Lang Walker AO Medical Research Building - Macarthur:

Archaeological Survey Report

FINAL REPORT

Prepared for Walker Corporation on behalf of Western Sydney University

21 October 2021

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- BVN: Katie Yeung.
- BVN: Connor Larkins.
- Walker Corporation: Garry Pham.

Biosis staff involved in this project were:

- Sammy Blades (Mapping).

Contents

Tables

Figures

Photos

Glossary

ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
ASR	Archaeological Survey Report
Biosis	Biosis Pty Ltd
Consultation requirements	*Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*
DECCW	Department of Environment, Climate Change and Water (now Heritage NSW)
DP	Deposited Plan
EP&A Act	*Environmental Planning and Assessment Act 1979*
GPS	Global Positioning System
GSV	Ground Surface Visibility
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
Lang Walker AO Medical Research Building - Macarthur	Lang Walker AO Medical Research Building - Macarthur
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service
NSW	New South Wales
PAD	Potential Archaeological Deposit
RAP	Registered Aboriginal Party
SEPP	State Environmental Planning Policy
SSD	State Significant Development
Study area	Defined as 100 Parkside Crescent, Campbelltown (Lot 6 DP 1058047)
the Code	*Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*

Summary

Biosis Pty Ltd (Biosis) was commissioned by Walker Corporation on behalf of Western Sydney University to undertake an Aboriginal Cultural Heritage Assessment (ACHA) for the proposed commercial development of the Lang Walker AO Medical Research Building - Macarthur at 100 Parkside Crescent, Campbelltown, New South Wales (NSW) (the study area) (Figure 1, Figure 2 and Figure 3). This Archaeological Survey Report (ASR) documents the findings of the archaeological investigations conducted as part of the ACHA.

The study area is located within the Western Sydney University Campus, in central Campbelltown, approximately 60 kilometres south of the Penrith Central Business District (CBD). There are 85 Aboriginal cultural heritage sites registered with the Aboriginal Heritage Information Management System (AHIMS). None of these sites are located within the study area.

The project is to be assessed as a State Significant Development (SSD) under Section 4.36 (previously section 89(c)) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 1 of the *State Environmental Planning Policy 2011* (SEPP). The ACHA is being conducted as part of the SSD application to address the requirements of the Secretary's environmental assessment requirements (SEARs) (SSD 17491477).

The Aboriginal community is currently being consulted regarding the heritage management of the project. Consultation has been undertaken as per the process outlined in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010b) (consultation requirements).

An archaeological survey was conducted on 23 September 2021. The overall effectiveness of the survey for examining the ground for Aboriginal sites was deemed low. This was attributed to significant ground coverage due to development and grass coverage 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 survey.

Due to significant disturbances caused by historical land use and modern development of the Campbelltown Hospital, the study area has been determined to contain low archaeological potential. Previous assessments of the study area conducted by Austral Archaeology (2012), GML (2011), and Biosis (2018) have also concluded this. Disturbances that contribute to this assessment include the stripping of top soil, large-scale excavation, cutting and benching of the landscape, importing of material for fill, installation of services, construction of underground carparks, installation of roadways, and landscaping of the grounds. The combined effects of these activities have impacted upon the preservation and integrity of any cultural materials that may have been present.

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 of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a) (the Code).

Management recommendations

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

Recommendation 1: Areas identified as having low archaeological potential

No further investigations are required for areas assessed as having low archaeological potential. This recommendation is conditional upon Recommendations 2 and 3.

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 Heritage NSW and Aboriginal stakeholders.

Recommendation 3: Discovery of Human Remains

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

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

Recommendation 4: Continued consultation with the registered Aboriginal parties

Biosis is currently undertaking an ACHA for this project. As per the consultation requirements, it is recommended that the ACHA report is finalised prior to any works proceeding and that the proponent provides a copy of the draft ACHA report to the registered Aboriginal parties (RAPs) 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 was commissioned by Walker Corporation on behalf of Western Sydney University to undertake an ACHA for the proposed commercial development of the Lang Walker AO Medical Research Building - Macarthur at 100 Parkside Crescent, Campbelltown NSW (the study area) (Figure 1, Figure 2 and Figure 3). This ASR documents the findings of the archaeological investigations conducted as part of the ACHA.

To assist Walker Corporation in meeting their EIS submission deadline, Biosis has provided a concise Archaeological Survey Report (ASR), which includes an in-depth desktop assessment and results from the archaeological survey, conducted on 23 September 2021. It does not include a detailed impact assessment, this will be included as part of the ACHA. Biosis and Walker Corporation are currently undertaking Aboriginal consultation, as per the consultation requirements (DECCW 2010b). Biosis is currently completing Stage 2 and 3 community consultation and estimates that consultation will conclude by mid November 2021.

This ASR documents the findings of the archaeological investigations conducted as part of the ACHA. The ASR provides evidence about the material traces of Aboriginal land use to support the conclusions and management recommendations in the ACHA. The project is to be assessed as a SSD under Section 4.36 of the EP&A Act and Schedule 1 of the SEPP. The ACHA is being conducted as part of the SSD application to address the requirements of the SEARs (SSD 17491477).

This investigation has been carried out in accordance with the Code. The Code has been developed to support the process of investigating and assessing Aboriginal cultural heritage by specifying the minimum standards for archaeological investigation undertaken in NSW under the NPW Act. The archaeological investigation must be undertaken in accordance with the requirements of the Code. As the project is an SSD an Aboriginal Heritage Impact Permit (AHIP) will not be required, with the purpose of the assessment to assist the Secretary of the Department of Planning, Industry and Environment in the consideration and determination of the application.

1.2 Study area

The study area is located within the Western Sydney University Campus, in central Campbelltown, approximately 60 kilometres south of the Penrith CBD (Figure 1). It encompasses approximately 22.60 hectares of private land and the adjacent road reserves.

The study area is within the:

- Campbelltown Local Government Area (LGA).
- Parish of St Peter.
- County of Cumberland.

The study area is bounded by Appin Road to the east, Therry Road to the south, Parkside Crescent to the west and residential buildings to the north (Figure 2).

1.3 Planning approvals

The proposed development will be assessed against Section 4.36 of the EP&A Act. Other relevant legislation and planning instruments that will inform this assessment include:

- NPW Act.
- *National Parks and Wildlife Amendment Act 2010.*
- Infrastructure State Environmental Planning Policy 2007 (SEPP).
- Campbelltown Local Environmental Plan 2015 (LEP).
- Campbelltown Development Control Plan 2015.

1.4 Objectives of the investigation

The objectives of the investigation can be summarised as follows:

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

1.5 Investigators and contributors

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

Table 1 Investigators and contributors

Name and qualifications	Experience summary	Project role
Taryn Gooley **BASc (Hons) Archaeology**	Taryn has over 10 years' archaeological consultancy experience, as well as extensive volunteering experience on archaeological research projects overseas. Taryn has a strong background in project management, leading project teams and volunteer groups in heritage management projects throughout NSW and Western Australia. Her areas of expertise include archaeological and heritage management advice, archaeological excavation and survey, artefact analysis, Aboriginal community consultation, technical report writing, and preparing cultural heritage management plans. Taryn is also accomplished in obtaining approvals under the NPW Act.	• Technical advice • Quality assurance
Amanda Markham	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 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, skeletal remains assessment and conducting archaeological and anthropological surveys and assessments. She also has a wealth of experience writing complex reports.	• Technical advice • Quality assurance
Ashley Bridge **BA Archaeology** **MArchSci (Adv) (Hons)**	Ashley is an archaeologist with three years' experience. She has experience in conducting Aboriginal and historical heritage assessments, surveys and archaeological test excavations for a variety of projects throughout NSW, particularly in the Sydney region. Ashley possesses specialist skills in the identification of human remains, while also having experience in zooarcheological analysis. She also has experience in project management for a number of Aboriginal heritage projects, including test excavations, throughout Sydney and Western Sydney.	• Project management • Background research • Archaeological survey • Reporting
Madeleine Lucas **BA (Hons) Archaeology** **BSC**	Madeleine joined Biosis as a Research Assistant in 2019, having completed her honours in archaeology in 2018. Madeleine has excavation experience in both Australia and the United Kingdom, and is developing skills in Aboriginal and historical desktop research, field surveying and significance assessments.	• Reporting

Name and qualifications	Experience summary	Project role
Caitlin McManus **BA – AN AR Majors** **GradCert in MA** **GradCert in Project Management**	Caitlin joined Biosis in the Sydney office in 2019 as a Project Management assistant, assisting with project administration and support for the Ecology, Heritage, and Planning teams. Prior to joining Biosis, Caitlin worked in the Native Title space, collaborating with traditional owners and Prescribed Body Corporates. Caitlin has several years' experience in the record and project management in government and the private sector. Caitlin has undertaken fieldwork in Israel, Vietnam, and Spain as a volunteer technician. Caitlin has since been promoted to Research Assistant in 2020 and has experience with Aboriginal consultation, background research and field excavations.	• Aboriginal community consultation
Astrid Mackegard **Bachelor of Marine Science**	Astrid has been working with Biosis since January 2021 where she has been responsible for creating maps and conducting spatial analysis for various ecology and heritage projects. To generate high quality outputs, Astrid has used a variety of technical skills including georeferencing, area calculations, data conversion, map design, and data management. Prior to joining Biosis, Astrid spent 10 months as the GIS Specialist for a small environmental consultancy providing mapping outputs for environmental plans for various Pacific Island Nations. In that time she developed strong skills in spatial analysis, map design, and managing mapping projects, which she has utilised in her work with Biosis.	• Mapping

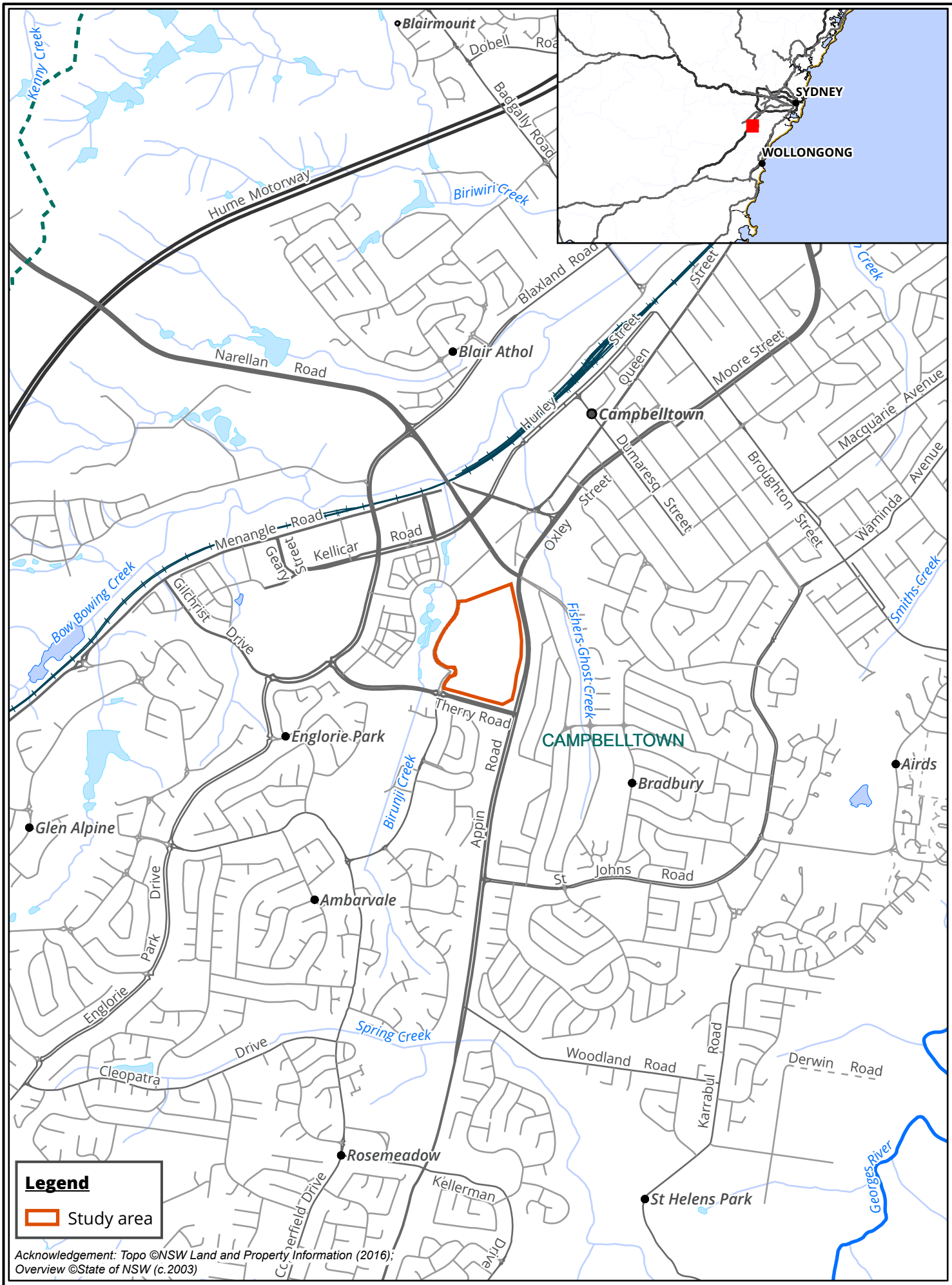

Figure 1 Location of the study area

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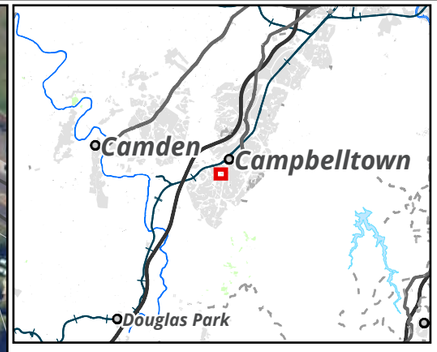

Legend

- Study area
- Impact area
- Lot

Figure 2 Study area detail

0 20 40 60 80 100

Metres

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Scale: 1:2,500@ A3

Coordinate System:
GDA 1994 MGA Zone 56

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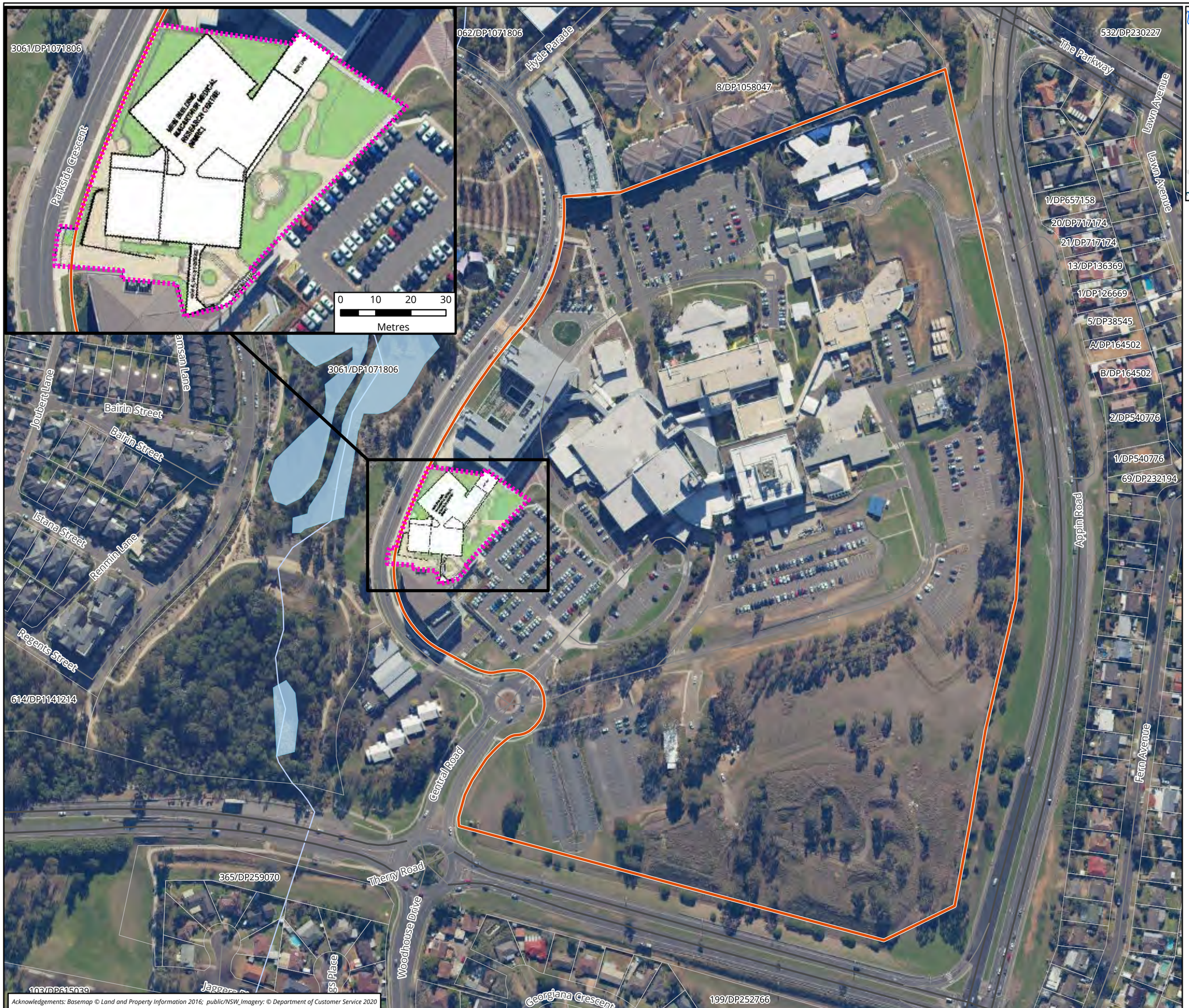
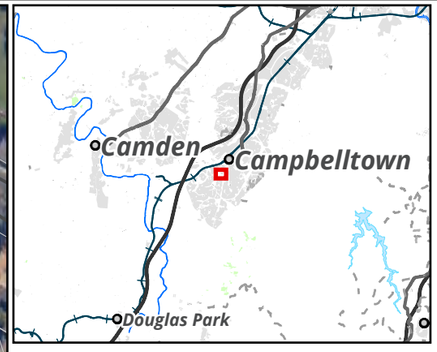
2 Proposed development

The proposed development involves the construction of the Lang Walker AO Medical Research Building - Macarthur, as part of the wider Campbelltown Hospital redevelopment. The Lang Walker AO Medical Research Building - Macarthur will be a multi-faceted research facility that forms part of an integrated hospital and research precinct. Within a total building area of approximately 5,800m^2, the Lang Walker AO Medical Research Building - Macarthur will include Clinical Research facilities, associated Dry Research and Collaboration spaces, a Community Engagement zone, and Back of House/Support spaces as required across four levels.

These works will include ground disturbing works, landscaping, construction of a large medical research centre and installation of subsurface infrastructure (i.e. utility services) (Figure 3).





Legend

- Study area
- Impact area
- Lot

Figure 3 Proposed works

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

3.1.1 Geology, topography and hydrology

The study area is located within the Cumberland Plain, a broad expanse of rolling and undulating hills and flats. The topography of the study area itself lies within the centre of the Sydney Basin, in an area known as the Cumberland Lowlands (Chapman et al. 2009, p.2). This region comprises of gently undulating to low hills and plains on the youngest of the Triassic rocks, the Wianamatta Group. This is overlain by the Ashfield Shale formation, which is present under the Wianamatta Group and consists of black to dark grey siltstone and laminite. The study area itself comprises of a gently sloping landscape, however high levels of development has occurred throughout the extent of the area, changing the overall visible topography.

Stream order is recognised as a factor which helps the development of predictive modelling in Aboriginal archaeology in the Cumberland Plain. Predictive models which have been developed for the region have a tendency to favour permanent water courses as the locations of complex sites that have been continuously occupied, as they would have been more likely to provide a stable source of water and by extension other resources which would have been used by Aboriginal groups (Jo McDonald Cultural Heritage Management 2000, p.19)

The stream order system used for this assessment was originally developed by Strahler (1964). It functions by adding two streams of equal order at their confluence to form a higher order stream, as shown in Photo 1. As stream order increases, so does the likelihood that the stream would be a perennial source of water.

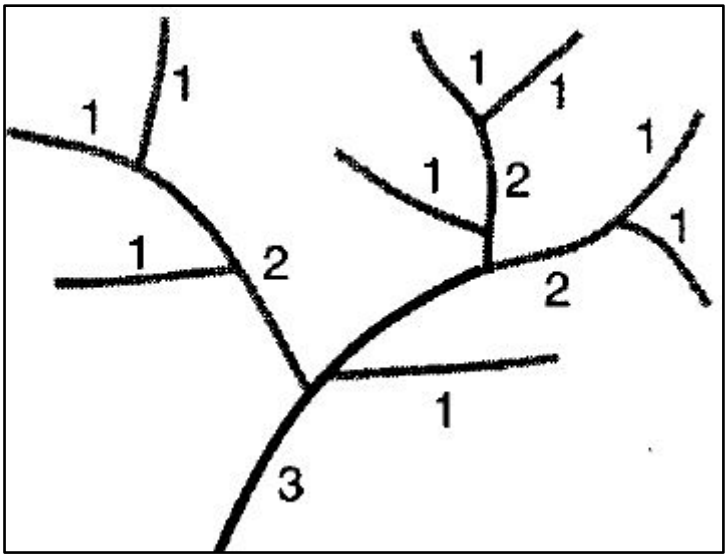

Photo 1 Diagram showing Strahler stream order (Ritter, Kochel, & Miller 1995, pp. 151)

The study area does not contain any water sources, however it is located approximately 60 metres east of Birunji Creek, a non-perennial second order creek line and approximately 240 metres west of Fishers Ghost Creek, a first order non-perennial creek line. Both of these creek lines are tributaries of Bow Bowing Creek, a fifth order creek line, approximately 720 metres north of the study area. A review of aerial photographs shows that Birunji Creek was previously located within the study area and has been highly modified due to development.

3.1.2 Soil landscapes

Soil landscapes have distinct morphological and topological characteristics that result in specific archaeological potential. 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.

The study area is contained with the Blacktown soil landscape, a residual soil landscape, which consists of gently undulating rises, broad rounded crests and gently inclined slopes with a gradient of less than 5%. Residual soils form from the in-situ weathering of bedrock material, resulting in slow accumulation of soils over long periods of time. Due to their age and slow accumulation, residual soil landscapes have reasonable potential to preserve archaeological deposits in an open context, such as stone artefacts derived from occupation sites. However, this slow accumulation when combined with extensive land clearing and land use (usually associated with pastoral and civic development) will result in an increased likelihood that soils will have been disturbed. This results in poor preservation of archaeological material in these locations.

Local relief within the Blacktown soil landscape is up to 30 metres and rocky outcropping is absent. The Blacktown soil landscape is characterised by its low reliefs and gentle slope, and is generally associated with landform patterns of gently undulating rises (Hazelton & Tille 1990, p.29). The soil characteristics of this landscape are described in Table 2 and shown in Photo 2 and Figure 6.

Table 2 Blacktown soil landscape characteristics (Hazelton & Tille 1990, pp.29–30)

Soil Material	Description
bt1—Friable greyish brown loam	This is a friable to occasionally hard setting greyish brown loam to sandy loam with polyhedral, rough faced peds (2 – 20 millimetre). This material occurs as topsoil (A horizon) up to 30 cm thick. Colour ranges from greyish brown (10YR 4/2) to dark brown (7.5YR 3/3), with a pH between 5.5 and 7. Rounded iron indurated fine gravel-sized shale fragments and charcoal fragments are sometimes present. Roots are common.
bt2—Hardsetting brown clay loam	This is a hard setting, dry bleached, brown clay loam to silty clay loam with apedal massive to weakly pedal structure and slowly porous earthy fabric. It occurs as subsoil from 10 to 20 cm thick on crests and upper/mid slopes and 40 to 100 cm thick on lower slopes. This material is water repellent when extremely dry. Colour ranges from brown (7.5YR 4/4) to bright reddish brown (5YR 5/6) and pH from 5 to 6.5. Platy, iron indurated gravel-sized shale fragments are common. Charcoal fragments and roots are rarely present.
bt3—Strongly pedal, mottled brown light clay	This is a brown light to medium clay with strongly pedal polyhedral or sub-angular to blocky structure and smooth-faced dense ped fabric. This material usually occurs as subsoil (B horizon) underlying bt2. Colour ranges from brown (7.5YR 4/6) to reddish brown (5YR 4/6). Frequent red, yellow or grey mottles occur often becoming more numerous with depth. The pH ranges from 3.5 to 6.5. Fine to coarse gravel-sized shale fragments are common and often occur in stratified bands. Both roots and charcoal fragments are rare.
bt4—Light grey plastic mottled clay	This is a plastic light grey silty clay to heavy clay with moderately pedal polyhedral to subangular blocky structure and smooth-faced dense ped fabric. This material usually occurs as deep subsoil above shale bedrock (B3 or C horizon). Colour is usually light grey (10YR 7/1) or, less commonly, greyish yellow (2.5YR 6/2). Red, yellow or grey mottles are common. Strongly weathered ironstone concretions and rock fragments are common. Gravel-sized shale fragments and roots are occasionally present. Charcoal fragments are rare.

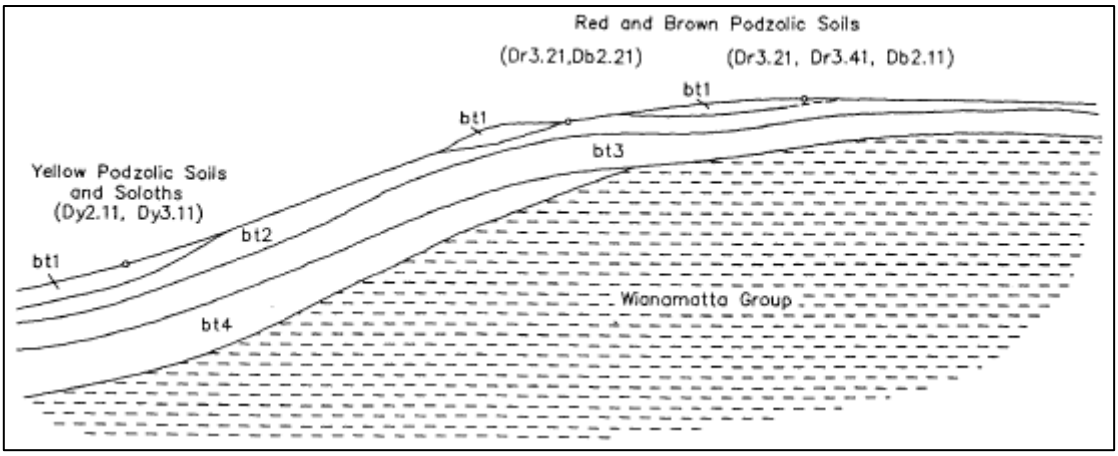

Photo 2 Representative cross section of Blacktown soils showing material relationships (Hazelton & PJ Tille 1990)

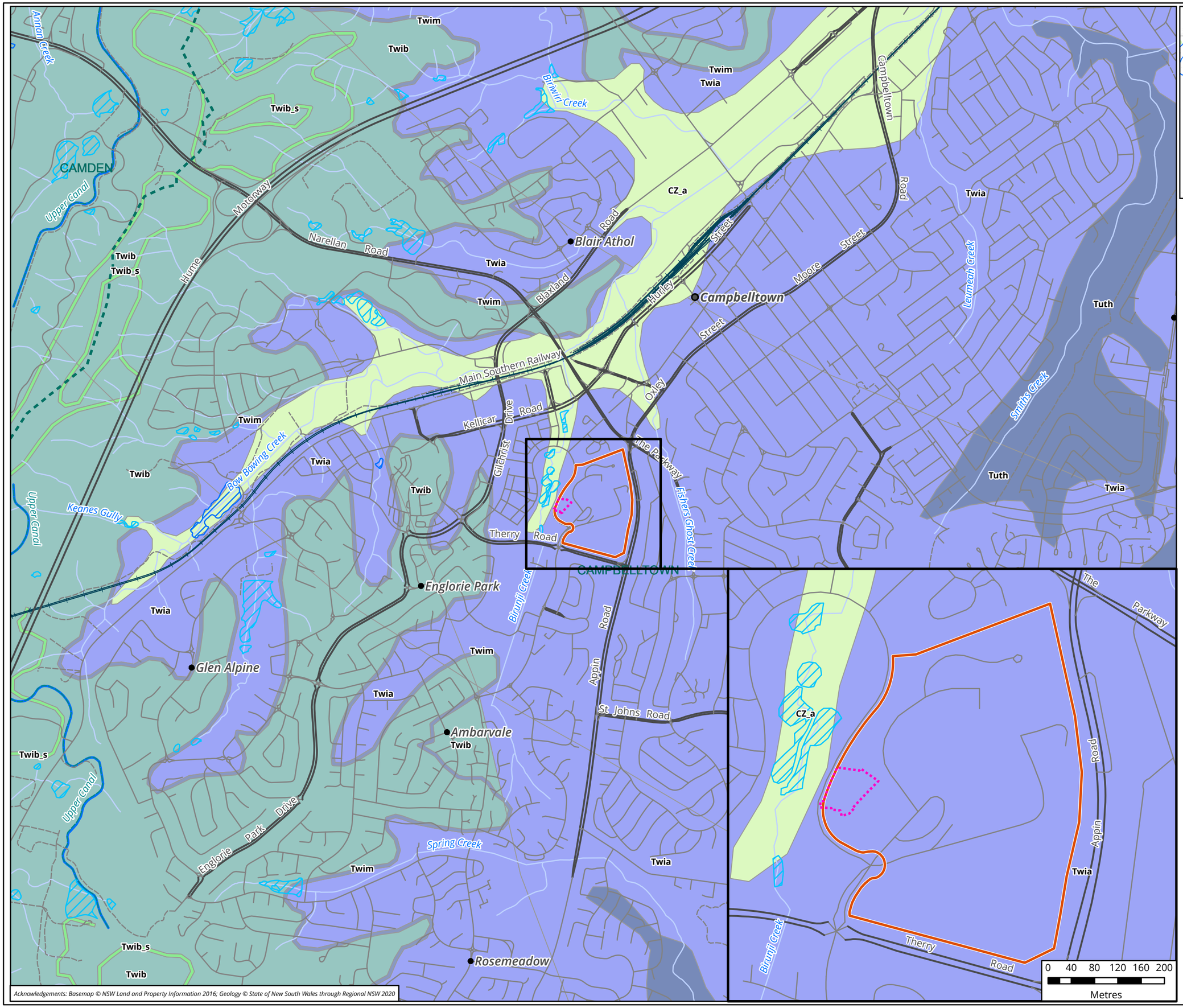

Figure 4 Geological units in the vicinity of the study area

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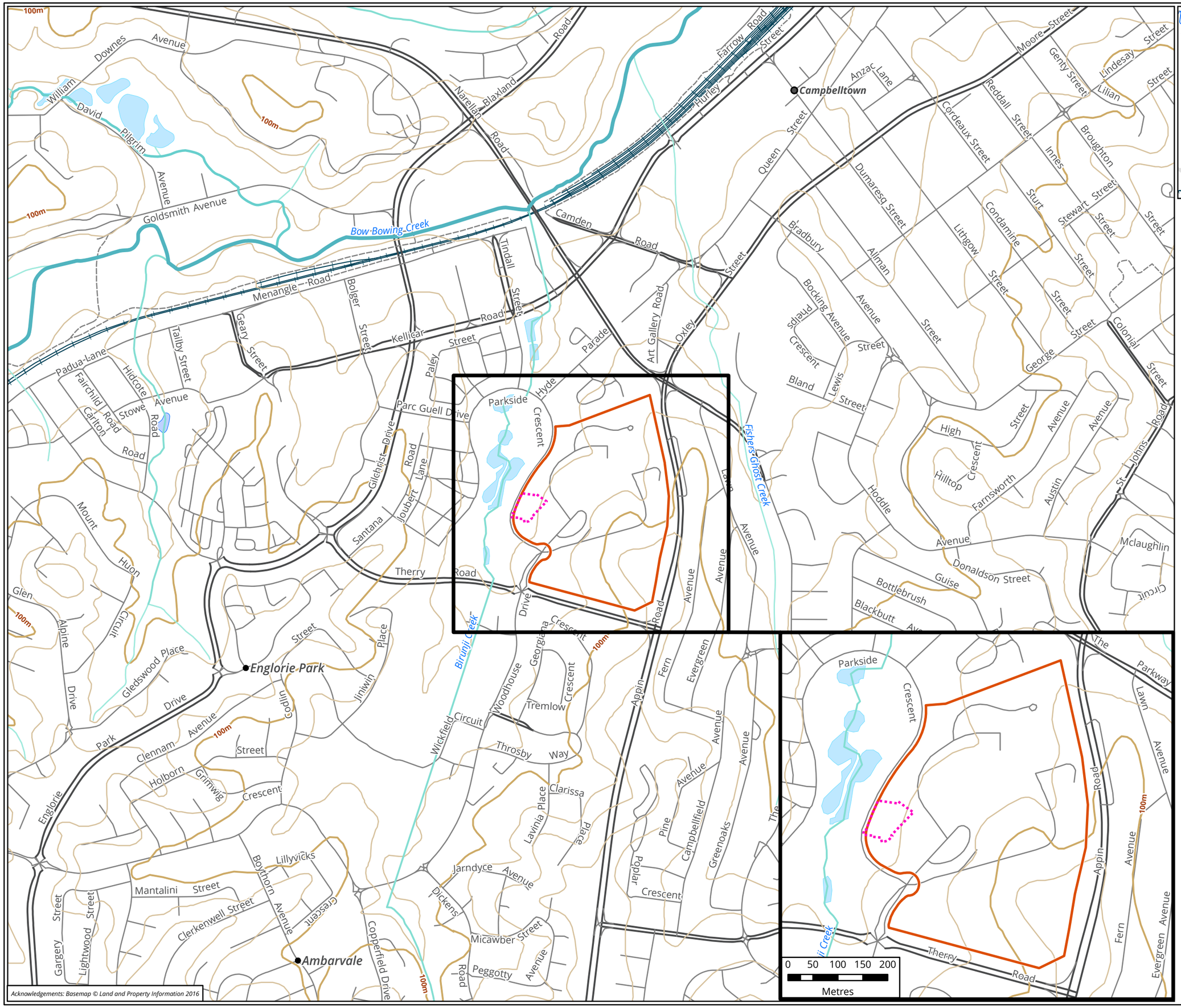

Figure 5 Hydrology and topography in the vicinity of the study area

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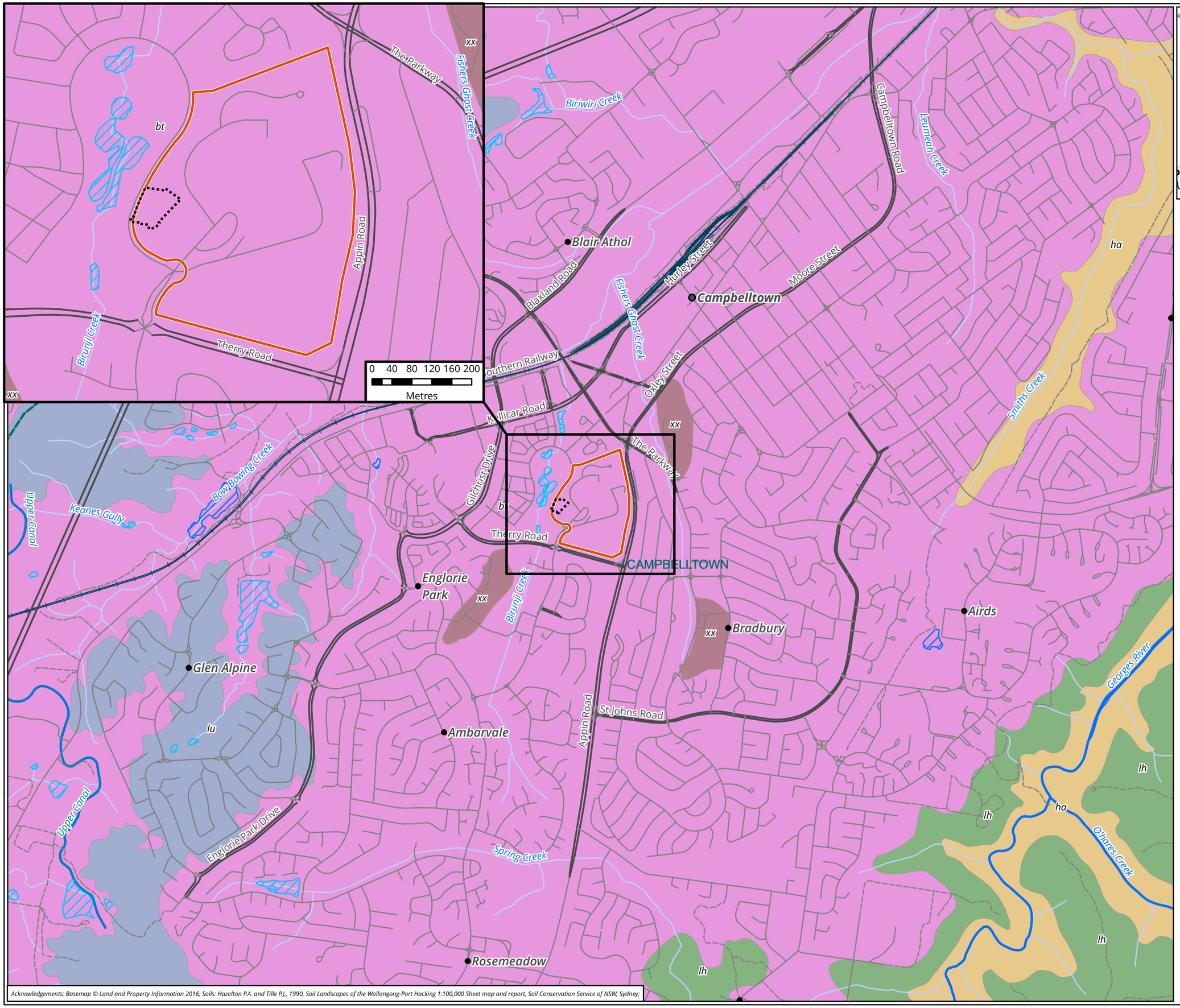

Legend

- Study area
- Impact area

Soil Landscape units

- bt - BLACKTOWN
- ha - HAWKESBURY
- lh - LUCAS HEIGHTS
- lu - LUDDENHAM
- xx - DISTURBED TERRAIN

Figure 6 Soil landscapes in the vicinity of the study area

0 200 400 600 800 1,000

Metres

Scale: 1:20,000@ A3

Coordinate System:
GDA 1994 MGA Zone 56

N

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Matter: 35567
Date: 13 October 2021,
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Location: P:\35500s\35567\Mapping\
35567_MMRC_ACHA_SoHI, Layout: 35567_ACHA_F6_Soils

Acknowledgements: Basemap © Land and Property Information 2016; Soils: Hazelton P.A. and Tille P.J., 1990, Soil Landscapes of the Wollongong-Port Hacking 1:100,000 Sheet map and report, Soil Conservation Service of NSW, Sydney;

3.1.3 Landscape resources

Within the Cumberland subregion of the Sydney Basin Bioregion there is a variety of vegetation types present. Grey Box *Eucalyptus moluccana*, Forest Red Gum *Eucalyptus tereticornis*, Narrow-leaved Ironbark *Eucalyptus crebra*, and Spotted Gum *Corymbia maculata* are present on shale hills. Hard-leaved Scribbly Gum *Eucalyptus sclerophylla*, Rough-barked Apple *Angophora floribunda*, and Old Man Banksia *Banksia serrata* are identified on alluvial sands and gravels. Broad-leaved Apple *Angophora subvelutina*, Cabbage Gum *Eucalyptus amplifolia*, Forest Red Gum *Eucalyptus tereticornis*, and Swamp Oak *Casuarina glauca* are present on river flats. Tall Spike-rush *Eleocharis sphacelata*, and Juncus with Parramatta Red Gum *Eucalyptus parramattensis* is noted around lagoons and swamps (Dunn & Sahukar 2003, p.193).

The Blacktown soil landscape would have typically supported open-forest and open-woodland that has been extensively cleared since European contact. Originally the Blacktown soil landscape would have featured woodland and open-forest of Forest Red Gum, narrow-leaved Ironbark, Grey Box and Spotted Gum (Bannerman & Hazelton 1990, p.29).

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 from eucalypts was used in the provision of shelter; a large sheet of bark being propped against a stick to form a gunyah (Attenbrow 2002, p.105). Swamp Oak bark could be used for the making of canoes, and Smooth-barked Apple for the making of baskets and bowls.

Native fauna that may have inhabited the area or its surrounds include the Koala *Phascolarctos cinereus,* Grey-headed Flying-fox *Pteropus poliocephalus,* Swamp Wallaby *Wallabia bicolor,* Common Ringtail Possum *Pseudocheirus peregrinus* and the Eastern Grey Kangaroo *Macropus giganteus*. Bird species which may have been present include the Sulphur-crested Cockatoo *Cacatua galerita*, Australian Raven *Corvus coronoides*, Welcome Swallow *Hirundo neoxena* and the Superb Fairy-wren *Malurus cyaneus.* Reptiles and amphibians could have included the Eastern Blue-tongue *Tiliqua scincoides,* Red-bellied Black Snake *Pseudechis porphyriacus,* Common Froglet *Crinia signifera* and the Peron's Tree Frog *Litoria peronii* (Atlas of Living Australia n.d.).

As well as being important food sources, animal products were also used for tool making and fashioning a myriad of utilitarian and ceremonial items. For example, tail sinews are known to have been used to make fastening cord, while 'bone points', which would have functioned as awls or piercers, are often an abundant part of the archaeological record. Animals such as Brush-tailed Possums, were highly prized for their fur, with possum skin cloaks worn fastened over one shoulder and under the other (Attenbrow 2002, p.107).

3.1.4 Land use history

The study area lies within land that was originally part of 100 acres (Portion 71) granted to John Bolger by Governor Macquarie in 1817 (Photo 3). Soon after it was granted, former convict and government surveyor James Meehan purchased the property (Primary Application 16350 and 12602, NSW Land Registry Services). Bolger's 100 acres was most likely tenanted by farmers as Meehan's main farm was Macquarie Fields at Ingleburn (Perry 1967).

Photo 3 Parish map showing John Bolger's 100 acre grant marked in red (Source: NSW Land Registry Services).

Adjoining the land to the north, a nine hole golf course was built in 1926. It was a rough course that was watered by rain and attended to by its members (Photo 4). The original course was closed, with a portion of it transferred to Lend Lease, and the remaining 30 acres was acquired by the NSW Health Commission in 1980 to enlarge Campbelltown Hospital.

Photo 4 **c.1950 photograph of Campbelltown Golf Course looking south. Appin Road is on the left and the site of the future hospital is marked with a red arrow (Source: Campbelltown and Airds Historical Society).**

During the 1920s, the Campbelltown Auxiliary Committee met to raise funds for Camden District Hospital, the Hospital for Infants and the Liverpool Ambulance Service. It was this committee that in 1952 concentrated their efforts to bring the long awaited hospital to Campbelltown (Perry 1967). An aerial photograph dated to 1951 shows that the entire study area has been cleared of vegetation (Photo 5). The boundary between two farms is visible within the central area and evidence of cropping, ploughing and agriculture can be seen throughout. An aerial photograph dated to 1963 shows the golf course located within the northern portion of the study area (Photo 6).

Photo 5 An aerial photograph dated to 1951, with the study area outlined in orange

Photo 6 An aerial photograph dated to 1963, with the study area outlined in orange

Construction began in 1974 just weeks following Gough Whitlams' release of funding. An aerial photograph dated to 1979 shows the initial development of the Campbelltown Hospital located within the central and western portion of the study area (Photo 7). The golf course can still be seen in the north.

Photo 7 An aerial photograph dated to 1979, with the study area outlined in orange

A second phase of development occurred in 1984 which included a maternity facility, Waratah House, a new entrance with offices and outpatient facilities, and a child care facility. This is visible within an aerial photograph dated to 1990 (Photo 8). This aerial shows further development within the central and eastern portion has occurred. The golf course in the north has also been removed.

Photo 8 An aerial photograph dated to 1990, with the study area outlined in orange

A third phase then occurred between 1998 and 2004 with the construction of a new five story clinical block, the Cancer Treatment Centre, Paediatric Ward, the Mental Health Building, the Youth Mental Health Building, the helipad and extensive roadworks and additional parking. An aerial photograph dated to 2005 shows this development within the study area, taking up much of the northern portion (Photo 9). Alterations have also occurred in already developed areas within the centre and the west of the study area. Birunji Creek that once transected the study area has been highly modified.

Photo 9 An aerial photograph dated to 2005, with the study area outlined in orange

Further development then occurred between 2011 and 2015 with a new six-storey acute services building, new Acute Health Services building, Campbelltown Hospital Main entry, new patient drop off zone, visitor parking, new landscape entry, new cafe, and refurbishment of some existing buildings. Development initiated in 2018 also includes the demolition of some existing structures, earth movements, construction of a 13 storey building, new internal hospital roads, carpark, tree removal and installation of associated services. A current aerial photograph shows these developments occurring (Figure 2).

3.2 Previous archaeological work

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

It is generally accepted that Aboriginal people have inhabited the Australian landmass for the last 65,000 years (Allen & O'Connell 2003, Clarkson et al. 2017). Dates of the earliest occupation of the continent by Aboriginal people are subject to continued revision as more research is undertaken. The timing for the human occupation of the Sydney Basin is still uncertain. While there is some possible evidence for occupation of the region around 40,000 years ago, the earliest known radiocarbon date for the Aboriginal occupation of the Sydney Basin is associated with a cultural / archaeological deposit at Parramatta, which was dated to 30,735 ± 407 Before Present (BP) (JMCHM 2005a, 2005b).

Archaeological evidence of Aboriginal occupation of the Cumberland Plain indicates that the area was intensively occupied from approximately 4,000 years BP (Dallas 1982). Such 'young' dates are probably more a reflection of the conditions associated with the preservation of this evidence and the areas that have been subject to surface and subsurface archaeological investigations, rather than actual evidence of Aboriginal people prior to this time.

3.2.1 Regional overview

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

Brayshaw McDonald Pty Ltd (1994) completed the Liverpool Rural Lands Study which reviewed the locations and site types of Aboriginal sites in rural areas to the west of Liverpool. The report identified that the distribution of sites was mostly dependent on topography, the bedrock formation of the area and the geology.

The report stated that shelter sites, art sites, and grinding grooves were likely to occur upon overlying sandstone formations where the appropriate topography and geology was present. Sites over the remainder of the Cumberland Plain were likely to consist of open artefact scatters, quarry sites, modified trees, and stone arrangements. The report noted that occupation within the area was likely to be similar to the northern Cumberland Plain, as the landscape and geology were extremely similar. As such, predictive site modelling was summarised following test excavations completed by Rich and McDonald in 1993:

- Most of the areas tested (either with sparse or no surface manifestations) contained subsurface archaeological deposits.
- Sites which were nearby permanent water sources tended to be more complex (i.e. they were representative of foci for larger groups or were used repeatedly by smaller groups over a long period of time) than sites on ephemeral or temporary water lines. Major creek confluences were prime site locations. Sparse sites also occur on major creeklines.
- Alluvial terraces (and other depositional environments) contain the best potential for intact archaeological remains. Some hillslope zones may also be intact and have archaeological potential. In areas where there is deep alluvium deposits, many sites also contain intact material below the plough zone. These sites often have artefact bearing deposit to a depth of 70-90 centimetres; with the plough zone reaching a maximum depth of 25 centimetres.
- Temporary and minor gullies tend to have been utilised as a one-off or occasionally during repeated visits by Aboriginal people in the past, hence lower density sites are usually present.
- A few sites were located by the testing programme upon ridgetops. These sites were located in close proximity to creeklines.
- While much of the Rouse Hill study area has been severely disturbed over the last 200 years, the areas tested on the whole revealed intact patterns in the archaeological material (Brayshaw McDonald Pty Ltd 1994, pp.20–21).

Brayshaw McDonald Pty Ltd (1995) subsequently undertook salvage excavations at site WH3 (Rich and McDonald 1995). A total of 3,686 artefacts were recovered and artefact densities were the highest within an alluvial terrace on the southern Cumberland Plain. The artefact-bearing deposit

reached a depth of between 150 to 300 millimetres along the terrace; and two silcrete knapping floors of approximately three metres by 2.5 metres, and 4 metres by 4 metres, were identified. The artefact assemblage was mostly silcrete, with some mudstone and quartz present. The majority of the assemblage comprised of debitage. A small component of the assemblage consisted of cores, backed artefacts and retouched pieces. The worked portion of the silcrete component and the mudstone component totalled 2.1 % and 8.8 %, respectively. Bipolar cores and flakes were also present within the quartz assemblage. The site was interpreted as a low to moderate density artefact scatter over much of the site, with two knapping features present where backed blades were manufactured. Brayshaw McDonald suggested that the site size and the variety of raw material and artefact types indicated multiple visits by Aboriginal people and specialised tool production.

Australian Museum Business Services (1997) undertook a large scale regional Aboriginal heritage study of part of the Cumberland Plain. The assessment focused on the representativeness of Aboriginal sites on the Cumberland Plain, assessing the effectiveness of the planning framework to achieve the aims of heritage management, and producing guidelines on the recognition of silcrete artefacts. The study examined all previously recorded archaeological sites and studies completed across the region, including field survey and subsurface investigation work. The report concluded:

- Previous archaeological investigation on the Cumberland Plain has not contributed significantly to a developed understanding of Aboriginal occupation and settlement patterns of the region. This was attributed to the isolated, small scale nature of the archaeological investigations dispersed throughout the region, and the use of intuitive and simple pattern recognition models and research designs. Further, where large scale research projects and models have been developed, they have not been adequately tested by ensuing investigations (Australian Museum Business Services 1997, p.i).
- Excavation projects have been limited and techniques have been restrictive and not interpreted the spatial structure of open sites adequately, as the focus of analysis has been on technology of the assemblages, limiting the interpretive potential of many archaeological investigations.
- Regional planning approaches are inadequate for the assessment and conservation of Aboriginal heritage throughout the region. This was attributed to development pressures, minor reserve coverage and limited opportunities for establishing new protected areas.

JMCHM (1999) undertook a large scale survey within the Rouse Hill area in advance of stage 2 infrastructure projects to take place there. This assessment included extensive background research and predictive modelling in order to characterise the study area, including a review of previous disturbance, landform, distance to watercourses and underlying geology in order to characterise potential sites within the area being studied and rank them according to their potential. It built on the results of a number of previous assessments within the area.

The survey identified a number of new sites, but it was noted that the overall coverage was poor, as much of the area being studied was covered by vegetation (JMCHM 1999, p.15).

The model of potential was based primarily on the level of land use impact identified throughout the area, with areas of low impact being assigned high potential, areas of moderate impact being assigned moderate potential, and areas of high impact being assigned low potential. As such, this assessment is more a reflection of identified potential throughout the study area, with its purpose being to inform the post-survey assessments of actual potential (JMCHM 1999, p.41). It was also noted in the predictive model that areas with low levels of previous land use disturbance should be used to identify areas of PAD.

Jo McDonald Cultural Heritage Management Pty Ltd (JMCHM) (2001) undertook an assessment at West Hoxton, for the South Hoxton Park Aerodrome Master Plan. The background research for the area suggested that artefact scatters would likely be associated with streams, with the size and number of sites increasing with stream order. It also noted that smaller scatters and isolated finds have the potential to be identified across a variety of landforms within the landscape, including hillslopes and ridge lines, away from water sources (JMCHM 2001, p.9). A total of two artefact scatters and nine PADs were identified by the investigation, with one previously identified site (artefact scatter) being relocated. A majority of the PAD sites were identified upon hillslopes which were often associated with spurs, and first and second order creeklines. Most of the PADs associated with hills slopes were assessed as having low to moderate potential, with JMCHM noting that the true potential of sites was difficult to assess in the absence of test excavations.

Central West Archaeological & Heritage Services (2002) completed an Aboriginal archaeological assessment for 7 kilometres of pipeline between Hoxton Park Release Areas and Liverpool Sewage Treatment Plant. The survey was carried out across areas of disturbed creek banks, upon alluvial floodplains and adjacent plains, and within predominately disturbed road corridors and areas of dense urban development. Alluvial floodplains were identified via predictive modelling to be areas of high archaeological sensitivity. However, it was determined that it was unlikely for sites to be identified upon floodplains within the proposed pipeline corridor, due to high levels of disturbance, and the flood prone nature of these areas. No Aboriginal sites were identified during the survey. Two areas of low disturbance located along the northern and southern banks of Cabramatta Creek at Hoxton Park, adjacent the Hinchinbrook Creek junction; and the northern bank and alluvial terrace at the second creek crossing of Cabramatta Creek, located approximately 400 metres east of Hinchinbrook Creek were recommended for monitoring.

JMCHM (2002) undertook an assessment of Areas 2, 5, 20, 22, and 24b of the Rouse Hill Infrastructure Project in the Second Ponds Creek Area. The initial sections of the assessment identified the majority of Area 20 as being in a zone of 'lesser' disturbance (JMCHM 2002, p.14). The regional predictive modelling used for this study was based on work undertaken throughout the 1990s and early 2000s in the Cumberland Plain, predominantly throughout the Rouse Hill area. It was stated that:

- *"It is predicted that the size (density and complexity) of archaeological features will vary according to the permanence of water (i.e. ascending stream order), landscape unit and proximity to lithic resources in the following way:*
  - *In the headwaters of upper tributaries (i.e. first order creeks) archaeological evidence will be sparse and represent little more than a background scatter.*
  - *In the middle reaches of minor tributaries (second order creeks) will be archaeological evidence for sparse but focussed activity (e.g. one-off camp locations, single episode knapping floors).*
  - *In the lower reaches of tributary creeks (third order creeks) will be archaeological evidence for more frequent occupation. This will include repeated occupation by small groups, knapping floors (perhaps used and reused), and evidence of more concentrated activities.*
  - *On major creek lines, such as the lower reaches of Second Ponds and Caddies Creeks (fourth order), there will be archaeological evidence for more permanent or repeated occupation. Sites will be complex and may even be stratified.*
  - *Creek junctions may provide foci for site activity; the size of the confluence (in terms of stream ranking nodes) could be expected to influence the size of the site.*

- *Ridgetop locations between drainage lines will usually contain limited archaeological evidence, although isolated knapping floors or other forms of one-off occupation may be in evidence in such a location.*
- *Naturally outcropping silcrete will have been exploited and evidence for extraction activities (decortication, testing and limited knapping) would be found in such locations.*
- *Sites in close proximity to an identified stone source would cover a range of size and cortex characteristics. As one moves away from the resource, the general size of artefacts in the assemblage should decrease, as should the percentage of cortex. The increasing number of new (in particular) silcrete sources has made the testing of the distance decay model* (Dallas & Witter 1983) *more difficult, and suggests that this model is a poor mechanism for explaining raw material preferences around the Plain."* (JMCHM 2002, pp.15–16).

This predictive model, and variations upon it, has formed the base standard for predictive modelling in the Cumberland Plain region for the past decade, with a large numbers of reports drawing on it to develop their own predictions of sites that will be present in a given area. Stream order is given precedence as an indicator of permanent, reliable watercourses, which in the Cumberland Plain occurs at the confluence of two second or third order creeks (JMCHM 2002, p.12).

The local predictive model stated that surface artefacts (predominantly silcrete) were likely to occur in open locations on shale bedrock, but were unlikely to be present in large numbers unless in a disturbed context. Areas of PAD should be marked based on low disturbance caused by previous land use. Shelter sites would not be found, but open grinding grooves may be found in sandstone or shale/sandstone transition areas. There was some potential for scarred trees to occur in areas of original vegetation.

The survey identified four new sites within its study area, as well as eighteen previously recorded sites and nine PADs (which were not recorded as sites on the AHIMS register). Of these sites, four were isolated finds, seven were open camp sites, ten were open camp sites with PADs, and one was an open camp site with grinding groove. The majority of these sites were located in the Ashfield Shale or Quaternary Alluvium geological formations. The majority of artefacts identified by survey were made of silcrete.

JMCHM (2006) completed an Aboriginal archaeological assessment of the Western Sydney Parklands Bungarribee precinct and interface lands, as part of the Western Sydney Region Parklands Project. Predictive modelling indicated that Aboriginal sites are likely to occur in various densities across the Cumberland Plain. Areas of archaeological potential are more likely to occur in areas where limited disturbance has occurred. It was also concluded that the absence of surface artefacts does not support an absence of subsurface deposits. The survey identified a total of 52 sites, 18 of which were previously unrecorded, and five of which were defined as areas possessing PAD. Of these sites, 22 possessed moderate or high archaeological potential. McDonald argues that the continuous presence of surface artefact sites within the study area suggests that these sites are exposures of more extensive subsurface deposit.

White and McDonald (2010) undertook a review of previous work in the Rouse Hill development area, discussing lithic artefact distribution in previous excavations carried out by JMCHM in 2008. The study considered a number of factors including stream order, distance from water, landform, aspect, and distance to silcrete sources. As a result of the assessment, the following statements were made:

- Stream order: water supply was a significant factor influencing Aboriginal land use and habitation in the area. There was a correlation between increasing stream order and larger

numbers and higher densities of artefacts (from a comparison of first, second, and fourth order streams).

- Distance from water: the results showed that an assumption that sites would be clustered within 50 metres of water sources was not entirely correct from the data available. In first order stream landscapes, there was no significant correlation between artefact distribution and distance to water. In second order landscapes, artefact density was highest within 50 metres of water, and then declined with increasing distance. In fourth order landscapes, density was highest between 51-100 metres from water.
- Landform: Artefact density was considered to be lowest on upper slopes and ridgetops, with density increasing on mid and lower slopes. Density was highest in terrace landforms, and lower on creek flats, likely due to repeated flooding events and the erosion they caused.
- Distance to silcrete sources: the results of the study showed no significant difference between sites located closer to or further away from silcrete sources. However, 6 kilometres was the maximum tested distance from silcrete sources, so the sample is only representative of a limited area.
- Aspect: only appeared to have an influence on sites in the lower parts of valleys may have been sited to take advantage of steady factors such as the rising/setting sun and wind direction. Sites in higher parts of valleys may have been influenced by weather and other factors.

The study concluded that landform and distance from water had an impact on site distribution, with artefacts becoming more numerous closer to creeks, and along higher order creeks. It also found that although artefacts are found on all landforms, landform type influences artefact distribution, with the preference being for slightly elevated, well-drained areas in the lower parts of valleys.

More recent archaeological work (AECOM 2010) has indicated that while the most recognised Cumberland Plain predictive modelling is most relevant, it is not always typical. Archaeological material tends to occur anywhere on the Cumberland Plain and that while the size and frequency of sites can be linked with stream order, the complexity of sites cannot.

Kelleher Nightingale Consulting (KNC) (2010) undertook an Aboriginal heritage assessment of the Area 20 precinct of the North West growth centre for the NSW Department of Planning, to the north-west of the study area. The study involved broad assessment and survey of the area to inform precinct planning, zoning, and layout. Based on the results of previous assessments in the vicinity of the study area, KNC developed a predictive model which stated the following (Kelleher Nightingale Consulting 2010, p.18):

- Stone artefacts are likely to occur across the entire study area.
- The highest artefact numbers and densities will be associated with the margins of Second Ponds Creek.
- Artefact densities are likely to be quite low on the higher upper slope and crest landforms within Area 20. Although artefacts may not be observed on the surface during field survey they are likely to be present in a subsurface context.
- The subsurface archaeological context across Area 20 would not necessarily have been heavily disturbed by ploughing and/or vegetation clearance.

This model was based on the findings of Australian Museum Business Services (2000), JMCHM (2002), and a number of other surface and subsurface investigations that have taken place in the vicinity of

Area 20. It noted that the results of multiple excavations had indicated that low artefact densities were consistently recorded on upper slopes and crests in the area (Kelleher Nightingale Consulting 2010, p.17). It was also noted by KNC that previous predictive models had placed a large emphasis on the idea that more complex sites would be identified in close proximity to streams, but that that potential had been demonstrated by the results of excavations carried out by Therin (2004), which had identified artefacts in a range of landforms, but that the highest artefact densities were located in the margins of Second Ponds Creek.

The majority of sites identified in the survey were located on lower and mid slopes, with some being present on upper slopes and crests as well as one on a creek flat. A total of 19 artefact sites and seven PADs were identified during the survey.

The results of the survey largely confirmed the predictive statements made in the predictive model. Stone artefacts formed the majority of identified sites, and were located across a variety of landforms, as well as being well distributed throughout the study area. The majority of sites were located away from upper slopes and crests, and those that were located on these landforms were low density scatters and isolated finds (although it is noted that all scatters were of low density). The sites with the largest artefact counts were located within 150 metres of Second Ponds Creek. As the assessment did not involve subsurface investigations, it is not possible to judge the accuracy of that portion of the predictive model.

Archaeological and Heritage Management Solutions Pty Ltd (AHMS) (2015) was commissioned by the Department of Planning and Environment (DPE) to undertake an Aboriginal and historic heritage gap analysis of the Greater Macarthur Investigation Area (GMIA). The purpose of the gap analysis was to identify the cultural heritage values of the area and to recommend any further investigations required. The assessment consisted of a review of existing Aboriginal and historical heritage assessments for the region, determination of areas which have been subject to minimal or no previous assessment, and the identification of areas of known Aboriginal and historical heritage significance. The assessment found that the GMIA contained a number of areas which may contain evidence of Aboriginal and European contact archaeology, particularly near Menangle and Menangle Park. A total of 323 AHIMS sites have been recorded within the GMIA, with the vast majority being recorded in areas which have been subject to previous assessment as a result of development activities. The assessment found that artefact sites are identified commonly throughout the Cumberland Plain region which makes up the vast majority of the GMIA. Artefact sites are found generally within 200 metres of the larger river systems within the region, however some artefact sites were recorded up to 500 metres from a larger river system. The eastern portions of the GMIA located within the Sydney Cataract region, contained higher instances of rockshelters and other closed sites. These are frequently found along creek-lines where the sandstone geology allows for the formation of such natural features. Predictive modelling conducted as part of the assessment found that there is high potential for Aboriginal sites and objects to be identified in close proximity to the Nepean, Cataract and Georges Rivers, and Allens, Elladale, Clemens, Cascade, and Wallandoola, creeks. The Georges River, Allens Creek, Elladale Creek and headwaters of the Cataract River (including Wallandoola creek) were assessed as having the highest potential for scientifically significant deposits due to lower levels of development in these areas along with these areas having higher elevations suggesting they have not been heavily disturbed by inundation events.

3.2.2 Local overview

A number of Aboriginal cultural heritage investigations have been conducted within the local area (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.

Jo McDonald Cultural Heritage Management (1990) undertook an archaeological survey at Menangle Park, located approximately 4 kilometres south west of the study area. During the survey two artefact scatters were identified, Menangle Park 1 (AHIMS# 52-2-1597/Menangle Park 1) and Menangle Park 2 (AHIMS# 52-2-1598/Menangle Park 2). Menangle Park 2 is located within 200 metres of the western border of the current study area. Both sites were located upon ridgelines adjacent to the Nepean River and an unnamed creek line. The raw materials observed at both sites were pink and red silcrete including flakes, geometric microliths, backed blades and a thumbnail scraper. It was concluded that these sites were likely highly disturbed due to recent development within the study area and past agricultural activities.

Brayshaw McDonald Pty Ltd (1991) conducted test excavations and surface collection of three Aboriginal sites in Menangle Park, located approximately 4 kilometres south west of the study area. Two small artefact scatters were relocated (AHIMS # 52-2-1597/Menangle Park 1 and AHIMS# 52-2-1598/Menangle Park 2). These were located upon a ridgeline and composed of red silcrete flakes, backed blades and thumbnail scrapers. During test excavations a third site was identified (AHIMS # 52-2-1007/Menangle Park 3). It was found that all sites were severely disturbed and displayed evidence of erosion. Numerous historical artefacts were also identified.

HLA ENSR (2007) conducted a ACHA of a number of gas wells, associated infrastructure and post development activities, as part of Stage 2 of the Camden Gas Project, located in Spring Farm (5 kilometres west of the study area) and Menangle Park (4 kilometres south west of the study area).

The survey identified 21 sites considered to have been previously unrecorded, which consisted of ten open artefact scatter sites and 11 open isolated artefact sites. Most of the sites were located on vehicle tracks and landforms, with the exception of two sites located on a crest and slope of a low ridge. In total stone artefact material associated with these sites consisted of silcrete and quartz predominantly, chert, mudstone and fine-grained material. These sites and their coordinates do not appear to have been registered with AHIMS. These sites have been mapped for the purposes of this assessment based on indicative locations provided on an aerial photograph by HLA-ENSR.

Notable areas of erosional exposure were vehicle tracks with generally limited visibility outside of the tracks due to vegetation cover.

Areas of high sensitivity were identified at the following locations:

- Near major creek lines (second order or higher).
- Elevated areas, particularly near creek lines, including the crest north of Jack's Gully Waste Management.
- Low lying land around S1, AHIMS 52-2-3256/MPFIF 01, and AHIMS 52-2-3238 (HLA ENSR 2007, p.35).
- High ridge, upon which S8, S9 and S10 are located, considered to be associated with high density sites and undisturbed deposits (HLA ENSR 2007, pp.35–36).

Areas of moderate sensitivity were identified at the following locations:

- First order creeks.

- Erosional channels.
- At reasonable distances from greater water ways, for example, the Nepean River.

Areas of low sensitivity included steep terrain, slopes, highly eroded areas, and areas disturbed by modern human land use including access roads, infrastructure services and residential development.

AECOM (2010) completed an archaeological survey as part of the Camden Gas Project Northern Expansion project in rural areas of Currans Hill, Varroville, Raby and Denham Court in the Camden and Campbelltown LGAs. The general predictive model used for the Cumberland Plain was utilised, in that the most likely Aboriginal archaeological sites to be encountered would be stone artefact scatters or isolated finds. The results of the survey generally reflected the predictive modelling, with the majority of the 28 newly identified sites (11 isolated artefact finds, 12 open campsites, three scarred trees) located close to first and second order drainage lines, or on ridge and hill crests, but also in a disturbed context.

GML (2011) undertook a heritage assessment for the Campbelltown Hospital Stage 1 Redevelopment, which includes the study area. Background research identified no previously recorded historical or AHIMS sites to be present within the study area. The landforms and presence of nearby waterways was used to determine potential for artefacts to be present in undisturbed areas. However, high erosional hazard of underlying geology and previous land use causing disturbance was used to determine low potential for sites to remain within the study area. A survey of the site focused on areas of potential, which were determined to be the southeast corner and western boundary. No sites were recorded and the site was determined to have no potential for intact sites due to the significant development and modification of original landforms across the site. All landforms within the western portion and associated with Birunji Creek were significantly modified. Within the rest of the study area, soil horizons have been modified to create 10 metre high levee banks. Further landform modifications included altering original slopes to create buildings and facilities.

Austral Archaeology (2012) conducted an Aboriginal archaeological and cultural heritage assessment for the Campbelltown Hospital Stage 1 Redevelopment, which includes the study area. This report followed on from the assessment conducted by GML (2011). As no Aboriginal people were involved in the survey, consultation as undertaken. This process identified that the landscape was previously used by Aboriginal people, however due to the highly disturbed nature it is unlikely that any archaeological sites remain. No further assessment was recommended.

Australian Museum Business Services (AMBS) (2012) conducted a wide-ranging report, assessing the entirety of the Austral and Leppington North precincts for the Urban Form Analysis of the South West Growth Centres (approximately 5 kilometres north of the study area). Surveys were targeted at accessible properties. The results of the survey were combined with the existing regional model and a review of studies within the local area in order to provide sensitivity mapping for the entirety of the Austral and Leppington North precincts. AMBS determined the following within their predictive modelling (Australian Museum Business Services 2012, p.56):

- The most common site type to occur within the area would be stone artefact sites. This site type would usually consist of low density artefact scatter or isolated finds.
- The detection of artefact sites increases with high levels of ground surface visibility and exposure.
- Site are more frequently identified in close proximity to permanent water sources like Kemps and Bonds Creek, upon creek banks, alluvial flats and topographies.

- Larger artefacts sites of higher densities are often found in associated with stream confluences or permanent water sources.
- High density subsurface deposits can be present up to 250 metres from water sources.
- Undisturbed alluvial soils have the potential to be associated with stratified archaeological deposits.
- Subsurface archaeological material may be greater than present on the surface.

The results of the survey largely confirmed this predictive model, with AMBS identifying seven new sites, including six isolated finds and one artefact scatter with PAD. The report defined moderate sensitivity as "artefacts in detectable densities are known to occur in the area, or in similar environmental/landscape contexts within the region", and high sensitivity is "artefacts known to occur in high densities in the area, or are consistently identified in similar environmental/landscape contexts, and are highly likely to be detected and disturbed during ground disturbance works and archaeological excavations" (Australian Museum Business Services 2012, p.72).

Biosis (2012) undertook an ACHA and archaeological survey for a large area in the Campbelltown and Camden areas as part of the Camden Gas Project, 687 metres north of the study area. The predictive model prepared for the archaeological survey was based on site distribution in relation to landscape descriptions, consideration of site type, raw material types and site densities likely to be present within the site, findings of ethnohistorical research on the potential for material traces to be present, potential use of natural resources available or previously available within the project area, and consideration of the temporal and spatial relationships of sites within the site and surrounding region. The model proposed there was high potential for flaked stone artefact scatters and isolated artefacts and PADs, but low potential for other Aboriginal site types, such as grinding grooves, scarred trees and Aboriginal places. The survey consisted of 69 transects, which resulted in the identification of 39 Aboriginal sites and two PADs, of which there were five newly identified sites. The majority of sites were open lithic scatters and isolated artefact finds, with several scarred trees also identified. Almost all of the sites were considered to be situated within a disturbed context.

Niche Environment and Heritage (Niche) (2013) conducted an ADDA for a proposed residential and business zone development at Maryfields Estate, Campbelltown, NSW located approximately 900 metres to the north of the current study area. The study area was found to have been subject to high levels of previous disturbance, however one area of PAD (Maryfields PAD1) was recorded along an undisturbed creekline, while one isolated artefact consisting of a broken ground edged axe fragment (Maryfields AS1) was identified in association with the area of PAD. The area of PAD measures 50 by 100 metres on the northern side of a creek terrace. The northern side of the creek was considered less likely to have been impacted on by inundation events and contained areas of remnant native vegetation. The area of PAD is located within the Blacktown soil landscape, a residual soil landscape. Residual soil landscapes have reasonable potential to contain archaeological deposits in an open context, such as stone artefacts derived from occupation sites. The portion of the study area within the Luddenham soil landscape was found to be highly disturbed and assessed as having a low potential for intact soil deposits due to the high erosion potential of the soils present. Niche recommended that further works in the form of an ACHA and AHIP would be required if the proposed works could not avoid Maryfields AS1 and Maryfields PAD1.

GML (2016) conducted an archaeological excavation and assessment of Stockland's land in east Leppington approximately 4 kilometres north of the study area, prior to the development of the residential estate Willowdale. Predictive modeling of the area has shown that Aboriginal people occupied East Leppington over 5,000 years. Areas along Bonds Creek were used as camping sites

meanwhile areas of tool manufacture and procurement was resource specific. Both survey and excavation were used to understand the area. In total, 12 locations were excavated over a total of 487 square metres. Of these, 7,956 lithic artefacts and 21 features were identified. Features included eight ground ovens, hearths, clay extraction pits and modified trees. Dominant material types were silcrete, mudstone (IMSTC) and quartz, comprising 66%, 25% and 8% of finds respectively. Tool types included anvils, hammers and a possible grindstone fragment. Backing was visible in artefacts from all but two excavation areas (OA4 and OA11). A total of 253 cores and core fragments were also recovered, mostly of silcrete.

Overall, GML identified an area of domestic activity (associated with hearths and ovens), and an area of ceremonial activity associated with red paint pits, culturally modified trees and unusual stone arrangements. Pits at the base of these trees suggest evidence of landscape use unique to this particular area of the site.

Biosis Pty Ltd (2018) undertook an Aboriginal archaeological survey report for the Campbelltown Hospital redevelopment (stage 2), which includes the study area. Background research identified that this study area had low archaeological potential due to significant disturbance. These disturbances included the stripping of top soil, large-scale excavation, cutting and benching of the landscape, importing of material for fill, installation of services, construction of underground carparks, installation of roadways, and landscaping of the grounds. The assessment concluded that the combined effects of these activities had impacted upon the preservation and integrity of any cultural materials that may have been present. This assessment was based off two previous Aboriginal heritage assessments undertaken by GML and Austral Archaeology. GML (2011, p.27) stated that 'the subject area contains no previously recorded Aboriginal sites and has no archaeological potential for Aboriginal sites to be located within an intact subsurface context'. This was supported with consultation from registered Aboriginal stakeholders. Austral Archaeology (2012) agreed with GML's assessment and concluded that there was a low likelihood of Aboriginal cultural material or deposits being impacted by the proposed works. The survey identified no Aboriginal sites or PADs.

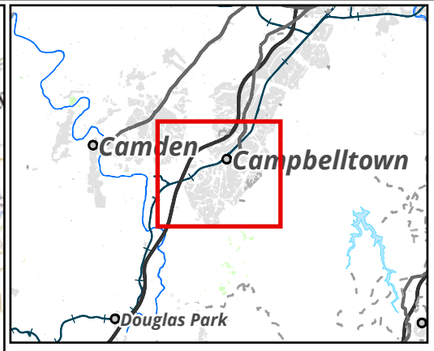
3.2.3 AHIMS site analysis

A search of the AHIMS database (Client Service ID: 613371) identified 85 Aboriginal archaeological sites within a 3 by 3 kilometre search area, centred on the 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 details 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 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 94 results presented here, compared to the 85 sites identified in AHIMS.

Table 3 AHIMS site type frequency

Site type	Number of occurrences	Frequency (%)
Artefact	63	67.02
Potential Archaeological Deposit	19	20.21
Art (pigmented or engraved)	4	4.25
Open camp site	3	3.19
Modified tree	3	3.19
Shelter with art	2	2.13
Total	94	100.00

A simple analysis of the Aboriginal cultural heritage sites registered within the 3 by 3 kilometre buffer of the study area indicates that the most common site type is artefact at 67.02% (n=63), followed by PAD at 20.2% (n=19). Art (pigmented or engraved) represented 4.25% of the total assemblage (n=4), with open camp site and modified tree representing 3.19% (n=3) respectively and shelter with art representing 2.13% (n=2).



Legend

- Study area
- AHIMS

NOT TO BE MADE PUBLIC

Figure 7 AHIMS in the vicinity of the study area

0 200 400 600 800 1,000

Metres
Scale: 1:30,000@ A3
Coordinate System:
GDA 1994 MGA Zone 56

N

biosis

Matter: 35567,
Date: 31 August 2021,
Drawn by: SB, Checked by: AB, Last edited by: sblades
Location: P:\35500s\35567\Mapping\
35567_MMRC_ACHA_SoHI, Layout: F7_AHIMS

3.3 Discussion

The study area is situated within the Cumberland Lowlands which features undulating plains and low hills with dense drainage lines. The location of the study area in the Wianamatta Group geological formation and the residual Blacktown soil landscape indicates potential for archaeological deposits within the study area if undisturbed. The topography of the study area has been disturbed through pastoral and modern development. While currently no watercourses are present within the study area, Bunji Creek was previously present within the central portion. A number of low to moderately high order creek lines surround the study area.

A search of the AHIMS register identified 85 sites to be located within the vicinity of the study area, with the most common site type being artefact. Previous assessments in the Campbelltown region (Biosis 2021, McCardle Cultural Heritage 2018, GML 2016, GML Heritage Pty Ltd 2012) identified the region to contain moderate to low density artefact scatters and isolated finds, with potential limited by agriculture and residential development. Historical aerials provide evidence of previous land use within the area, showing significant land modification and development throughout.

Previous assessments conduced within the study area by Austral Archaeology (2012), GML (2011), and Biosis (2018) have identified that there is low archaeological potential within the study area due to extensive historical and modern disturbances removing any potential for intact archaeological deposits.

3.3.1 Predictive statements

A series of predictive statements have 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.

These statements are based on:

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

Table 4 indicates the site types most likely to be encountered across the present study area. The definition of each site type is described firstly, followed by the predicted likelihood of this site type occurring within the study area.

Table 4 Aboriginal site prediction statements

Site type	Site description	Potential
Flaked stone artefact scatters and isolated artefacts	Artefact scatter sites can range from high-density concentrations of flaked stone and ground stone artefacts to sparse, low-density 'background' scatters and isolated finds.	Low: Stone artefact sites have been previously recorded in the region across a wide range of landforms including alluvial flats, they have potential to be present in undisturbed areas. Given the level of previous disturbance present across the study area this site type is unlikely to be present.
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 study area. There is some potential for shell middens to be located in vicinity of permanent water sources. There is a low potential of Shell Middens being present within the study area due to the high levels of previous disturbance and absence of permanent water sources within the study area.
Quarries	Raw stone material procurement sites.	Low: There is no record of any quarries being within or surrounding the study area.
Potential archaeological deposits (PADs)	Potential sub surface deposits of cultural material.	Low: PADs have been previously recorded in the region across a wide range of landforms including alluvial flats. They have the potential to be present in undisturbed landforms. Given the level of previous disturbance present across the study area this site type is unlikely to be present.
Axe grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	Low: The geology of the study area lacks suitable horizontal sandstone rock outcrops for axe-grinding grooves. Therefore there is low potential for axe grinding grooves to occur in the study area.
Burials	Aboriginal burial sites.	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.
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.

Site type	Site description	Potential
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.
Modified trees	Trees with cultural modifications	Nil: Due to extensive vegetation clearing from the 1800's onwards no mature trees have survived within the study area.
Rock shelters with art and / or deposit	Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground characterised by cliff lines and escarpments. These naturally formed features may contain rock art, stone artefacts or midden deposits and may also be associated with grinding grooves.	Nil: The sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space exist, which are not present in the study area.

4 Archaeological survey

An archaeological survey of the study area was undertaken on 23 September 2021 by Biosis Archaeologist Ashley Bridge and representative of Darug Custodian Aboriginal Corporation, Dominic Wilkens. The archaeological 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 those portions of the study area that would be subject to impacts by the proposed works in addition to covering remaining portions of the study area (Figure 3). The survey consisted of one meandering transect across visible and accessible landforms within the study area. Surveyors were spaced approximately 2 metres apart for effective ground coverage. 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.

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 recorded during the survey included:

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

Where possible, identification of natural soil deposits within the study area was undertaken. Photographs and recording techniques were incorporated into the survey including representative photographs of survey units, landform, vegetation coverage, GSV and the recording of soil information for each survey unit where possible. 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 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 limited GSV, exposure and disturbance. Low GSV and exposure limited the effectiveness of the survey, as it was difficult to ascertain whether any surface Aboriginal artefacts were present within the study area, while the existing development reduced surface visibility and access. A number of areas within the central portion, the east and south were inaccessible due to current development and fencing of these areas (Photo 10).

Photo 10 Current development and fencing within the central portion fo the study area

4.4 Archaeological survey results

A total of one meandering transect was walked across all accessible landforms with the surveyors walking two metres apart (Figure 8). Specific focus was placed on the impact area within the western portion of the study area. No Aboriginal sites or PADs were identified in the study area. The results from the survey have been summarised in Table 5 and Table 6 below.

Table 5 Survey coverage

Survey unit	Landform	Survey unit area (m²)	Visibility (%)	Exposure (%)	Effective coverage area (m²)	Effective coverage (%)
1	Gentle slope to slope	193390.72	5	5	4186.68	2.16

Table 6 Landform summary

Landform	Landform area (m²)	Area effectively surveyed (m²)	Landform effectively surveyed (%)	No. of Aboriginal sites	No. of artefacts or features
Gentle slope	83393.61	3687.24	4.42	0	0
Slope	109997.11	499.44	0.45	0	0

4.4.1 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 throughout the majority of the study area was nil (0%) due to the extensive levels of development, landscaping and grass coverage (Photo 11, Photo 12, Photo 13, Photo 14 and Photo 15). Some areas of visibility were present in high traffic grassed areas (Photo 16).

Photo 11 Photograph of helipad within the western portion of the study area showing low GSV due to grass and concrete coverage

Photo 12 Built up helipad area covering natural ground surface

Photo 13 Photograph within the central portion of the study area showing low GSV due to development and concrete coverage

Photo 14 **Photograph of the study area showing low GSV due to grass, road and development**

Photo 15 **Photograph of the study area showing low GSV due to asphalt carpark and developemnt**

Photo 16 Photograph showing an area of visiblity within a high traffic grassed area.

4.4.2 Exposure

Exposure refers to the geomorphic conditions of the local landform being surveyed, and attempts to describe the relationship between those conditions and the likelihood the prevailing conditions provide for the exposure of (buried) archaeological materials. Whilst also usually expressed as a percentage estimate, exposure is different to visibility in that it is in part a summation of geomorphic processes, rather than a simple observation of the ground surface (Burke & Smith 2004, p.79, DECCW 2010a). As with GSV, exposure across the majority of the study area was nil (0%) due to extensive development, landscaping and grass coverage impacting the remaining ground surface (Photo 11 Photo 13 Photo 14 and Photo 15). Areas of higher visibility were associated with high pedestrian traffic routes within grassed areas (Photo 12, Photo 16, Photo 17 and Photo 18).

Photo 17 Ground exposure in high pedestrain traffic area

Photo 18 Exposure within grassed area

4.4.3 Disturbance

Disturbance in the study area can be 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.

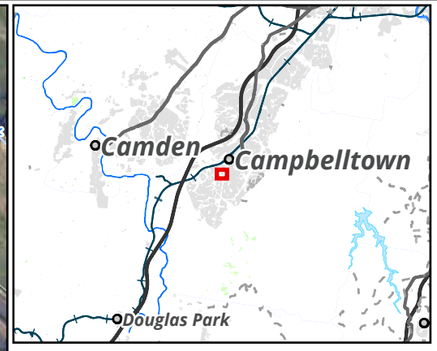
Disturbances associated with recent human action are prevalent in the study area and cover large sections of the land surface. The agents include industrial development such as landscaping and construction of carparks (Photo 22 and Photo 21), roads and buildings (Photo 20); prior farming practices, such as initial vegetation clearance for creation of paddocks, fencing and stock grazing; agricultural practices such as fruit orchards; and creation of artificial dams and golf course. Extensive disturbance has occurred throughout the entirety of the study area primarily due to the development of multiple hospital structures (Photo 21 and Photo 20) and associated services (Photo 19 and Photo 20), carparks, landscaping and current development (Photo 22 and Photo 10).

Photo 19 Electrical services

Photo 20 Campbelltown Hospital building and helipad

Photo 21 Large multistorey carparking

Photo 22 Roads, landscaping and current development



Legend

- Study area
- Survey tracks

Area of archaeological potential

- Low potential

Figure 8 Survey results and coverage

0 20 40 60 80 100

Metres

Scale: 1:2,500@ A3

Coordinate System:
GDA 1994 MGA Zone 56

N

biosis

Matter: 35567,
Date: 06 October 2021,
Drawn by: SB, Checked by: ML, Last edited by: sblades
Location: P:\35500s\35567\Mapping\
35567_MMRC_ACHA_SoHI, Layout: 35567_SoHI_F8_SurveyResults

4.5 Discussion of archaeological survey results

The archaeological survey consisted of a single meandering transect throughout the extent of the study area, focusing on the development impact area and sampling the accessible landforms within the study area. The majority of the study area is located within a sloped landform that has been highly modified due modern developments associated with the Campbelltown Hospital. As the majority of the impacts are occurring throughout areas of previous disturbance, the survey first attempted to target areas that would be impacted and contained minimal disturbance, and then sought to survey the remaining areas within the study area.

As the study area previously contained and is surrounded by a number of creek lines, it likely held archaeological potential for artefact scatters and PAD sites (GML 2011, Austral Archaeology 2012). As a residual and slowly accumulating landscape, the Blacktown soil landscape holds potential for these site types when undisturbed. However, a review of historical aerials show that the study area has been extensively disturbed by tree clearance and agricultural practices throughout, and the construction of buildings and landscaping activities associated with Campbelltown Hospital taking up the majority of the study area, particularly within central portions.

Previous assessments of the study area conducted by Austral Archaeology (2012), GML (2011), and Biosis (2018) have identified that there is low archaeological potential within the study area due to extensive historical and modern disturbances removing any potential for intact archaeological deposits. The disturbances associated with the construction of the hospital would have included the stripping of top soil, large-scale excavation, cutting and benching of the landscape, importing of material for fill, installation of services, construction of underground carparks, installation of roadways, and landscaping of the grounds. All of these activities would have resulted in the mass movement of soils and the removal off any intact sub-surface deposits or surface artefacts.

The archaeological survey of the study area confirmed the extensive disturbance throughout the study area previously reported and no Aboriginal sites were identified. Due to the likelihood that limited to no intact soil deposits remain, and no sites or areas of archaeological potential have been identified, the study has been determined to contain low archaeological potential.

5 Conclusion and recommendations

5.1 Conclusions

This assessment has identified that the entire study area has low archaeological potential. This assessment was based on background research and the significant disturbances that have occurred within the study area over a long period of time. These disturbances include the stripping of top soil, large-scale excavation, cutting and benching of the landscape, importing of material for fill, installation of services, construction of underground carparks, installation of roadways, and landscaping of the grounds. The combined effects of these activities have impacted upon the preservation and integrity of any cultural materials that may have been present.

This assessment is consistent with three previous Aboriginal heritage assessments undertaken by GML, Austral Archaeology, and Biosis. (GML 2011, p. 27) stated that 'the subject area contains no previously recorded Aboriginal sites and has no archaeological potential for Aboriginal sites to be located within an intact subsurface context', which was supported with consultation from registered stakeholders. (Austral Archaeology 2012, p. 38) agreed with GML's assessment and stated that 'there is a low likelihood of Aboriginal cultural material or deposits being impacted by the proposed works'. (Biosis 2018, p. 41) agreed with the previous two assessments and confirmed that the entire study area has low archaeological potential.

5.2 Recommendations

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

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

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

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

Recommendation 1: Areas identified as having low archaeological potential

No further investigations are required for areas assessed as having low archaeological potential. This recommendation is conditional upon Recommendations 2 and 3.

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 Heritage NSW and Aboriginal stakeholders.

Recommendation 3: Discovery of Human Remains

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

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

Recommendation 4: Continued consultation with the registered Aboriginal parties

Biosis is currently undertaking an ACHA for this project. As per the consultation requirements, it is recommended that the ACHA report is finalised prior to any works proceeding and that the proponent provides a copy of the draft ACHA report to the RAPs 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

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 35567 - ALB

Client Service ID : 613371

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
52-2-2116	TLC4	AGD	56	294802	6227005	Open site	Not a Site	Artefact : 6	Open Camp Site	
Contact		Recorders	Annie Nicholson,Mr.David Marcus					Permits		
52-2-0027	Sugarloaf Tunnel, Spring Creek Shelter	AGD	56	298614	6223537	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	1976
Contact		Recorders	Illawarra Prehistory Group					Permits		
52-2-0032	Campbelltown;	AGD	56	300269	6227777	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	1976
Contact		Recorders	Sydney Prehistory Group					Permits		
52-2-1725	IF 2;	AGD	56	294780	6228640	Open site	Valid	Artefact : -	Isolated Find	
Contact		Recorders	Anthony English					Permits	743	
52-2-1121	St Helens Park 1 Campbelltown	AGD	56	297880	6223830	Open site	Valid	Artefact : -	Open Camp Site	856,1011
Contact		Recorders	Doctor.Jo McDonald					Permits		
52-2-1219	MT.Annan Tunnel.	AGD	56	293920	6227320	Open site	Valid	Artefact : -	Open Camp Site	32
Contact		Recorders	Ms.Laila Haglund					Permits		
52-2-2222	MV3 - MANOOKA VALLEY 3	AGD	56	294880	6230420	Open site	Valid	Artefact : -		97349
Contact		Recorders	Stephanie Garling,Mr.Mark Rawson					Permits		
52-2-2150	AIRDS-01	GDA	56	299449	6226643	Open site	Valid	Modified Tree (Carved or Scarred) : -		102726
Contact		Recorders	Huw Barton,GML Heritage Pty Ltd - Surry Hills,Doctor.Tim Owen					Permits		
52-2-2151	AIRDS-02	GDA	56	299473	6226456	Open site	Valid	Artefact : -		
Contact		Recorders	Huw Barton,GML Heritage Pty Ltd - Surry Hills,Doctor.Tim Owen					Permits	4691	
52-2-2281	GL16	AGD	56	293956	6225876	Open site	Valid	Artefact : 1		
Contact		Recorders	Doctor.Julie Dibden,Heritage Concepts					Permits		
52-2-2271	GL 16-14	AGD	56	293803	6226072	Open site	Valid	Artefact : 1		
Contact		Recorders	Doctor.Julie Dibden					Permits		
52-2-2274	GL15	AGD	56	293932	6225688	Open site	Valid	Artefact : 1		
Contact		Recorders	Doctor.Julie Dibden					Permits		
52-2-2277	GL18	AGD	56	294961	6226573	Open site	Valid	Artefact : 4		
Contact		Recorders	Doctor.Julie Dibden					Permits	4322	
52-2-2312	H299	AGD	56	300530	6225530	Open site	Valid	Artefact : -		
Contact		Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
52-2-2657	H377	AGD	56	300360	6225400	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
Contact		Recorders						Permits		
52-2-2702	Site H761	AGD	56	300620	6225530	Open site	Valid	Potential Archaeological Deposit (PAD) : -		

Report generated by AHIMS Web Service on 12/08/2021 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 293775.705 - 301224.223, Northings : 6223199.912 - 6230834.825 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 85

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Mr.Kelvin Officer					**Permits**		
52-2-2703	Site H762	AGD	56	300690	6225440	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Mr.Kelvin Officer					**Permits**		
52-2-2704	Site H763	AGD	56	300820	6225400	Open site	Valid	Artefact : 5		
	Contact	**Recorders**	Mr.Kelvin Officer					**Permits**		
52-2-2705	Site H764	AGD	56	300940	6225350	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Mr.Kelvin Officer					**Permits**		
52-2-2706	Site H765	AGD	56	300240	6225140	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Mr.Kelvin Officer					**Permits**		
52-2-2658	H376	AGD	56	300700	6225900	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**						**Permits**		
52-2-2659	H375	AGD	56	300860	6226090	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**						**Permits**		
52-2-2715	Site H774	AGD	56	300100	6225180	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Mr.Kelvin Officer					**Permits**		
52-2-2717	Site H775	AGD	56	300060	6225230	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	**Recorders**	Mr.Kelvin Officer					**Permits**		
52-2-2718	Site H776	AGD	56	300140	6225130	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Mr.Kelvin Officer					**Permits**		
52-2-2720	Site H777	AGD	56	300390	6225040	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Mr.Kelvin Officer					**Permits**		
52-2-2390	Site H549	AGD	56	301010	6223100	Open site	Valid	Potential Archaeological Deposit (PAD) : -		

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 35567 - ALB

Client Service ID : 613371

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Ms.Louise Gay					Permits		
52-2-2392	Site H547	AGD	56	301100	6223190	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Ms.Louise Gay					Permits		
52-2-2978	Pembroke Road IF1	AGD	56	300200	6230580	Open site	Valid	Artefact : -		
	Contact	Recorders	Paul Irish Consultant Archaeologist					Permits	1899,1948	
52-2-2931	H859	AGD	56	301020	6223070	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders						Permits		
52-2-2933	H860	AGD	56	300670	6223380	Open site	Valid	Art (Pigment or Engraved) : -		
	Contact	Recorders						Permits		
52-2-2934	H861	AGD	56	300740	6223340	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders						Permits		
52-2-3066	H10/K036	AGD	56	300470	6225620	Open site	Valid	Potential Archaeological Deposit (PAD) : 1		
	Contact T Russell	Recorders	Mr.Kelvin Officer					Permits		
52-2-3045	Macarthur Square Campsite 1	AGD	56	296050	6227100	Open site	Destroyed	Artefact : 2		
	Contact S Scanlon	Recorders	Dominic Steele Archaeological Consulting,Mr.Paul Irish					Permits	2245	
52-2-3046	Sugarloaf Farm 1	AGD	56	294984	6224049	Open site	Valid	Artefact : -		
	Contact	Recorders	Doctor.Julie Dibden					Permits	2173	
52-2-3047	Sugarloaf Farm 2	AGD	56	295026	6224214	Open site	Valid	Artefact : -		
	Contact	Recorders	Doctor.Julie Dibden					Permits	2173	
52-2-3048	Sugarloaf Farm 4	AGD	56	294954	6224379	Open site	Valid	Artefact : -		
	Contact	Recorders	Doctor.Julie Dibden					Permits	2173	
52-2-3049	Sugarloaf Farm 5	AGD	56	294780	6224847	Open site	Valid	Artefact : -		
	Contact	Recorders	Doctor.Julie Dibden					Permits	2173	
52-2-3050	Sugarloaf Farm 3	AGD	56	294990	6224323	Open site	Valid	Artefact : -		
	Contact	Recorders	Doctor.Julie Dibden					Permits	2173	
52-2-3222	Macarthur Square IF3	AGD	56	296250	6226950	Open site	Valid	Potential Archaeological Deposit (PAD) : -, Artefact : 1		
	Contact T Russell	Recorders	Mr.Paul Irish					Permits	2416	
52-2-3221	Woodland Road -01	AGD	56	297752	6224948	Open site	Valid	Artefact : 2		

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 35567 - ALB

Client Service ID : 613371

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact T Russell	**Recorders**	Stedinger Associates					**Permits**		
52-2-3057	IF 6	AGD	56	295014	6227116	Open site	Valid	Artefact : 5		
	Contact Searle	**Recorders**	Matthew Kelleher					**Permits**		
52-2-3058	IF 7	AGD	56	294893	6227450	Open site	Valid	Artefact : 1		
	Contact Searle	**Recorders**	Australian Museum Consulting (AM Consulting)					**Permits**		
52-2-3059	UWS 2	AGD	56	295089	6227211	Open site	Valid	Artefact : 3		
	Contact Searle	**Recorders**	Matthew Kelleher					**Permits**		
52-2-3060	UWS 3	AGD	56	294944	6227145	Open site	Valid	Artefact : 2		
	Contact Searle	**Recorders**	Australian Museum Consulting (AM Consulting)					**Permits**		
52-2-3061	UWS 4	AGD	56	295636	6228123	Open site	Valid	Artefact : 2		
	Contact Searle	**Recorders**	Matthew Kelleher					**Permits**		
52-2-3062	UWS 5	AGD	56	295383	6228081	Open site	Not a Site	Artefact : 5		
	Contact Searle	**Recorders**	Matthew Kelleher,Mr.David Marcus					**Permits**		
52-2-3316	Mt Annan, Macarthur Sub Station Site - 1	GDA	56	294062	6226305	Open site	Valid	Artefact : 1		
	Contact Searle	**Recorders**	Heritage Concepts					**Permits**	4303	
52-2-3317	Mt Annan, Macarthur Sub Station Site - 2	GDA	56	293998	6226286	Open site	Valid	Artefact : 1		
	Contact Searle	**Recorders**	Heritage Concepts					**Permits**		
52-2-3318	Mt Annan Macarthur Sub Station Site 3	GDA	56	293907	6226252	Open site	Valid	Artefact : 1		
	Contact Searle	**Recorders**	Niche Environment and Heritage,Heritage Concepts,Ms.Clare Anderson					**Permits**		
52-2-3321	Mt Annan Macarthur Sub Station Site 6	GDA	56	294020	6225949	Open site	Valid	Artefact : 1		
	Contact Searle	**Recorders**	Niche Environment and Heritage,Heritage Concepts,Ms.Clare Anderson,Mr.Matthev					**Permits**	4577	
52-2-3322	Mt Annan, Macarthur Sub Station - 7	GDA	56	294051	6226094	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact Searle	**Recorders**	Heritage Concepts,Mr.Matthew Kelleher,Kelleher Nightingale Consulting Pty Ltd (G					**Permits**		
52-2-2223	MV4 -MANOOKA VALLEY 4	AGD	56	294680	6230480	Open site	Valid	Artefact : -		97349
	Contact	**Recorders**	Stephanie Garling,Mr.Mark Rawson					**Permits**	2576,2838	
52-2-3636	MA 1 & PAD MA1 (Campbelltown)	GDA	56	295187	6228881	Open site	Valid	Potential Archaeological Deposit (PAD) : 4, Artefact : 4		101160
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
52-2-3637	MA2 (Campbelltown)	GDA	56	295150	6226387	Open site	Valid	Artefact : 5		101160
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
52-2-3723	CG-IA-16	GDA	56	294120	6226374	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Ms.Renee Regal					**Permits**		
52-2-3738	CG-IA-05	GDA	56	295268	6230653	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Miss.Melanie (Duplicate of #6086) Thomson					**Permits**		

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 35567 - ALB

Client Service ID : 613371

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
52-2-3739	CG-IA-06	GDA	56	295132	6228982	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Miss.Melanie (Duplicate of #6086) Thomson					**Permits**		
52-2-3740	CG-IA-07	GDA	56	295170	6228923	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Miss.Melanie (Duplicate of #6086) Thomson					**Permits**		
52-2-3741	CG-IA-08	GDA	56	295094	6228196	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Miss.Melanie (Duplicate of #6086) Thomson					**Permits**		
52-2-3742	CG-IA-09	GDA	56	294892	6227751	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Miss.Melanie (Duplicate of #6086) Thomson					**Permits**		
52-2-3743	CG-IA-10	GDA	56	294858	6227665	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Miss.Melanie (Duplicate of #6086) Thomson					**Permits**		
52-2-3744	CG-IA-11	GDA	56	294790	6227496	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Miss.Melanie (Duplicate of #6086) Thomson					**Permits**		
52-2-3745	CG-IA-12	GDA	56	294656	6227263	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Miss.Melanie (Duplicate of #6086) Thomson					**Permits**		
52-2-3748	CG-OCS-10	GDA	56	295189	6228881	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Miss.Melanie (Duplicate of #6086) Thomson					**Permits**		
52-2-3749	CG-OCS-11	GDA	56	294871	6227709	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Miss.Melanie (Duplicate of #6086) Thomson					**Permits**		
52-2-3820	Horsley Park AS1	GDA	56	297967	6223748	Open site	Valid	Artefact : -		
	Contact Deerubbin LALC	**Recorders**	GML Heritage Pty Ltd - Surry Hills,Mr.Lyndon Patterson					**Permits**		
52-2-3966	UWS TP40 IF	GDA	56	295619	6227461	Open site	Deleted	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Mr.Marcus Leslie					**Permits**		
52-2-3967	UWS TP20 IF	GDA	56	295320	6227442	Open site	Deleted	Artefact : -		
	Contact	**Recorders**	Mr.Marcus Leslie					**Permits**		
52-2-3945	AB12 ARTEFACT SCATTER	GDA	56	299681	6226984	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Doctor.Alan Williams					**Permits**	3689,3794	
52-2-3956	UWS_TP19_AS	GDA	56	295298	6227500	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Austral Archaeology Pty Ltd - Liverpool,Mr.David Marcus					**Permits**	3611	
52-2-3957	UWS_TP20_IF	GDA	56	295320	6227442	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Austral Archaeology Pty Ltd - Liverpool,Mr.David Marcus					**Permits**	3611	
52-2-3958	UWS_TP25_IF	GDA	56	295369	6227426	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Austral Archaeology Pty Ltd - Liverpool,Mr.David Marcus					**Permits**	3611	
52-2-3959	UWS_TP40_IF	GDA	56	295619	6227461	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Austral Archaeology Pty Ltd - Liverpool,Mr.David Marcus					**Permits**		
52-2-4111	LP11AS	GDA	56	296293	6223729	Open site	Valid	Artefact : -		

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Extensive search - Site list report

Your Ref/PO Number : 35567 - ALB

Client Service ID : 613371

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Mrs.Jenna Weston					Permits		
52-2-4162	Claymore 1	GDA	56	297512	6230819	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Ms.Fenella Atkinson					Permits	4126	
52-2-4163	Claymore Park IF 3	GDA	56	297425	6230161	Open site	Valid	Artefact : -		
	Contact	Recorders	Ms.Fenella Atkinson					Permits	3832	
52-2-4164	Claymore Park IF1	GDA	56	297468	6230075	Open site	Valid	Artefact : -		
	Contact	Recorders	Ms.Fenella Atkinson					Permits	3832	
52-2-4166	Badgally Reserve IF 4	GDA	56	297488	6230394	Open site	Valid	Artefact : -		
	Contact	Recorders	Ms.Fenella Atkinson					Permits	3832	
52-2-4196	Dimeny Park	GDA	56	297850	6230296	Closed site	Valid	Art (Pigment or Engraved) : -		
	Contact	Recorders	Doctor.Alan Williams					Permits		
52-2-4437	Macarthur AS1	GDA	56	296320	6227640	Open site	Valid	Artefact : 1		
	Contact	Recorders	Austral Archaeology Pty Ltd - Liverpool,Mr.James McGuinness					Permits	4443,4444,4446	
52-2-4438	Macarthur IF1	GDA	56	296160	6227680	Open site	Valid	Artefact : 1		
	Contact	Recorders	Austral Archaeology Pty Ltd - Liverpool,Mr.James McGuinness					Permits	4444,4446	
52-2-4439	Macarthur IF2	GDA	56	296500	6227680	Open site	Valid	Artefact : 1		
	Contact	Recorders	Austral Archaeology Pty Ltd - Liverpool,Mr.James McGuinness					Permits	4444,4446	
52-2-4490	Spring Farm Parkway IF 1	GDA	56	293900	6224977	Open site	Valid	Artefact : -		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Miss.Kristen Taylor					Permits		
52-2-4556	MACARTHUR HEIGHTS RAINGARDEN	GDA	56	295091	6226800	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Miles Robson,Austral Archaeology - Wollongong					Permits	4605	

**** Site Status**

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

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