the study area. Dallas concluded by stating that while the study area may contain evidence of past Aboriginal use, it is likely that it was sporadic use by people moving between the hinterland plateau and coast; therefore, no further archaeological investigation was recommended.

Navin Officer (2004) assessed a series of fringe lands being considered for residential development and encompassed around 380 hectares of land around the outer fringes of Albion Park and Dunmore, approximately two kilometres east of the study area. The report identified level ground on hill crests close to water as having moderate potential for artefact occurrences, particularly given the likely use of watershed crests as access routes for the rangelands and coastal plain. Grinding grooves were assessed as having a moderate potential to occur, if sandstone outcrops were present; the same was said of scarred trees, if mature growth trees were present. The general assessment of the area concluded that areas of archaeological potential within this zone comprise level ground on ridge and spurline crests and benches, especially locally elevated landforms adjacent to freshwater.

The survey identified four PADs: SUFA4 was identified on a gentle to flat section of ground between a deeply incised creek line and a shallow gully; SUFA 5 was located on a spur crest above a drainage line; SUFA 6 is part of a major spur leading from Shellharbour to the coast; and SUFA 7 is a crest on a major spurline upon which Shellharbour Road has been constructed. The sites have not been recorded in AHIMS.

Artefact Heritage (2015) was commissioned by Hyder Cardno Joint Venture to prepare an ACHA for the Albion Park Bypass project, located west of the M1 Princes Highway, located 5 kilometre north of the study area. Following an archaeological survey in 2013, which identified two previously recorded Aboriginal sites and one new area of PAD, test excavations were undertaken in 2014. One Aboriginal site (AHIMS#52-5-0512) and six areas of PADs were excavated. Four PADs contained low density subsurface artefact deposits while the other two PADs have moderate density subsurface artefact deposits. A total of 99 artefacts were recovered with a variety of raw materials; however, silcrete and quartz were the most abundant raw material types. From this assessment, a predictive model was developed. It stated that all levels of the Western foothills zone and the Coastal Plain within 100 metres of a creek situated on quaternary deposits (floodplains), Budgong Sandstone, and Berry Siltstone, are archaeologically sensitive.

Biosis Pty Ltd (2017b) undertook a previous Aboriginal cultural heritage desktop assessment for Albion Park Quarry. The assessment did not identify any Aboriginal sites within the study area. The assessment noted that the type and distribution of Aboriginal sites within the Albion Park area is strongly correlated with landform features, particularly level ground on ridge and spurline crests and benches adjacent to freshwater. The landform in the study area consisted of a natural amphitheatre with two spurs extending towards the south along its eastern and western boundaries. Steep slopes drop from the spur lines to creek lines that flow south east towards the Minnamurra River. Due to the steep slope, disturbance from exposed areas of bedrock, and limited soil development within the study area, it was concluded that the archaeological potential for the site was low.

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Kelleher Nightingale Consulting (2017) engaged by Boral to undertake a detailed Aboriginal cultural heritage assessment to seek approval to expand the Croome Farm Pit, at the Dunmore Hard Rock Quarry, Dunmore, located approximately 1.8 kilometres south of the study area. A total of 27 test pits were excavated with a total of 86 artefacts being recovered. The test excavation program established the presence of archaeological deposit in all three test excavation areas and consequently identified three Aboriginal archaeological sites. Artefact distribution was characterised by a low density deposit with localised higher concentrations at sites Croome West AFT 1 and Croome West AFT 2. The areas of localised higher density suggest limited horizontal movement within the deposit at these sites. The low density and unfocused spread of artefacts at the Croome West AFT 3 suggests that horizontal movement had occurred at this location, possibly as a result of past land use practices such as ploughing or disturbance from the construction of farm structures.

Biosis Pty Ltd (2018) has been commissioned by Cardno to provide Aboriginal archaeological due diligence advice for the proposed Backsaddle Planning Proposal, Kiama NSW, located approximately 10 kilometres south east of the study area. The visual inspection consisted of a systematic survey of the study area targeting all landforms within the study area to identify and record any Aboriginal archaeological sites visible on the surface or areas of Aboriginal archaeological potential and cultural sensitivity. GSV of the study area was assessed as low due to extensive grass cover. No new Aboriginal objects or sites were located during the site inspection. The results of the site inspection indicated that the study area contained low archaeological potential.

Biosis Pty Ltd (2020) conducted an archaeological report for the Minnamurra Boardwalk at Minnamurra located approximately 5 kilometres south east of the study area. The survey identified that four areas of PAD despite poor ground surface visibility. Test excavations resulted in the recording of 24 artefacts. From MBW PAD1, 11 artefacts were identified in two test pits that displayed mottled clay fill with rubbish, gravel, and glass fragments. No natural soil profiles were present. Modification and disturbance created by the development of Gainsborough Estate at Kiama Downs, meant that the artefacts have been displaced and were redeposited with the clay fill. At MBW PAD 2, 12 artefacts were identified in two test pits with the majority being located within sandy contexts. Both test pits displayed disturbance in the top 100 to 200 millimetres but beneath this, deposits were minimally disturbed. At MBW PAD 3, one artefact was identified in one test pit along with one highly disturbed midden, which was located just outside of MBW PAD 3. No artefacts were discovered in MBW PAD 4. Shell was recovered from nine test pits, while animal bone was recovered three test pits. The excavated faunal assemblage was represented mostly by Sydney rock oyster, mud whelk, and Sydney cockle with small inclusions of fish, mammal and avian bone. The majority of shell material was weathered and fragmentary and is indicative of exposure to weathering prior to burial.

Biosis (2020) was commissioned by RW Corkery & Co Pty Ltd on behalf of Sydney Trains to undertake an ACHA of an area of land proposed for the quarrying of hard rock at a site known as Dunmore Quarry (Lot 1 DP1002951) at Dunmore, NSW. The survey did not identify any Aboriginal cultural heritage sites or areas of (archaeological) sensitivity. The overall effectiveness of the survey for examining the ground for Aboriginal sites was deemed low. This was attributed to vegetation cover restricting ground surface visibility combined with a low amount of exposures. The study area was assessed as having low archaeological potential and no further archaeological work was recommended.

3.2.3 AHIMS site analysis

A search of the AHIMS database (Client Service ID: 497615) identified 92 Aboriginal archaeological sites within a six by six kilometre search area, centred on the proposed study area (**Table 3**). None of these registered sites are located within the study area (**Figure 7**). AHIMS search results are provided in **Appendix 1. Table 3** provides the frequencies of Aboriginal site types in the vicinity of the study area. 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 a modified tree, 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 122 results presented here, compared to the 92 sites identified in AHIMS.

Table 3 AHIMS site type frequency

Site type	Number of occurrences	Frequency (%)
Artefact	78	63.93
Shell	32	26.23
PAD	8	6.56
Modified tree	1	0.82
Burial	1	0.82
Grinding Groove	1	0.82
Stone arrangement	1	0.82
Total	122	100

A simple analysis of the Aboriginal cultural heritage sites registered within the 6.5 x 6.5 kilometre envelope of the study area indicates that artefact is the most common site type, representing 63.93% (n=78). This is followed by shell, representing 26.23% (n=32) and PAD, representing 6.56% (n=8). Modified tree, burial, grinding grooves, and stone arrangement were all represented by the lowest frequency of 0.82% (n=1 each).

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Figure 7 AHIMS sites within the vicinity of the study area

REDACTED

3.3 Discussion

Ethno-historical information regarding the study area indicates that the region was intensively occupied by the Wodi Wodi of the Dharawal language group before European occupation. Traditional stories tell of the arrival of the Wodi Wodi to Lake Illawarra, bringing with them the Dharawal or Cabbage Tree Palm from which their language is named. The proximity of the study area to a rich resource zone suggests that the area was a preferable location for Aboriginal people. Tangible evidence of this occupation is reflected by the many sites recorded in the area with the majority of them being shell middens and artefacts.

Previous archaeological studies and assessments have also observed the effect of previous land use on cultural material (Bonhomme 1985, Lilley 1987, Koettig 1988). Studies located nearby the study area, such as the Dunmore Quarry located 1.5 kilometres to the south, identified low potential for archaeological deposits due to disturbance and the steep hill slopes within the Dunmore landscape (Robert Paton Archaeological Studies 1998, Biosis Pty Ltd 2017b, Mary Dallas Consulting Archaeologists 2001). However, the potential for subsurface material to survive within disturbed landscapes is still possible, as evidenced in the work of Navin Officer Heritage Consultants Pty Ltd (2000), who recovered over 900 artefacts from 21 test pits on a remnant beach ridge at Dunmore, approximately 3 kilometres south east of the current study area.

3.4 Predictive model

A model has 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. This model was formulated as part of the *Albion Park Quarry extension: Aboriginal and historical heritage scoping report* (2019).

This model is based on:

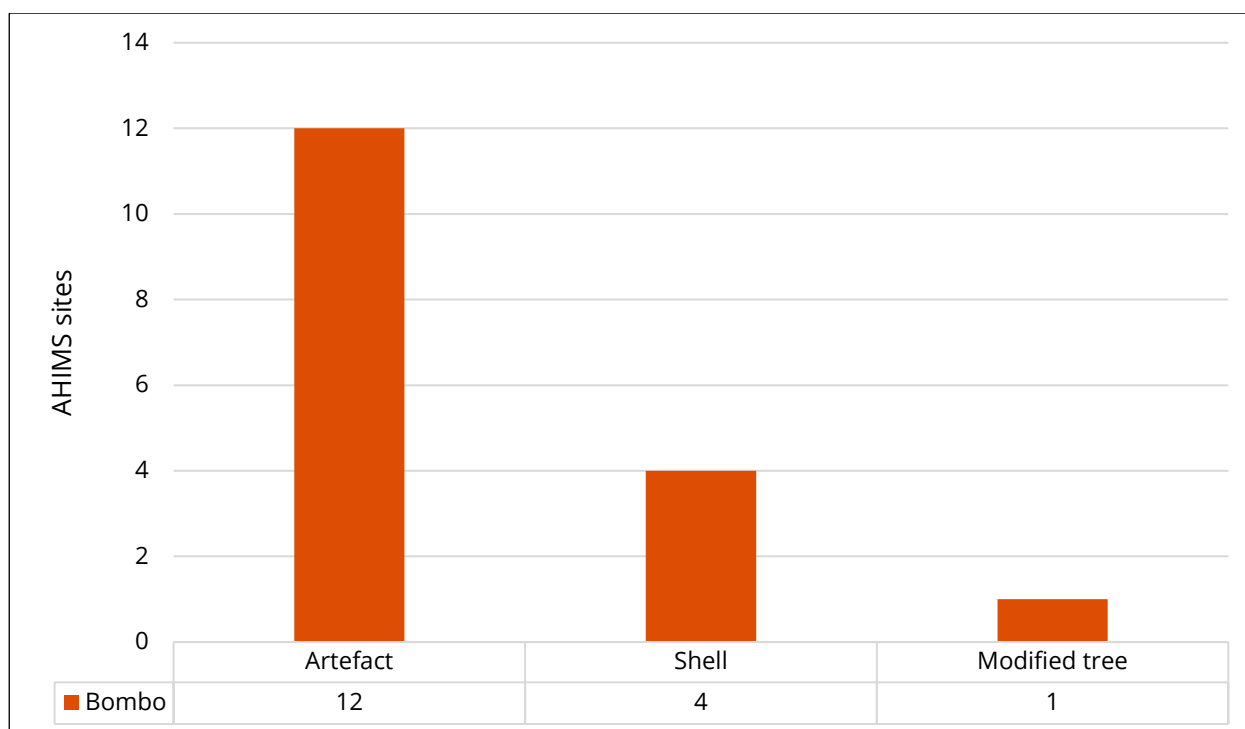
- Local and regional site distribution in relation to landform features identified within the study area.
- Consideration of site type, raw material types and site densities likely to be present within the study area.
- Findings of the ethnohistorical research on the potential for material traces to 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.

3.4.1 Local soils

There are 11 soil landscapes within a 5 kilometre radius of the study area; however, the Bombo soil landscape covers the entire study area. This soil landscape is an erosional landscape and is associated with rolling low hills with benched slopes and sea cliffs with extensive rock platforms on latite and basalt. Subsequently, this soil landscape has a low variety of Aboriginal sites. Artefacts are the most dominant site type recorded followed by shell, and one occurrence of modified trees (**Graph 1**).

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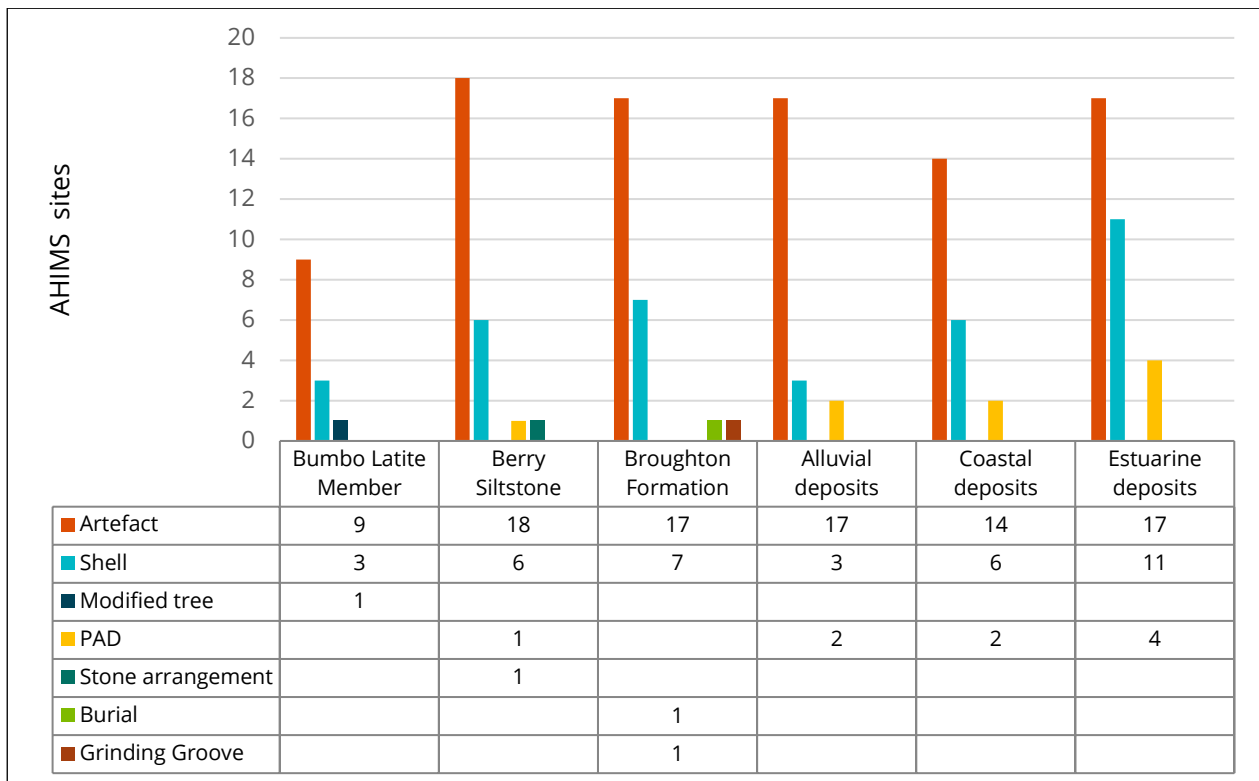
Graph 1 Site types and the number of recorded AHIMS sites located within the Bombo soil landscape in the local region



3.4.2 Local geology

The Bombo Latite Member geological formation is the most frequently occurring formation within the local area and covers the entire study area. The formation belongs to the Gerringong Volcanics and comprises of two distinct flows separated by a tuffaceous agglomerate and underlain by a grey tuffaceous sandstone. A total of 9.8% of all artefact scatters recorded in the local area have been noted within this formation. Likewise, 8.3% all shell and 100% (n=1) of all modified tree sites were recorded in this geological formation. Subsequently, the formation is the least archaeologically rich in comparison to geological formations in the region (**Graph 2**).

Graph 2 Site types and number of recorded AHIMS sites located within geological formation in the local region



3.4.3 Local hydrology

Distance to water

The closest water source is a fourth order creek, Rocklow Creek, located 2.7 kilometres south east of the study area. Within the local area, the average distance that sites are recorded from permanent watercourses is approximately 210 metres and 180 metres to an ephemeral water source. A further analysis of this information illustrates the distribution of site types within the landscape and their general relationship to current watercourses. The data illustrates that artefact scatters are on average closer to ephemeral watercourses than permanent ones, and PADs and shell are on average closer to permanent watercourses than ephemeral watercourses (**Table 4** and **Graph 3**). Burials, grinding grooves, modified trees and stone arrangement have one recording each within the local area; therefore, it is impossible to give average distance to water for these site types.

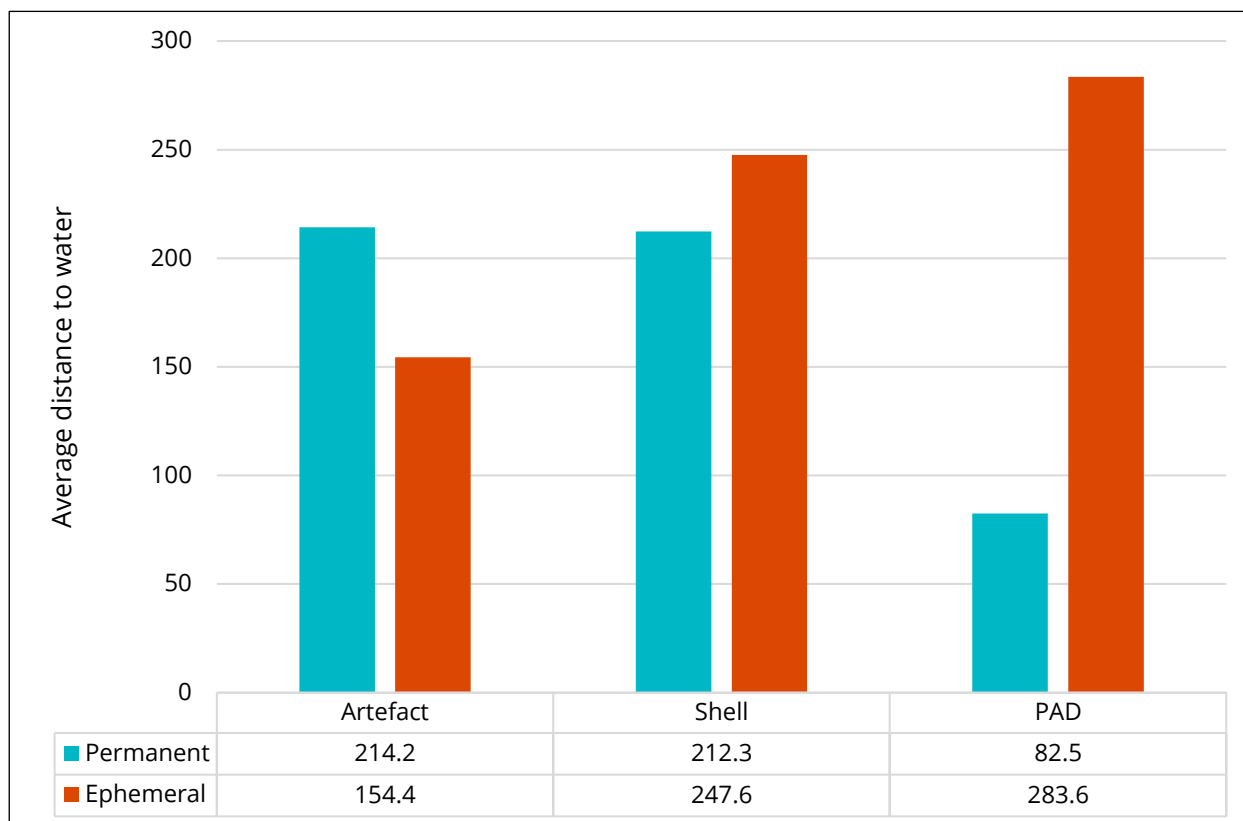
This analysis does not take into account the past pathways or paleochannels of these watercourses, which will in some cases be widely different to the current pathways. Sites are likely to be clustered around paleochannels that are representative of the period of Aboriginal occupation in the region. It was not feasible for this study to determine paleochannel locations.

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Table 4 Summary of site types and their associated distances to water (metres)

Site type	Permanent water source			Ephemeral water source		
	Min	Max	Average	Min	Max	Average
Artefact/s	9.4	1228.5	214.2	3.0	1233.9	154.4
Shell	30.9	593.6	212.3	7.1	1233.9	247.6
PAD	59.5	105.6	82.5	86.4	524.9	283.6
Burial (n=1)	-	-	-	-	166.2	-
Grinding groove (n=1)	-	-	-	-	133.3	-
Modified tree (n=1)	-	-	-	-	62.3	-
Stone arrangement (n=1)	-	-	-	-	105.8	-
Total			209.2			181.1

Graph 3 Recorded AHIMS site types and the average distance to water in the local region

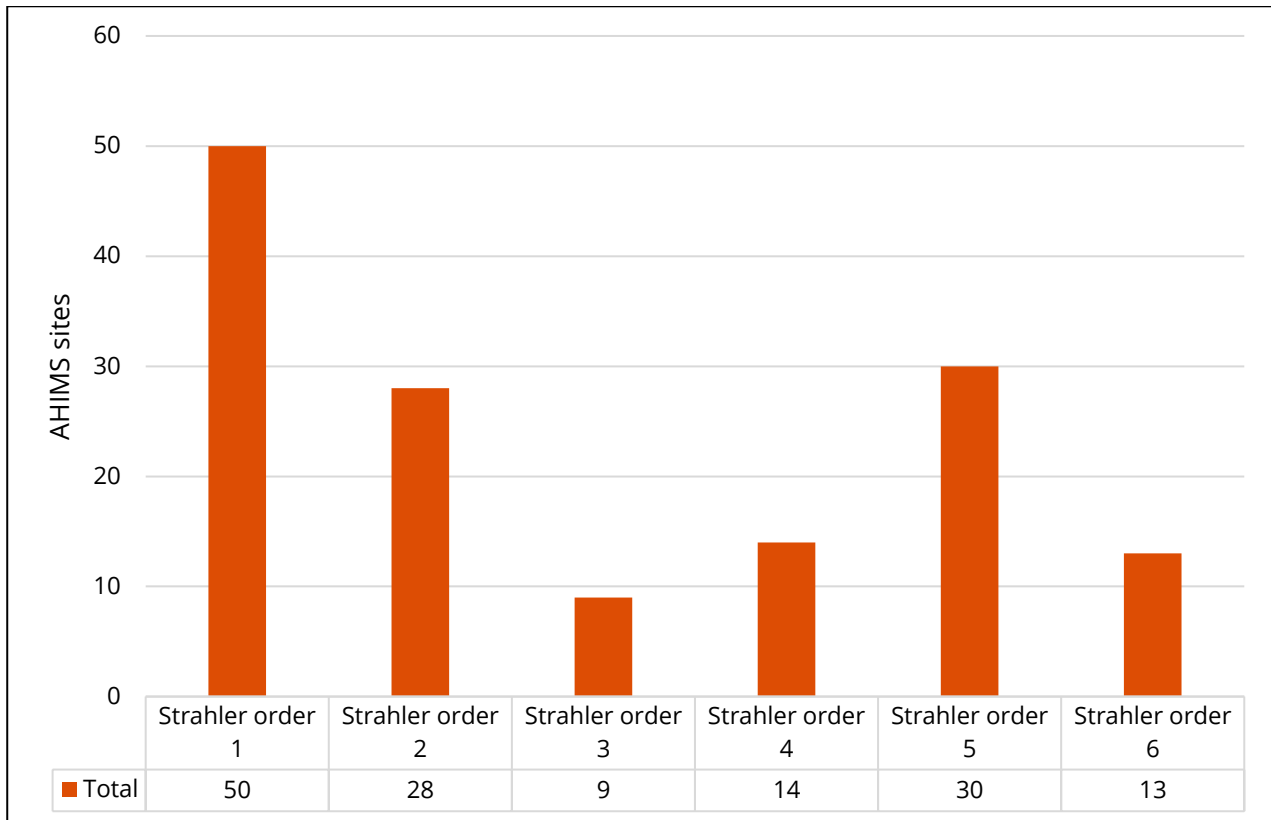


Stream order

In the local area, it becomes evident that 34.7% of all sites are located near a first order stream. These sites include artefacts, PADs, modified trees, shell fragments, grinding grooves, and burials. The second highest numbers of sites are located near fifth order streams (20.8%) and second order streams (19.4%). This group of sites consisted of artefacts, PADs, shell, and one stone arrangement. A total of 9.7% of sites are located near fourth order streams, 9% near sixth order streams and only 6.3% near third order streams. From this

analysis alone, it could be suggested that a higher number of Aboriginal sites are situated around first, second and fifth order streams. Overall, it could suggest a preference for this environmental zone by past subsistence strategies, which helps to predict the location and complexity of other unrecorded Aboriginal sites in the landscape (**Graph 4**).

Graph 4 Stream order of the recorded AHIMS sites in the local region



3.4.4 Local topography

The landform in the study area consists of a natural amphitheatre with two spurs extending towards the south along its eastern and western boundaries. Steep slopes drop from the spur lines to creeklines that flow south east towards Minnamurra River.

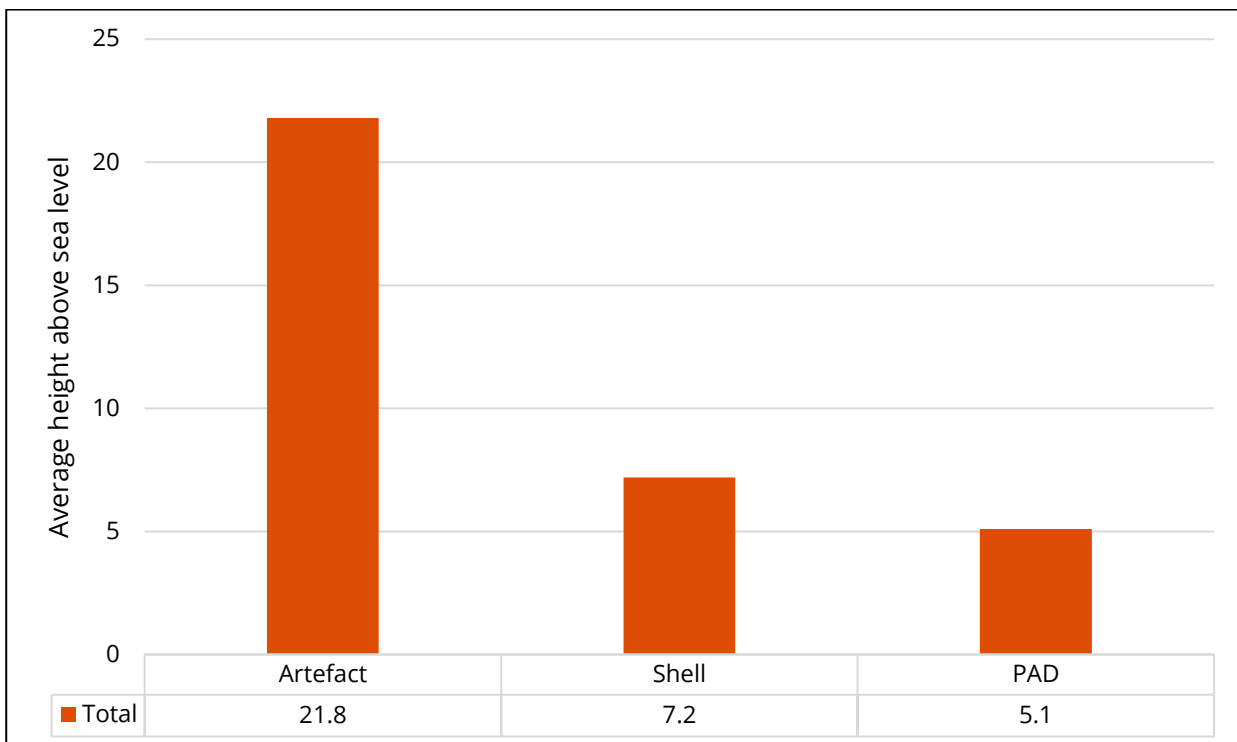
Within the local area, the average height above sea level (ASL) that artefact scatters are recorded at is approximately 21.8 metres. The maximum height recorded for artefact scatters is approximately 162 metres, with a minimum of approximately one metre. This data suggests that there appears to be no correlation with the topography and the appearance of this particular site type; artefact scatters are recorded throughout the landscape. Likewise, within the local area shell fragments are recorded at a height of approximately 7.2 metres ASL, with a maximum of 39 metres ASL and a minimum of 1 metre ASL. PADs are recorded on average at 5.1 metres ASL, with a maximum of 10 metres ASL and a minimum of 2 metres ASL (**Table 5** and **Graph 5**).

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Table 5 Summary of the level of sites above sea level for different site types within the area

Site type	Max (m)	Min (m)	Average (m)
Artefact/s	162	1	21.8
Shell	39	1	7.2
PAD	10	2	5.1
Burial (n=1)	8	N/A	N/A
Grinding groove (n=1)	170	N/A	N/A
Modified tree (n=1)	143	N/A	N/A
Stone arrangement (n=1)	8	N/A	N/A

Graph 5 Recorded AHIMS site types and the average height above sea level



Based on this information, a predictive model has been developed, indicating the site types most likely to be encountered during an archaeological survey within the present study area (**Table 6**). The definition of each site type is described, followed by the predicted likelihood of this site type occurring within the study area.

Table 6 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 on level, well-drained topographies in close proximity to reliable sources of fresh water. Due to the distance from permanent fresh water resources (2.7 kilometres), the potential for artefacts to be present within the study area is assessed as moderate.
Potential Archaeological Deposits (PADs)	Potential sub surface deposits of cultural material.	Moderate: PADs have been previously recorded in the region across a wide range of landforms. PADs are likely to be present within areas adjacent to water courses or on high points in undisturbed landforms.
Modified trees	Trees with cultural modifications	Low: Scarred trees have been recorded within the vicinity of the study area; however, due to extensive vegetation clearance only a small number of mature native trees have survived along the edges of the study area.
Shell middens	Deposits of shells accumulated over either singular large resource gathering events or over longer periods of time.	Low: Shell midden sites have not been recorded within the vicinity of the study area. There is low potential for shell middens to be located in the study area as the second order drainage line is not permanent water source.
Quarries	Raw stone material procurement sites.	Low: There is no record of any quarries being within or surrounding the study area with the underlying geology being unfavourable for this type of site.
Grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	Low: Suitable horizontal sandstone rock outcrops do not occur within the study area.
Burials	Aboriginal burial sites.	Low: Aboriginal burial sites are generally situated within deep, soft sediments, caves or hollow trees. Areas of deep sandy deposits will have the potential for Aboriginal burials. The soil profiles associated with the study area are not commonly associated with burials.

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Site type	Site description	Potential
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.	Low: The sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space exist, which are not present 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.

4 Archaeological survey

A field survey of the study area was undertaken on 13 August 2020 by Consultant Archaeologist Samantha Keats and Tracey Henry from the Illawarra LALC. 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:

- Provide RAPs an opportunity to view the study area and to discuss previously identified Aboriginal object(s) and/or place(s) in or within close proximity to the study area.
- 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 survey effort targeted these portions of the study area:

- All landforms (including each occurrence of a specific landform type) that will be impacted.
- Landforms with a higher potential for Aboriginal heritage and justifying the selection of these landforms.

4.2.2 Survey methods

The archaeological survey was conducted on foot with a field team of two members. Recording during the survey followed the archaeological survey requirements of the Code and industry best practice methodology. Information that recorded during the survey included:

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

Where possible, identification of natural soil deposits within the study area was undertaken. Photographs and recording techniques were incorporated into the survey including representative photographs of survey

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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 meandering transect was walked across the study area with the two surveyors walking two metres apart (**Figure 8**). This follows the methodology set out in Burke and Smith (2004, p.65) which states that a single person can only effectively visually survey an area of two linear metres. No Aboriginal sites or PADs were identified in the study area. The results from the field survey have been summarised in **Table 7** below.

4.3.1 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 factors that contributed most to the effectiveness of the survey within the study area were visibility, exposure and disturbance.

4.3.2 Visibility

In most archaeological reports and guidelines, visibility refers to GSV 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 (DECCW 2010a). GSV across the study area was typically low (20%) due to extensive grass coverage (**Photo 1**). Small areas of GSV were present along fence lines, around exposures of bedrock, along access tracks (**Photo 2**) and where erosion and disturbance had occurred.



Photo 1 East facing photo showing extensive grass coverage and low visibility



Photo 2 South facing photo showing visibility along access tracks

4.3.3 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, NPWS 1997). Overall, the study area displayed areas of exposure of less than 20% due to extensive grass coverage. Areas of exposure were located where bedrock was visible (**Photo 3**), along access tracks (**Photo 4**), at the base of mature trees, and around fence lines.

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Photo 3 South facing photo showing exposure associated with outcropping of bedrock.

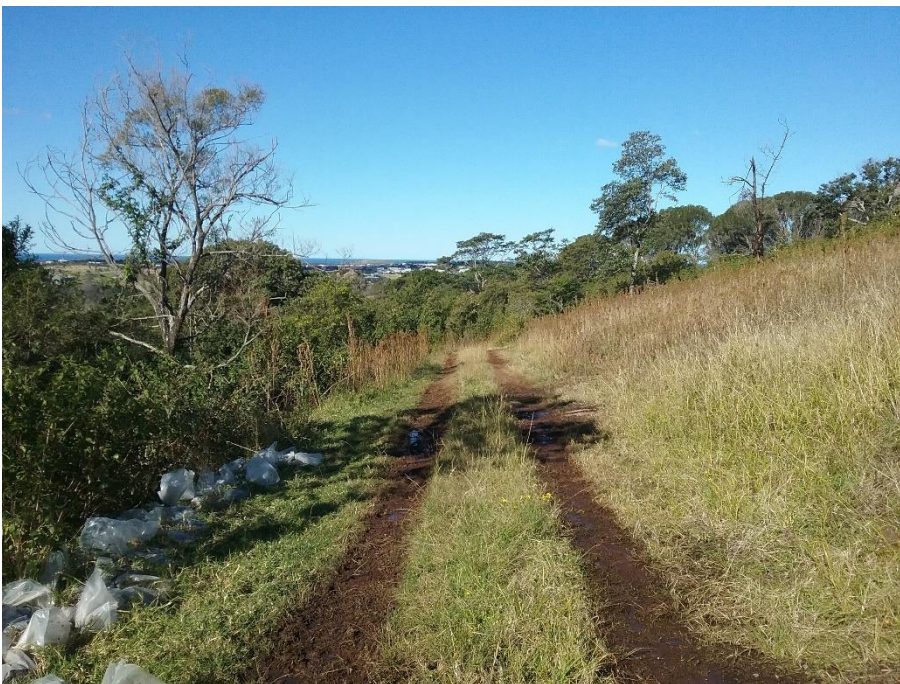


Photo 4 East facing photo showing exposure along access tracks

4.3.4 Disturbances

Disturbance in the study area is associated with natural and human agents. Natural agents generally affect small areas and include the burrowing and scratching in soil by animals, such as wombats, foxes, rabbits and wallabies, and sometimes exposure from slumping or scouring. Disturbances associated with recent human action are prevalent in the study area and cover large sections of the land surface.

There were a number of disturbances observed within the study area, which would have resulted in the removal of topsoil and its replacement with introduced materials of varying degrees. These areas include the extensive vegetation clearance, construction of residential buildings and associated outbuildings (**Photo 5**), construction of dams (**Photo 6**), cut and fill actions associated with the levelling of paddocks (**Photo 7**) and recent vegetation clearing (**Photo 8**).



Photo 5 West facing photo showing disturbances from the construction of buildings



Photo 6 North facing photo showing disturbances from the construction of dams

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Photo 7 North facing photo showing disturbances from cut and fill actions



Photo 8 East facing photo showing disturbances from vegetation clearance around installed piezometers

Table 7 Survey coverage

Landform	Survey unit area (m ²)	Visibility (%)	Exposure (%)	Effective coverage area (m ²)	Effective coverage (%)
Spur	91,677	20	20	8,119	8.86
Upper slope	114,961	20	20	4,186	3.64

Table 8 Landform summary

Landform	Landform area (m ²)	Area effectively surveyed (m ²)	Landform effectively surveyed (%)	No. of Aboriginal sites	No. of artefacts or features
Spur	91,677	8,119	8.86	0	0
Upper slope	114,961	4,186	3.64	0	0

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Figure 8 Survey effort

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4.4 Summary of archaeological survey results

The archaeological survey consisted of a meandering foot transect, which targeted accessible parts of the study area. The results of the field survey are provided in **Figure 9**. The assessment for areas that have low, moderate or high archaeological potential within the study area is based on a number of factors, including environmental conditions, geomorphological processes, past land use activities, results of previous archaeological studies, surveys and test excavations, and results of the current survey.

The field investigation revealed that parts of the study area had been subject to previous ground disturbance due to construction of residential buildings and associated outbuildings, construction of dams and cut and fill actions associated with the levelling activities. These areas would have displaced surface cultural material and disturbed deeper buried archaeological deposits. Land clearance is likely to have also exposed soils and exasperated effects of sheet wash, potentially eroding away archaeological deposits.

The 1963 aerial shows that much of the study area has been cleared of vegetation with remnant trees remaining in the southern part of the site (**Photo 9**). The house and associated sheds have been constructed. There also appears to be plough lines in the aerial image. By 1980, little has changed within the study area, although the vegetation appears to have regrown and the northern most dam has been constructed (**Photo 10**). The 1993 aerial shows the southern dam has been constructed and significant clearing has been undertaken in the southern part of the study area (**Photo 11**). By 2006, a number of structures associated with the house had been demolished and there is regrowth of vegetation evident in the southern part of the study area (**Photo 12**).

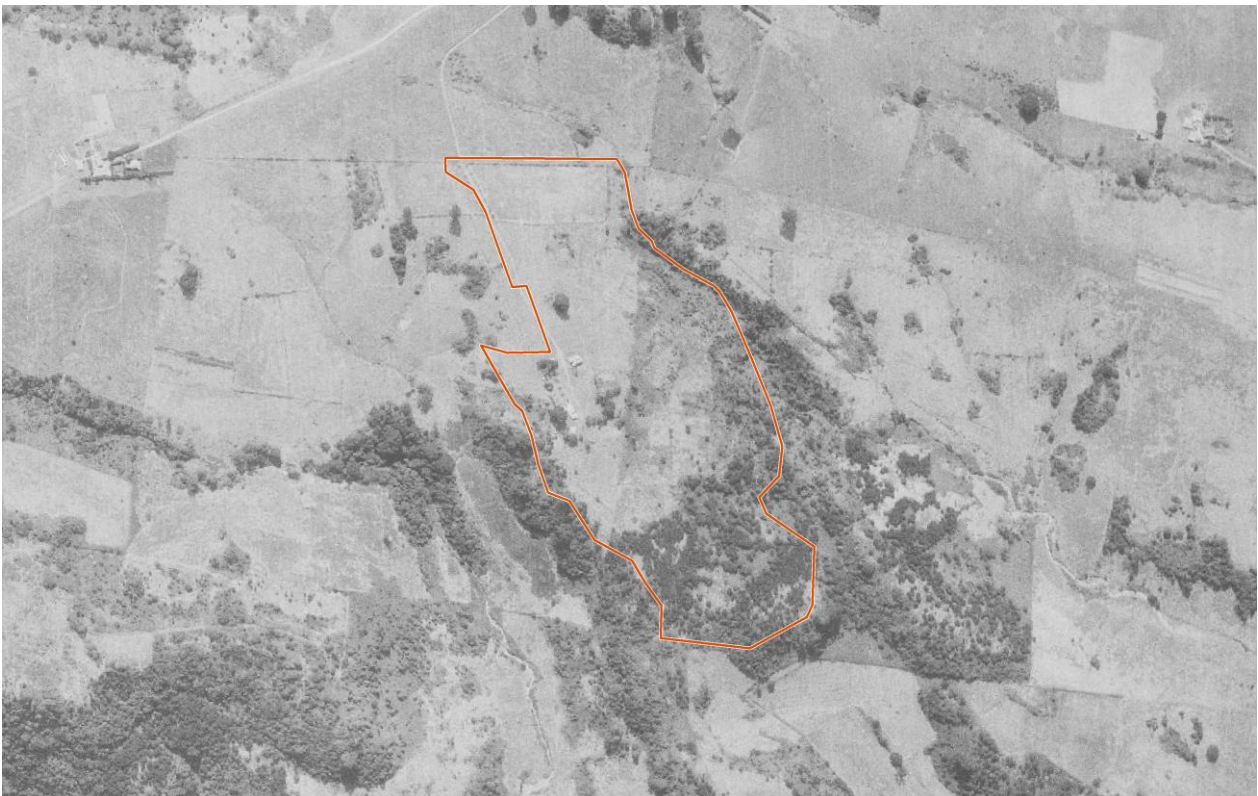


Photo 9 Aerial photograph dated to 1963 showing the study area in red (Source: Spatial Services)

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Photo 10 Aerial photograph dated to 1980 showing the study area in red (Source: Spatial Services)



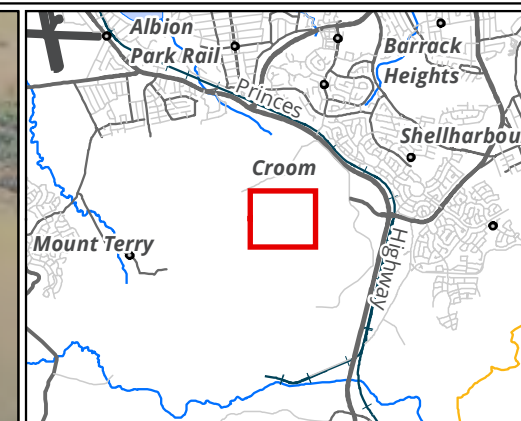
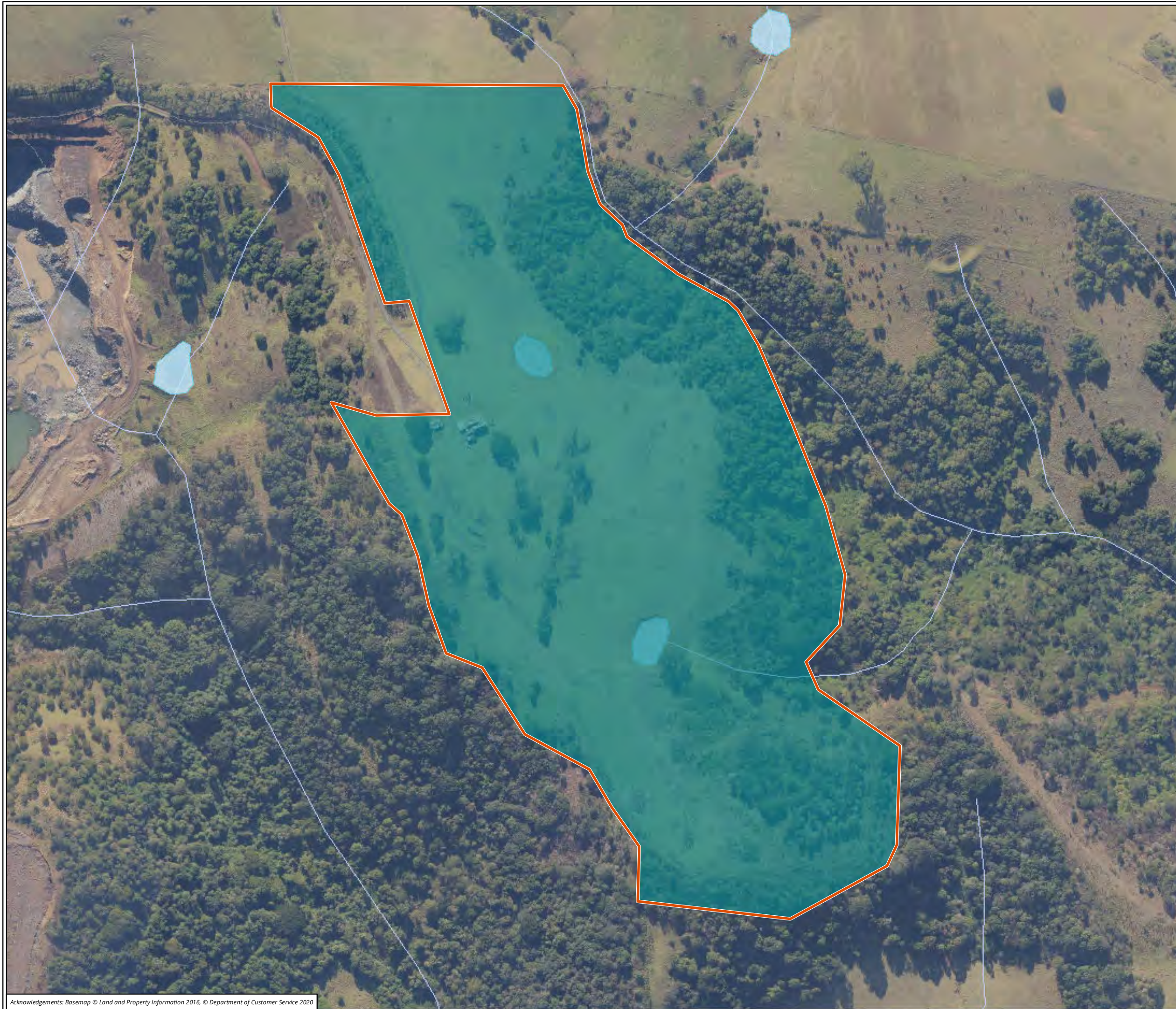
Photo 11 Aerial photograph dated to 1993 showing the study area in red (Source: Spatial Services)



Photo 12 Aerial photograph dated to 2006 showing the study area in red (Source: Spatial Services)

The review of recent Aboriginal heritage assessments conducted for the Albion Park Quarry and the wider area have found that the type and distribution of Aboriginal sites is strongly correlated with landform features. Predictive modelling suggests that the soil landscape and geological formation present within the study area are not conducive to large numbers of Aboriginal sites or objects. The average distance from sites to permanent watercourses is approximately 210 metres and 180 metres to ephemeral watercourses. The closest water source to the study area is a second order ephemeral stream that transects the north east corner of the study area. The predictive modelling also demonstrated that the highest number of Aboriginal sites would be situated around third and fourth order streams; however, the closest fourth order creek, Rocklow Creek, is located 2.7 kilometres south east of the study area.

The type of sites likely to occur within the study area are artefacts; however, the assessments by Dallas (2007) and Biosis (2017b) both concluded that there was low to minimal subsurface archaeological potential due to the exposed areas of bedrock and limited soil development. Also, the steep nature of the spur line slopes and the distance to a first order creek indicate that the potential for Aboriginal sites to occur in the study area is low.



Legend

 Study area

Archaeological potential

 Low

Figure 9 Survey results

0 20 40 60 80 100
Metres



Scale: 1:3,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56



Matter: 30305,
Date: 24 February 2021,
Checked by: SJK, Drawn by: AEDM, Last edited by: lharley
Location: P:\30300s\30305\Mapping\30305_AR_F9_SurveyResults.mxd

5 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 assesses scientific values while the ACHA report details the cultural values of Aboriginal sites in the study area.

5.1 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, 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.

5.2 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, p.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, p.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.

The site contents ratings used for archaeological sites are shown in **Table 9**, and the site condition ratings in **Table 10**.

Table 9 Site content ratings

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.
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 10 Site condition ratings

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, p.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

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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.

The representativeness ratings used for archaeological sites are shown in **Table 11**.

Table 11 Site representativeness ratings

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 shown in **Table 12**.

Table 12 Scientific significance ratings

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

Due to the absence of Aboriginal sites within the study area, it was given a score on the basis of these criteria – the overall scientific significance is determined by the cumulative score.

5.2.1 Statements of archaeological significance

The following archaeological significance assessment is based on Requirement 11 of the Code. Using the assessment criteria detailed in Scientific Values and Significance Assessment, an assessment of significance was determined and a rating for the study area was determined. The results of the archaeological significance assessment are given in **Table 13** below.

Table 13 Scientific significance assessment for the study area

Site name	Site content	Site condition	Representativeness	Scientific significance
Part Lot 1 DP 858245 and Lot 7 DP 3709	0	1	1	2 – Low

Table 14 Statements of scientific significance for the study area

Site name	Statement of significance
Part Lot 1 DP 858245 and Lot 7 DP 3709	The study area has been subject to disturbances created by the initial extensive vegetation clearance, construction of residential buildings and associated outbuildings, construction of dams and cut and fill actions associated with the levelling of paddocks. Historical sources also suggest that the study area was used for crops as well as livestock grazing. The soil landscape present within the study area is an erosional soil landscape, which has a high to very high erodibility rating and would therefore be susceptible to frequent soil movement and result in poor preservation of archaeological material at shallow depths. The study area has been assessed as having low to minimal subsurface archaeological potential due to the exposed areas of bedrock and limited soil development. Also, the steep nature of the spur line slopes and the distance to a first order creek indicate that the potential for Aboriginal sites to occur in the study area is low. The study area has low historical value and the scientific significance has been assessed as low. However, the study area has moderate aesthetic and high cultural value.

6 Impact assessment

As previously outlined, the Project proposes to extend the Albion Park Quarry beyond the current extraction areas of Stages 5 and 6 into an area identified as Stage 7.

6.1 Predicted physical impacts

The proposed extension to the extraction area will consist of drill and blasting of extraction areas, stockpiling of material, and transportation of material by heavy machinery. During the initial stages of extraction, a proportion of the topsoil and subsoil and weathered rock will be pushed up to form an amenity barrier with the remainder incorporated in the rehabilitated landform for Stages 1 to 4 of the existing quarry.

However, the study area has been subject to disturbances created by the initial extensive vegetation clearance, construction of residential buildings and associated outbuildings, construction of dams and cut and fill actions associated with levelling activities. Historical sources confirm that the study area was used for crops as well as livestock grazing. Therefore, the study area has been assessed as having low subsurface archaeological potential due to the exposed areas of bedrock and limited soil development. Also, the steep nature of the spur line slopes and the distance to a first order creek indicate that the potential for Aboriginal sites to occur in the study area is low. Therefore, the proposed works will not impact on Aboriginal heritage values.

6.2 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, p.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 the development is the primary mitigation and management strategy, and should be implemented where practicable. Biosis has undertaken background research and a survey of the study area 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. As a result, the study area has been assessed with low 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.

7 Recommendations

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

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

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

Recommendation 1: No further archaeological assessment is required

No further archaeological work is required in the study area due to the entire study area being assessed as having low archaeological potential.

Recommendation 2: Discovery of unanticipated Aboriginal objects

All Aboriginal objects and Places are protected under the NPW Act. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the 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 the 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 stakeholders

As per the consultation requirements, it is recommended that the proponent provides a copy of this final report to the Aboriginal stakeholders and considers all comments received. The proponent 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
REDACTED