128 Andrews Road, Penrith
Archaeological Survey Report

Prepared for Willowtree Planning on behalf of Cadence Property

31 October 2018

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- Biosis: Alexander Beben and Dave Kazemi
- Cadence Property: Mitchell Kent
- Willowtree Planning: Andrew Cowan

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Glossary

ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
ARI	Average recurrence interval
BP	Before present
Consultation requirements	*Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010a)
DA	Development Application
DECCW	Department of Environment, Climate Change and Water (now OEH)
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
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service
NSW	New South Wales
OEH	Office of Environment and Heritage
PAD	Potential Archaeological Deposit
Project area	Defined as Lot 20, DP 1216618
SEPP	State Environmental Planning Policy
the code	*Code of practice for archaeological investigation of aboriginal objects in NSW* (DECCW 2010)

Summary

Biosis Pty Ltd was commissioned by Willowtree Planning on behalf of Cadence Property to undertake an Aboriginal archaeological investigation of the proposed development of a warehouse and associated infrastructure at 128 Andrews Road, Penrith, New South Wales (NSW) (the study area). The study area is consists primarily of cleared land adjacent to low-lying swampy areas surrounded by parkland and industrial and commercial estates. The study area is located approximately 1.5 kilometres north of Penrith and approximately 49 kilometres north-west of the Sydney CBD (Figure 1).

Background research completed by Biosis included a search of the Aboriginal Heritage Information Management System (AHIMS) register, which identified a total 103 AHIMS sites within a 5 kilometre by search area centred on the study area. Three of the AHIMS sites are located within the immediate vicinity of the study area. Predictive modelling undertaken by Biosis identified that stone artefact sites and Potential Archaeological Deposits (PADs) were the site type most likely to occur within the study area.

The survey was conducted on 5 October April 2018, by Charlotte Allen (Field Archaeologist, Biosis). The overall effectiveness of the survey for examining the ground for Aboriginal sites was deemed low. This was attributed to vegetation cover restricting ground surface visibility combined with a low amount of exposures.

One area of archaeological potential was identified within the central portion of the study area on a terrace edge and its interface with a flat terrace top adjacent to a low-lying swampy area.

The proposed development will impact the area of archaeological potential identified during the survey.

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 2010b) (the code).

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

Management recommendations

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

Recommendation 1: ACHA required in advance of physical impacts

In advance of any physical impacts within the study area, an ACHA must be undertaken to assess any impacts the proposed works will have on identified Aboriginal sites within the study area. The ACHA must be undertaken in accordance with the consultation requirements and the code. Any impacts to areas of high or moderate archaeological potential should be addressed through a program of test excavation in accordance with the code. This ACHA should be completed prior to the issue of Development Consent for this project.

Recommendation 2: No further work required for areas of low archaeological potential

No further assessment is required in areas of low archaeological potential, and works can proceed with caution, subject to the unexpected finds protocol in Recommendation 3.

Recommendation 3: Discovery of unanticipated heritage items

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 OEH. Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying the OEH and Aboriginal stakeholders.

Aboriginal ancestral remains

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

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

1 Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by Willowtree Planning on behalf of Cadence Property to undertake an Aboriginal archaeological investigation for the proposed development of a warehouse and associated infrastructure at 128 Andrews Road, Penrith NSW (Figure 3). The assessment involved background research and an archaeological survey in order to identify Aboriginal sites and areas of archaeological potential within the study area, and has been formulated to support a DA under Part 4 of the EP&A Act.

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

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

1.2 Study area

The study area is located approximately 1.5 kilometres north of Penrith and approximately 49 kilometres north-west of the Sydney CBD (Figure 1). It comprises Lot 20, DP 1216618 and encompasses 31 hectares of private land.

The study area is within the:

- Penrith LGA
- Parish of Castlereagh
- County of Cumberland.

The study area is bounded as follows:

- on its northern side by Lot 8, DP 1087962, Lot 1, DP 1245002, Lot 90, DP 1200536, Andrews Road and Lot 13, DP 217705
- on its eastern boundary by Lots 1 and 3, DP 747153, Lot 91, DP 601050, Lot 1673, DP 811688 and Lot 2, DP 1036562
- on its southern side by Lot 110, DP 774782 and Lot 2, DP 787827
- on its western boundary by Castlereagh Road and Lot 2, DP 623918.

1.3 Planning approvals

The proposed development will be assessed against Part 4 of the EP&A Act. Other relevant legislation and planning instruments that will inform this assessment include:

- NPW Act
- NSW *National Parks and Wildlife Amendment Act 2010*
- Infrastructure State Environmental Planning Policy 2007 (SEPP)
- Penrith LEP 2010
- Penrith Development Control Plan 2014.

1.4 Objectives of the investigation

The objectives of the investigation can be summarised as follows:

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

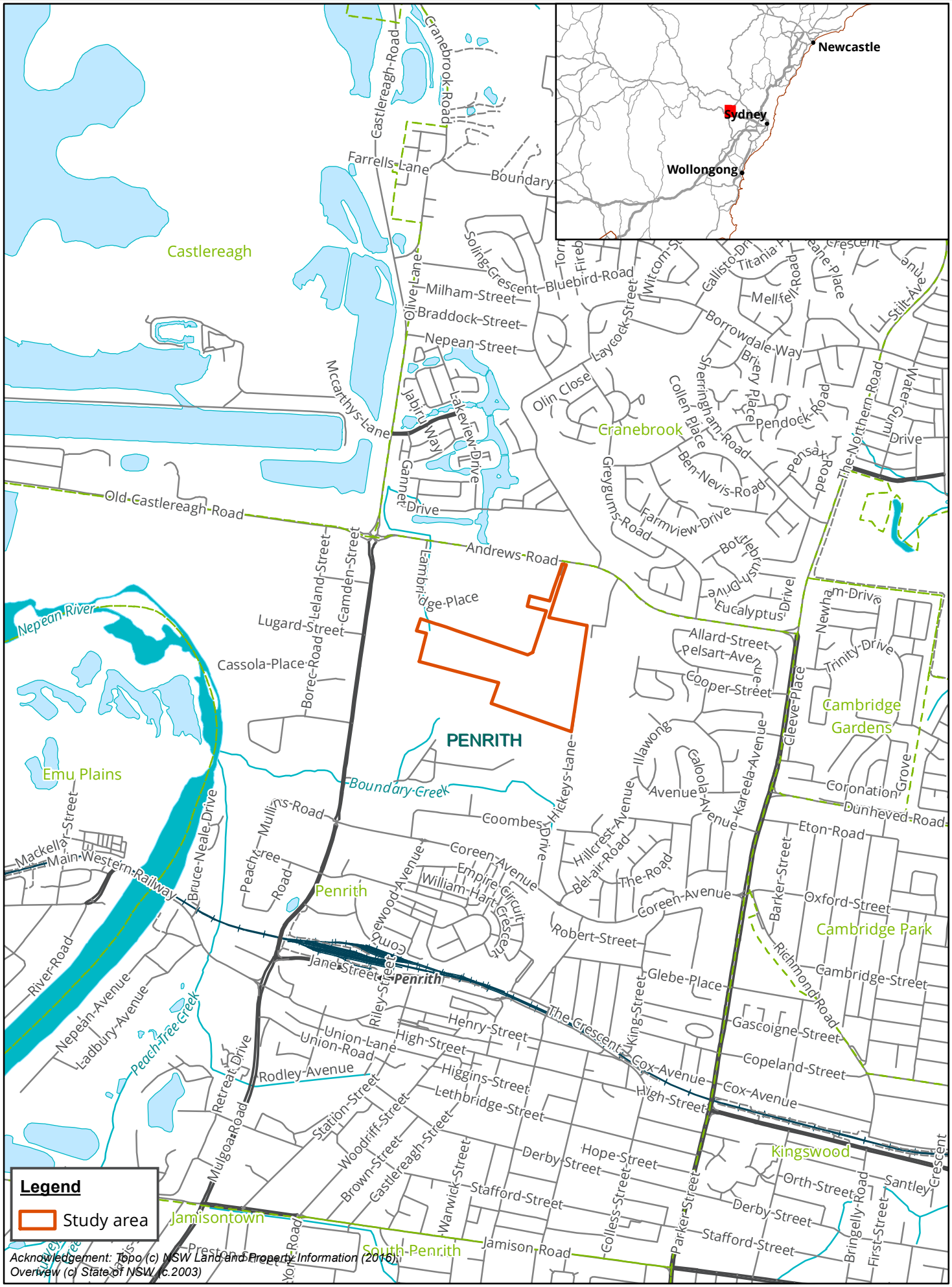
1.5 Investigators and contributors

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

Table 1 Investigators and contributors

Name and qualifications	Experience summary	Project role
Amanda Atkinson BA (Hons), GDip	Amanda has ten years' archaeological consulting experience across south-eastern and western Australia. She is experienced in all aspects of heritage consulting with specialisation in Aboriginal archaeology. Amanda has extensive experience in the successful completion of	• Quality assurance

Name and qualifications	Experience summary	Project role
	Aboriginal and historical assessments, archaeological surveys, excavations, permits and management plans. She is accomplished in obtaining approvals under the NPW Act. Amanda has primarily undertaken projects in south-eastern Australia and the Pilbara region of Western Australia and has a detailed understanding of heritage values within the Sydney Basin, Cumberland Plain and Hunter Valley. Amanda specialises in the archaeology of central and far western New South Wales, with particular research interests in riverine and lacustrine environments. Amanda specialises in water infrastructure and linear projects having undertaken heritage assessment for many of the major water infrastructure projects in NSW.	
James Cole **BA (Hons)**	James is a consultant archaeologist with five years' experience. James has had experience working as an archaeologist and project manager on a number of Aboriginal and European heritage projects across NSW, Victoria, and Tasmania, and is skilled in both excavation and field recording. James has well developed skills in Aboriginal archaeology, serving as a key team member and project manager on a number of projects in Sydney, the Illawarra, the Hunter Region, and in Western NSW. These projects have seen him take part in Aboriginal consultation, background research, the formation of predictive modelling, fieldwork, and report authorship. He is also skilled in undertaking historical heritage assessments, having completed a number of Statements of Heritage Impact as the primary author.	• Technical advice • Project management
Charlotte Allen **BA (Hons)**	Charlotte is a field archaeologist with one year of experience in archaeology. Charlotte has experience working as a research assistant and field archaeologist on a number of Aboriginal and European heritage projects within NSW, and has developed skills in background research, project management, excavation, field survey, report writing and historical assessments.	• Field investigation • Report writing • Development of recommendations
Ashley Bridge **BA, MArchSci (Hons)**	Ashley is a research assistant with under one year's experience in archaeology. Ashley is developing skills in background research for Aboriginal and non-aboriginal heritage assessments in NSW, and has excavation experience in both NSW and Europe.	• Background research



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

Figure 1: Location of the study area

Matter: 28456
Date: 31 October 2018,
Checked by: JAC, Drawn by: DK, Last edited by: dkazemi
Location:P:\28400s\28456\Mapping\

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

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Albury, Ballarat, Melbourne,
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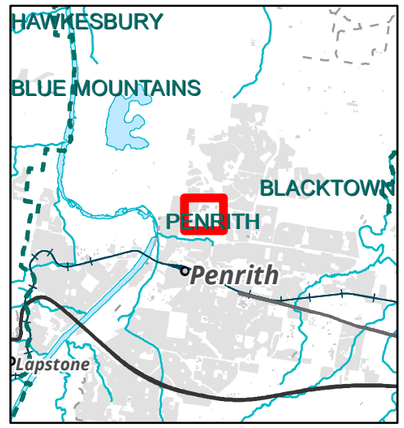

Legend

Study area

Figure 2: Extent of the study area

0 50 100 150 200

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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Newcastle, Sydney, Wangaratta & Wollongong

Matter: 28456
Date: 31 October 2018,
Checked by: JAC, Drawn by: DK, Last edited by: dkazemi
Location:P:\28400s\28456\Mapping
28456_F2_study area

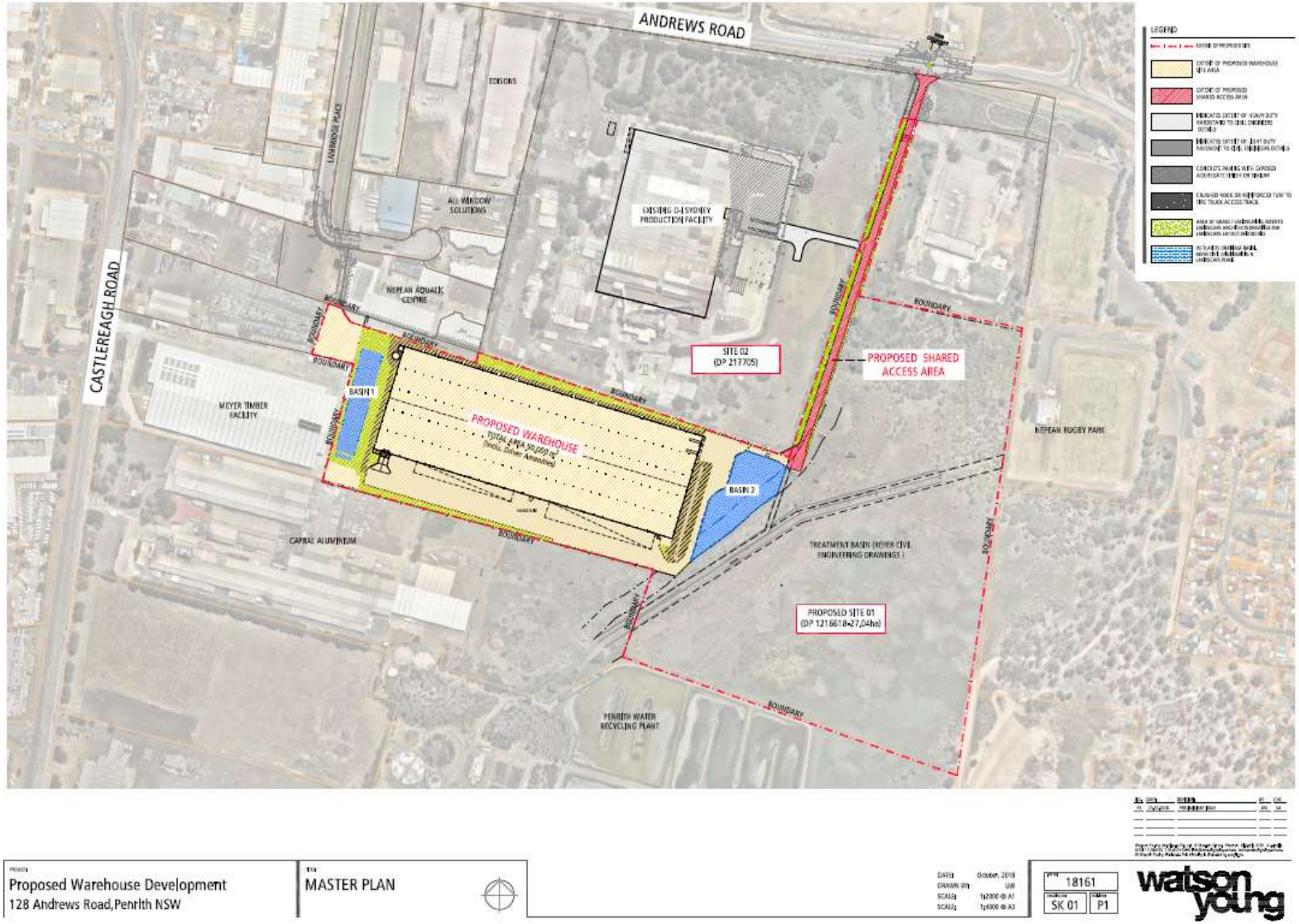
Acknowledgements: Basemap © Land and Property Information 2016

2 Proposed development

The proposed development consists of a new warehouse, which will include a dispatch office and amenities, and associated infrastructure. This will involve the installation of both light and heavy duty paving, foundations, services, site levelling and stabilisation, as well as vegetation clearing.

The proposed works are shown in Figure 3.

Figure 3 Proposed development footprint (source: Cadence Property, October 2018)



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

3.1.1 Topography and hydrology

The study area lies within the Cumberland Plain, which is a broad and shallow basin that stretches westwards from Parramatta to the Hawkesbury-Nepean River and southwards from Windsor to Thirlmere. The underlying geology of the study area is dominated by the Cranebrook formation, which consists of alluvial terrace deposits dating to the late Cainozoic era. The Cranebrook Terrace is an alluvial deposit dating from the late Cainozoic era. The Cranebrook Formation ranges from 8-14 metres in thickness, and generally consists of basal gravel averaging 7 metres in thickness overlain by medium-grained sandy silt and clay. The basal gravel comprised of pebbles and cobbles, including quartz, quartzite, chert, porphyry, granite, hornfels, sandstone and silcrete (Smith & Clarke 1991, p.44). The eastern border of the study area is underlain by Wianamatta Group Ashfield Shale and Bringelly Shale formations, which comprise of laminite and dark grey shale, and shale, calcareous claystone, and laminate (Figure 4).

The local Cranebrook terrace formation has been the subject of intensive geomorphological investigation and archaeological investigation. The most detailed geomorphological analysis was undertaken by Nason et al. (1987). They demonstrated that the Cranebrook Terrace was deposited by the Nepean River during a period when it was a high-discharge stream on a braid plain. Since then the Nepean River has remained stable and as a result the terrace deposits are largely undisturbed. The Cranebrook Terrace features two stratigraphic units: the Penrith Unit; and the Richmond Unit. The Penrith Unit is believed to have been deposited earlier (between 50,000-100,000 years before present (BP)) than the Richmond Unit, which is generally located closer to the Nepean River. It has been proposed that the Penrith Unit is likely to be too old to contain Aboriginal objects below A Horizon soils (i.e. topsoils) and upper overburden (Archaeological & Heritage Management Solutions 2012, pp.27–28). Plate 1 demonstrates the relationship between the Richmond and Penrith units of the Cranebrook Terrace, albeit within the Penrith Lakes area north-west of the study area. While the geological formation adjacent to the Cranebrook Terrace formation for the current study area is Bringelly Shale, Plate 1 does suggest that the study area is situated within the Penrith Unit, but further investigation is required to determine this.

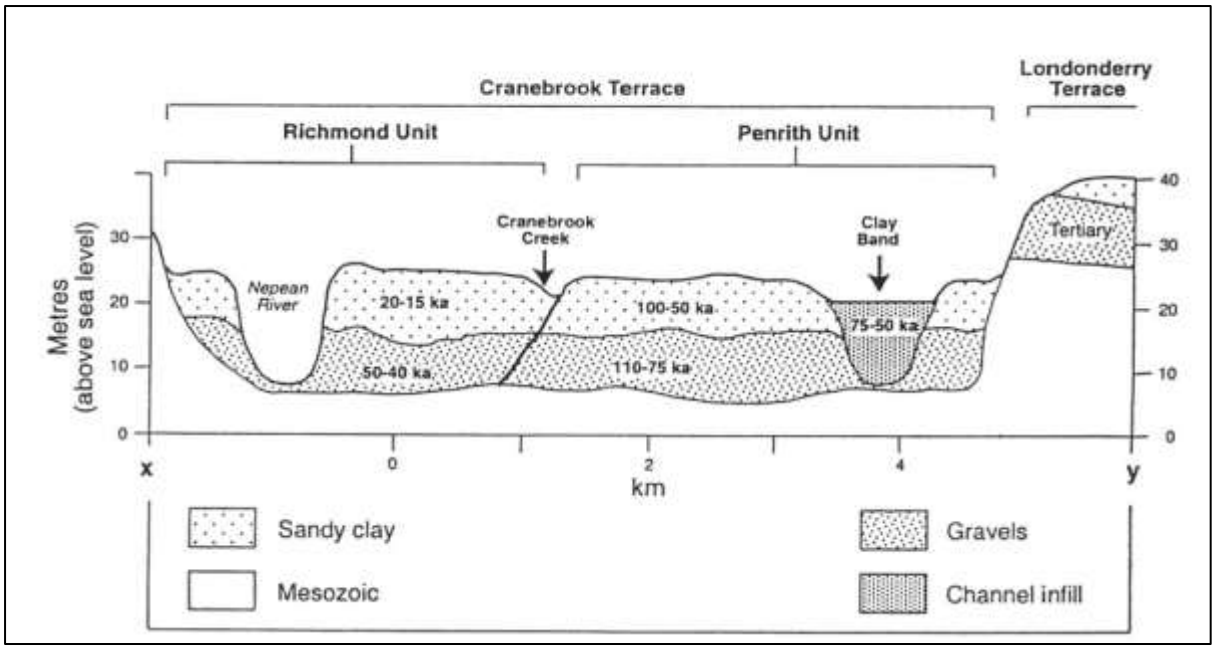


Plate 1 A diagram of the Cranebrook Formation within the Penrith Lakes Development Scheme, north-west of the study area (Source: Stockton & Nanson 2004, Mitchell 2010, cited by Archaeological & Heritage Management Solutions 2012, p.28)

Topographically, the study area is situated within mostly flat terrace tops, with low lying terrace edges and levees of up to 10 metres (Bannerman & Hazelton 1990, p.75). The eastern side of the study area comprises topographically of low rolling to steep low hills with the local relief between 50 metres to 120 metres. Moderately inclined slopes of 10–15% are dominant landform features within this landscape (Bannerman & Hazelton 1990, p.63).

Stream order is recognised as a factor which assists the development of predictive modelling in Sydney Basin Aboriginal archaeology, and has seen extensive use in the Sydney region, most notably by Jo McDonald Cultural Heritage Management (Jo McDonald Cultural Heritage Management 2000, Jo McDonald Cultural Heritage Management Pty Ltd 2005a, Jo McDonald Cultural Heritage Management Pty Ltd 2005b, Jo McDonald Cultural Heritage Management 2006, Jo McDonald Cultural Heritage Management 2008). Predictive models which have been developed for the region have a tendency to favour higher order streams as having a high potential for campsites as these types of streams would have been more likely to provide a stable source of water and by extension, other resources which would have been used by Aboriginal groups.

The stream order system used for this assessment was originally developed by Strahler (1952). It functions by adding two streams of equal order at their confluence to form a higher order stream, as shown in Plate 2. As stream order increases, so does the likelihood that the stream would be a perennial source of water.

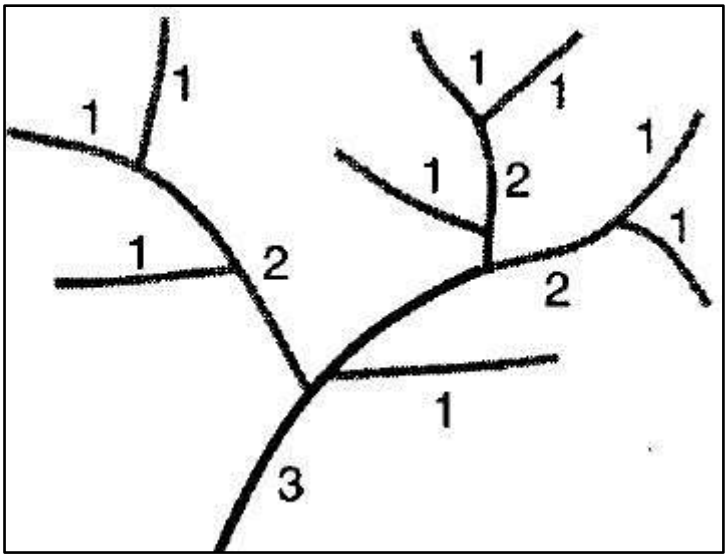


Plate 2 Diagram showing Strahler stream order (Ritter et al. 1995, p.151)

The study area is 1 kilometre from the Nepean River, which is a natural, perennial water course. This river would have provided a stable source of water in close proximity to the study area (Figure 5). Flood mapping of the Nepean River floodplain undertaken for the Penrith LGA shows that the eastern portion and two other areas in the northern and eastern part of the study area are contained within the 20 year average recurrence interval (ARI) flood extent, with areas adjacent to these within the 100 year ARI flood extent. A large area in the central part of the study area has been designated within the probable maximum flood extent, and within this a small portion has been classified as outside of potential flood zones (Cardno Lawson Treloar Pty Ltd 2006) (Plate 3). Peach Tree Creek is approximately 1.2 kilometres away from the study area and has a Strahler order of four. There is a first order, non-perennial stream which terminates inside of the north-western boundary. In addition to this first order stream, the study area is in close proximity to two first order creek lines (300 – 600 metres away), which connect to the Nepean River via Boundary Creek, a second order creek line (Figure 5). A swampy area is also situated in the south-eastern portion of the study area.

Plate 3 **Flood mapping of the Nepean River floodplain, with the study area highlighted in blue; yellow hashing is 20 year flood event, pink hashing is 100 year flood event and blue hashing is probable maximum flood event (Source: Cardno Lawson Treloar Pty Ltd 2006, Figure 6.1 E)**

3.1.2 Soil landscapes

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

The study area is made up of two soil landscapes, the Richmond soil landscape that occurs throughout the majority of the area, and the Luddenham soil landscape, which occurs towards the eastern border (Figure 6). The Richmond soil landscape is characterised by its mainly flat terrace tops and low lying terrace edges of 10 metres. Slays and levees provide local relief of <3 metres (Bannerman & Hazelton 1990, p.75). The soil characteristics of this landscape are described in Table 2 below.

Table 2 **Richmond soil landscape characteristics (Bannerman & Hazelton 1990, p.76)**

Soil material	Description
ri1 – Loose reddish brown loamy sand	This is a reddish brown loamy sand with apedal single-grained structure and porous sandy fabric. It occurs as topsoil (A horizon). The texture may range to sandy loam when organic matter content is high. The colour of the sand has a narrow range between brown (7.5YR 4/4) and very dark reddish brown (5YR 4/2). This material varies from moderately acid (pH 5.5) to slightly acid (pH 6.5). Roots are common near the surface but are rare at depth. Stones and charcoal are absent.

Soil material	Description
ri2 – Brown sandy clay loam	This is a brown sandy clay loam to fine sandy clay loam with apedal massive structure and an earthy fabric. It occurs as topsoil (A horizon). The structure often increases with depth to moderately pedal subangular blocky peds, which are porous and rough-faced. They range in size from 50 millimetres to 100 millimetres. The colour is brown (7.5YR 4/4, 4/6) but varies from a dull reddish brown (2.5YR 4/3) to bright brown (7.5YR 5/8). This material is typically slightly acid (pH 6.0), with few roots and no stones or charcoal fragments present.
ri3 – Brown mottled light clay	This is a reddish to yellowish brown light or light medium clay, with apedal massive structure, an earthy fabric increasing to moderate structure, with porous rough-faced ped fabric at depth. It occurs as subsoil (B horizon). At depth peds are large (50-100 millimetres) and angular blocky in shape. There is a wide colour range from dark reddish brown (2.5YR 3/6) to greyish yellow brown (10YR 5/2). Yellow or orange mottles often occur. This material varies from strongly acidic (pH 4.0) to slightly alkaline (pH 8.0). Small (2-20 millimetres) iron-indurated gravels may occur in concentrated bands or dispersed throughout this material. There are few roots, with charcoal and other inclusions being rare.
ri4 – Brown mottled stiff medium-heavy clay	This is a reddish brown to yellowish brown, mottled, occasionally subplastic medium to heavy clay, with a variable structure and dense smooth-faced ped fabric. It occurs as subsoil (B horizon). Structure increases with depth from weak small (<2 millimetres) crumb structure to a strong subangular blocky structure with ped sizes ranging from 20 millimetres to 100 millimetres. Colour ranges from dark reddish brown (2.5YR 3/4) to yellowish brown (l0YR 5/8). Light grey mottles are common, especially at depth. This material has a pH range of strongly acidic (pH 4.5) to neutral (pH 7.0). Stones, roots, charcoal and other inclusions are generally absent.

Drainage lines cut into the front and back of terraces within this soil landscape, with the subsequent sedimentary deposition causing interspersing of the layers within the channel and on the immediate floodplain. Ironstone nodules and lateritic bands within a reddish brown sandy (occasionally silty) clay are also associated with this soil landscape (Bannerman & Hazelton 1990, p.77). This material occurs in stratified layers or lenses to a maximum thickness of 220 centimetres. Up to 40 centimetres of reddish brown loamy sand (ri1) occurs as a surface layer near terrace edges. This overlies 40-100 centimetres of brown sandy clay loam (ri2). The underlying layers are stratified with alternating layers of ri3 and heavier ri4 clays, with occasional lenses of reddish brown sandy clay and red podzolic soils (Bannerman & Hazelton 1990, p.76). The boundaries between these soil materials are gradual to sharp. Towards the back of terraces, up to 100 centimetres of brown sandy day loam (ri2) can overlie up to 150 centimetres of light clay (ri3) and >100 centimetres of medium or heavy day (ri4). Boundaries between these soil materials are gradual (Bannerman & Hazelton 1990, p.77).

The Luddenham soil landscape is characterised by undulating to rolling low hills on the Wianamatta Croup shales, with narrow ridges, hillcrests and valleys also present. The landscape has a local relief of 50–80 metres with slopes being 5–20%. It has been extensively cleared of tall open-forest. On lower slopes and drainage lines, soils are moderately deep (<150 centimetres). It has a high erosion hazard, localised impermeable highly plastic subsoil and is moderately reactive, with low to moderate levels of fertility (Bannerman & Hazelton 1990, pp.63–66). The soil characteristics of this landscape are described in Table 3 below.

Table 3 Luddenham soil landscape characteristics (Bannerman & Hazelton 1990, pp.64–65)

Soil Material	Description
lu1	A dark brown friable loam, silt or silty clay loam with a moderately strong structure and porous rough-faced ped fabric, which occurs as a topsoil (A horizon). Peds are generally subangular blocky to polyhedral, 2-10mm in size and break down readily to very small crumbs in uncompacted soils. Surface condition is friable but can become hardsetting when compacted and dry, and is occasionally water repellent. Colour is commonly dark brown (10YR 3/3, 7.5YR 3/3) but can range from brownish black (5YR 3/1) to brown (10YR 4/4). Roots are common to 10cm and decrease with increasing deapth, while charcoal fragments and some small subrounded to rounded weakly weathered shale fragments occasionally occur.
lu2	A hardsetting brown fine sandy clay loam with an apedal massive or weakly pedal structure and earthy or porous rough-faced ped fabric 10-50mm in size, which occurs as an A2 horizon. Colour is generally brown (7.5YR4/4) but can range from a dull yellowish brown (10YR 5/4) to reddish brown (5YR 4/6). It can occasionally be hardsetting when exposed at the surface, contains shale rock fragments, charcoal fragments and roots.
lu3	A whole coloured medium clay, which can also range from a silty clay to heavy clay, with a strong structure and smooth-faced, dense subangular blocky or polyhedral ped fabric 5-20mm in size. Cutans are also present. Colour is generally reddish brown (5YR 4/6-8) but can range from a bright reddish brown (2.5YR 4/8) to bright yellowish brown (10YR 6/6). Charcoal is absent, roots are rare and shale rock fragments are common.
lu4	A mottled, medium to heavy grey clay with a strongly pedal structure and dense, smooth-faced subangular blocky ped fabric 10-20 mm in size. Colour is commonly light grey (10YR 7/1) but ranges to light reddish grey (2.5YR 7/1), with yellow and red mottles a common occurrence. Usually moist and very plastic, roots are rare but shale rock fragments and gravels are common.
lu5	An apedal massive brown sandy clay to light clay with a dense earthy fabric which usually occurs as a subsoil (B horizon), and occasionally features a weak subangular blocky or polyhedral structure. Colour is usually brown (7.5 YR 4/4-6) but ranges from dull reddish brown (5YR 4/4) to dull yellowish brown (10YR 5/4). Roots are common, while small (2-6 mm) angular well-weathered shale fragments may comprise up to 10% of the volume.

Lower slopes and drainage lines may feature a shallow (<50 centimetres) surface material of greyish brown loamy or clayey sand which frequently contains charcoal fragments and small amounts of gravels 2-20 millimetres in size. Regarding soil occurrences and relationships on lower slopes and drainage lines, up to 50 centimetres of loamy sand overlies >100 centimetres of sandy clay (lu5). However, other locations may contain up to 40 centimetres of clay loam (lu2) overlying <50 centimetres of sandy clay (lu5) and >100 centimetres of whole-coloured medium clay (lu3). This is occasionally underlain by >150 centimetres of mottled grey plastic clay (lu4). Soil horizons are

generally clear, and sometimes gradual, with a total soil depth of >200 centimetres (Bannerman & Hazelton 1990, p.65).

Geotechnical investigations undertaken within the study area indicate both distinct and indistinct A Horizon topsoils to depths ranging from 0.2 metres to 0.5 metres, overlying silty alluvial soils featuring instances of clayey silt, sandy silt and silty sand. Beneath these, alluvial gravels contained within a sandy silt matrix with traces of cobbles were encountered at depths ranging from 2.6 metres to 4.5 metres. Gravels became more dense at depths ranging from 3 metres to 4.9 metres where the auger was refused (JK Geotechnics 2018, pp.4–5).

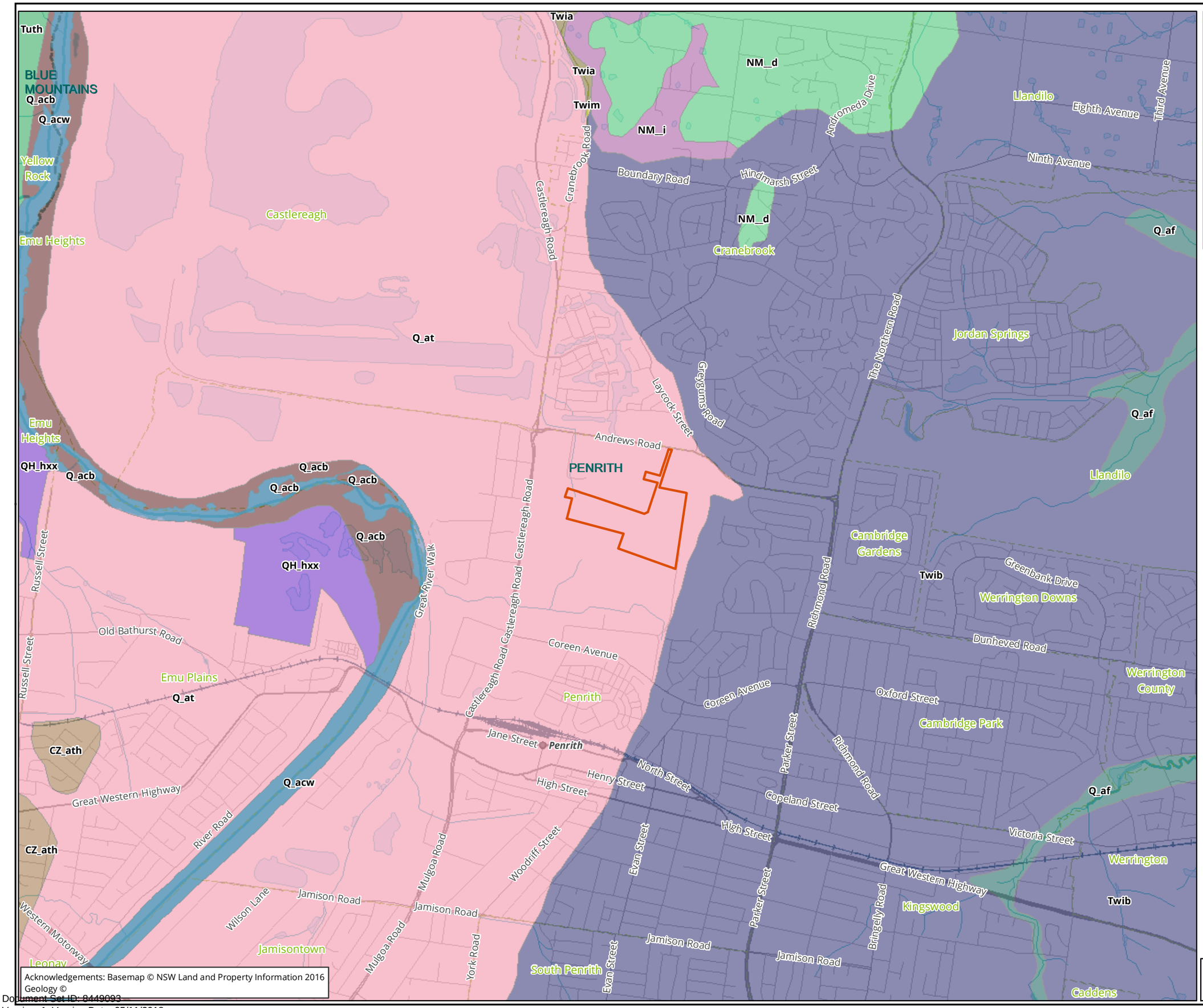
3.1.3 Landscape resources

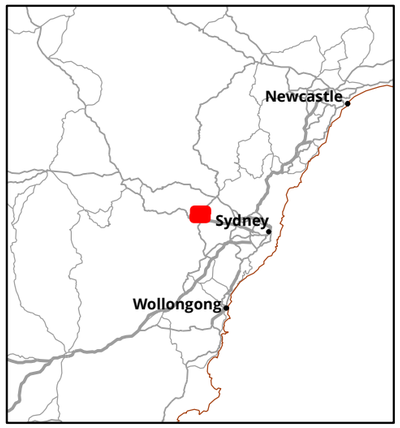
The diverse natural environment would have provided vast and plentiful floral and faunal resources, with the temperate climate making the area suitable for year-round occupation. Proximity of the study area to the Nepean River and other permanent water sources would have added to its appeal as a long term occupation site. Although extensively cleared today, both the Richmond soil landscape and the Luddenham soil landscape typically supports a range of vegetation. Within the Richmond soil landscape the dominant tree species include red cedar, coachwood paper barks and Sydney peppermint, with wattles being the most common type of regrowth vegetation. Within the Luddenham soil landscape the dominant tree species include gum and grey box, with broad- and narrow-leaved ironbark, forest red gum and woollybutt occur less frequently (Bannerman & Hazelton 1990, p.64).

Within the Cumberland subregion of the Sydney Basin Bioregion there is a variety of vegetation types present. Grey box, forest red gum, narrow-leaved ironbark woodland, and spotted gum are present on shale hills, while hard-leaved scribbly gum, rough-barked apple, and old man banksia are identified on alluvial sands and gravels. Broad-leaved apple, cabbage gum, forest red gum, and swamp oak are present on river flats. Tall spike rush, and juncus with Parramatta red gum is noted around lagoons and swamps (NSW National Parks and Wildlife Service 2003, p.193).

Many flora species would have been accessible as resources for the Indigenous inhabitants of the area. Vegetation communities of the greater Sydney area have over 200 species with edible parts (Attenbrow 2002, p.76). A variety of plant species were also useful for manufacturing tools. Wood from trees was used to manufacture canoe poles, weapons, woomeras, boomerangs and for use in fire. Resins from trees and grasses were used as a fixative in tool making. Bark and fibres were used for carrying vessels, canoes and decorations. Fibres were used to make ropes and nets for trapping fish and birds. In addition, many plants provided sources of both food and medicine. Food, tools, shelter and ceremonial items were derived from floral resources, with the locations of many campsites predicated on the seasonal availability of resources.

Native fauna which may have been present in the vicinity of the study area includes, but is not exclusive to, Rainbow Lorikeet, Noisy Miner, Dark- and Pale-Flecked Garden Sunskink, Eastern Dwarf Tree Frog, Fox, Red-rumped Parrot and Superb Fariy-wren (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).





Legend

Study area

Geological units

- Alluvial channel deposits- in-channel bar
- Alluvial channel deposits- subaqueous
- Alluvial floodplain deposits
- Alluvial terrace deposits
- Alluvial terrace deposits- high-stand facies
- Anthropogenic deposits- Extensive excavation of Quaternary deposits
- Ashfield Shale
- Bringelly Shale
- Hawkesbury Sandstone
- Londonderry Clay
- Minchinbury Sandstone
- Rickabys Creek Gravel

Figure 4: Geological units near the study area

0 250 500 750 1,000 1,250

Metres

Scale: 1:25,000 @ A3

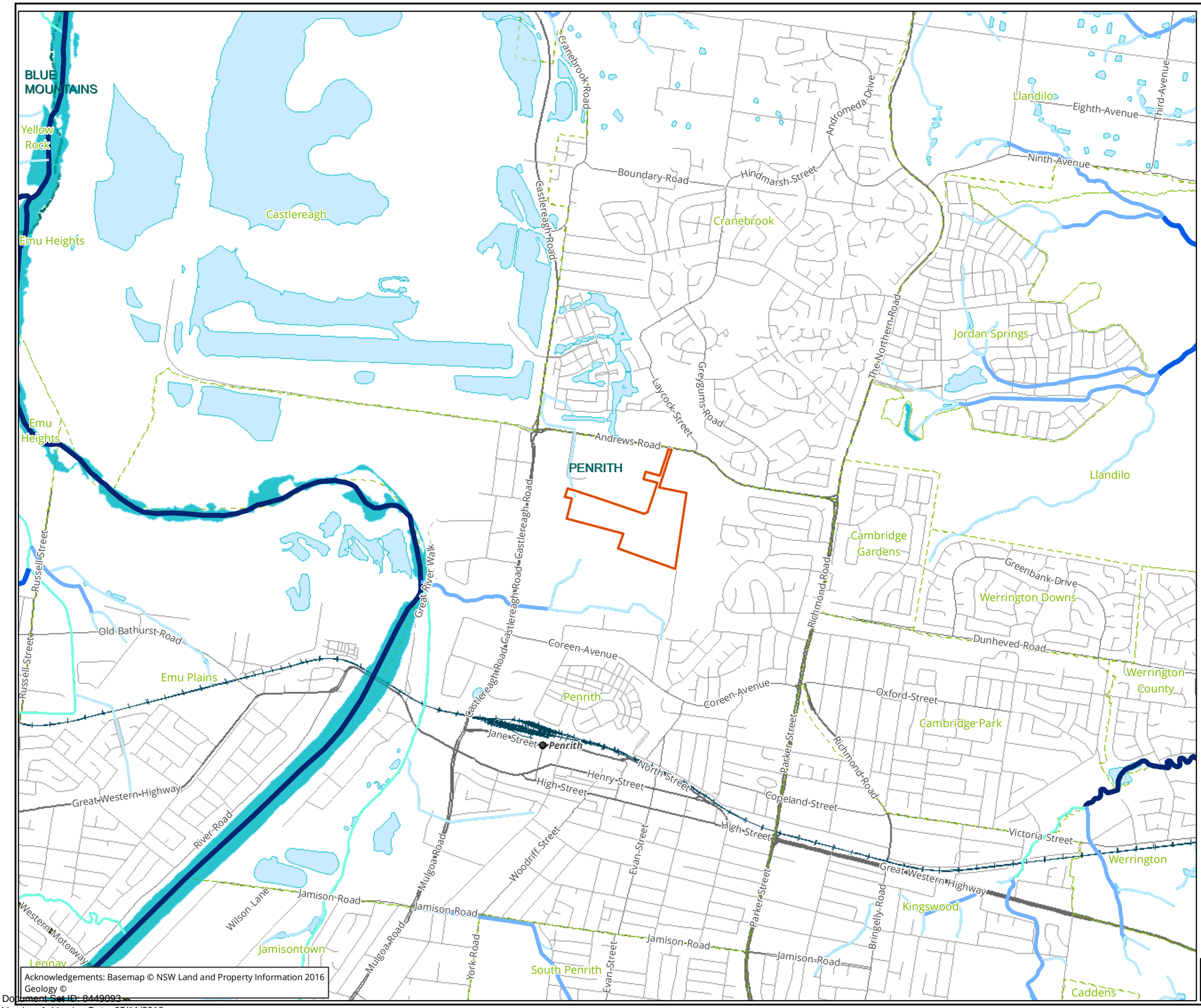
Coordinate System: GDA 1994 MGA Zone 56

Biosis Pty Ltd

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

Matter: 28456,
Date: 03 October 2018,
Checked by: JAC, Drawn by: DK, Last edited by: dkazemi
Location:P:\28400s\28456\Mapping
28456_F4_Geology.mxd

Acknowledgements: Basemap © NSW Land and Property Information 2016
Geology ©



Legend

- Study area

Strahler Order

- 1
- 2
- 3
- NonPerennial
- Perennial
- Canal-Drain
- NaturalWatercourse

Figure 5: Hydrology near the study area

0 250 500 750 1,000 1,250

Metres

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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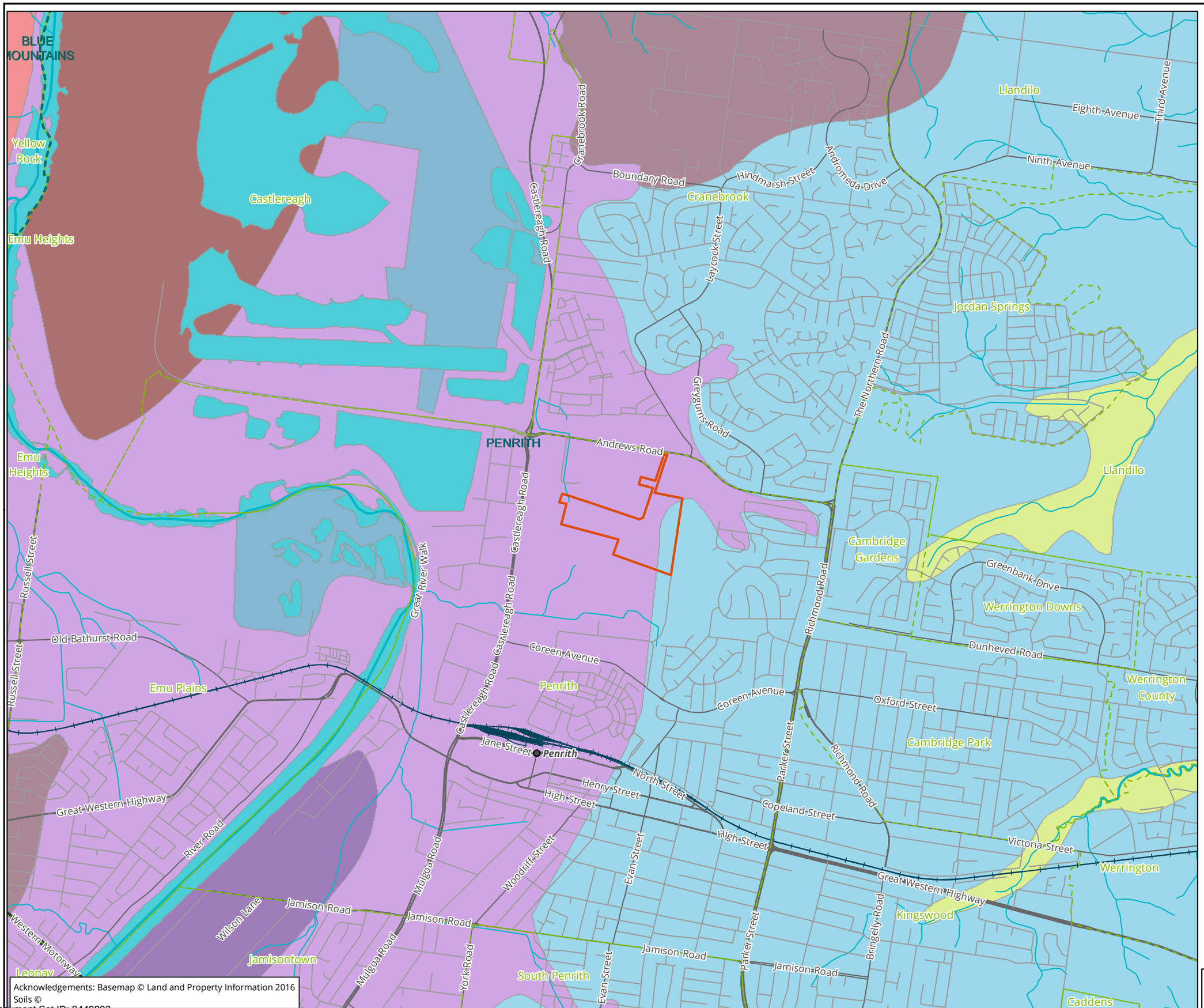
Sydney, Newcastle, Wangaratta & Wollongong

Matter: 28456,
Date: 03 October 2018,
Checked by: JAC, Drawn by: DK, Last edited by: dkazemi
Location:P:\28400s\28456\Mapping
28456_F5_Hydrology.mxd



Legend

Study area

Soil landscape units

- BERKSHIRE PARK
- DISTURBED TERRAIN
- FREEMANS REACH
- HAWKESBURY
- LUDDENHAM
- RICHMOND
- SOUTH CREEK
- UPPER CASTLEREAGH
- WATER

Figure 4: Soil landscapes near the study area

0 260 520 780 1,040 1,300

Metres

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Matter: 28456,
Date: 03 October 2018,
Checked by: JAC, Drawn by: DK, Last edited by: dkazemi
Location:P:\28400s\28456\Mapping\28456_F6_Soil.mxd

Acknowledgements: Basemap © Land and Property Information 2016
Soils ©

3.1.4 Land use history

Our knowledge of Aboriginal people and their land-use patterns and lifestyles prior to European contact is mainly reliant on documents written by non-Aboriginal people. These documents are affected by the inherent bias of the class and cultures of their authors, who were also often describing a culture that they did not fully understand - a culture that was in a heightened state of disruption given the arrival of settlers and disease. Early written records can however be used in conjunction with archaeological information and surviving oral histories from members of the Aboriginal community in order to gain a picture of Aboriginal life in the region.

Despite a proliferation of Aboriginal heritage sites there is considerable ongoing debate about the nature, territory and range of pre-contact Aboriginal language groups in the greater Sydney region. These debates have arisen largely because, by the time colonial diarists, missionaries and proto-anthropologists began making detailed records of Aboriginal people in the late 19th century, pre-European Aboriginal groups had been broken up and reconfigured by European settlement activity. The following information relating to Aboriginal people on the Cumberland Plains is based on such early records.

There is some confusion relating to group names, which can be explained by the use of differing terminologies in early historical references. Language groups were not the main political or social units in Aboriginal life. Instead, land custodianship and ownership centred on the smaller named groups that comprised the broader language grouping. There is some variation in the terminology used to categorise these smaller groups; the terms used by Attenbrow (2002) will be used here. Attenbrow (2002, p.34) suggests that a total of four dialects were spoken in the Sydney region:

- *Darug coastal dialect/s - the Sydney Peninsula (north of Botany Bay, south of Port Jackson, west to Parramatta), as well as the country to the north of Port Jackson, possibly as far as Broken Bay*
- *Darug hinterland dialect - on the Cumberland Plain from Appin in the south to the Hawkesbury River in the north; west of the Georges River, Parramatta, the Lane Cove River and Berowra Creek*
- *Dharawal - from south side of Botany Bay, extending south as far as the Shoalhaven River; from the coast to the Georges River and Appin, and possibly as far west as Camden,*
- *Gundungurra - southern rim of the Cumberland Plain west of the Georges River, as well as the southern Blue Mountains.*

Early interactions between local Aboriginal groups in the Sydney region and European settlers varied in nature between peaceful and hostile. It was not long before the effects of colonisation proved detrimental to local groups, with farming practices employed by the settlers removing land that had until that point been used for subsistence (Attenbrow 2002).

Early observers made no note of the language of the local groups, and it was not until the latter part of the nineteenth century that the name Darug was used. Matthews (1901, p. 155, cited by Attenbrow 2002, p.32) stated that "The Dharuk speaking people adjoined the Thurrawal on the north, extending along the coast to the Hawkesbury River, and inland to what are now Windsor, Penrith, Campbelltown, and intervening towns". Subsistence activities varied based on the local landscapes, with Darug groups closer to the coast employing different food sources and means of hunting in order to survive, compared to those further inland (Kelleher Nightingale Consulting 2010, p.10).

After the arrival of European settlers the movement of Aboriginal hunter-gatherers became increasingly restricted. European expansion along the Cumberland Plain was swift and soon there had been considerable loss of land to agriculture. This led to violence and conflict between Europeans and Aboriginal people as both groups sought to compete for the same resources (Brookes & Associates et al. 2003, p.16). At the same time diseases such as small pox were having a devastating effect on the Aboriginal population. Death, starvation and disease were some of the

disrupting factors that led to a reorganisation of the social practices of Aboriginal communities after European contact. The formation of new social groups and alliances were made as Aboriginal people sought to retain some semblance of their previous lifestyle.

The study area is part of a land grant originally made to William Neate Chapman in 1804 by the Crown. Parish maps as early as 1833 show Chapman owning 1300 acres (526.09 hectares) of land, culminating in the establishment of "Lambridge Estate". During the years Chapman owned the estate, he made no effort to cultivate or stock the land, and was not interested in using the land for agricultural purposes ('Chapman, William Neate (1773–1838)' 1966, NSW Land Registry Services, Certificate of Title Volume 3814 Folio 229; NSW Land Registry Services, Certificate of Title Volume 3814 Folio 229). The land changed hands several times of the next 120 years to different farming families, including the MacHenry and Landers families ('Local News.' 1890, Cartledge 1949, NSW Land Registry Services, Primary Application 26451).

In 1925, a portion of the land was purchased by George and William Henry Willet, both farmers, in two parts (NSW Land Registry Services, Certificate of Title Volume 3814 Folio 229; NSW Land Registry Services, Certificate of Title Volume 3814 Folio 229). The property remained in the Willet family until 1940 when part of the land was acquired by the Council of the Municipality of Penrith, while in 1962 an easement was established for electricity purposes (NSW Land Registry Services, Certificate of Title Volume 4934 Folio 212; NSW Land Registry Services, Certificate of Title Volume 5135 Folio 138). Aerial imagery dating to 1978 shows a large proportion of the area of proposed works within the study area consists of a cleared field, with darker patches suggesting this higher ground is surrounded by swampy areas or watercourses (Plate 4). Furthermore, an aerial photograph dating to 1986 shows evidence of ploughing in the cleared field area (Plate 5, Plate 6). In 1987, the area was subdivided into five lots (NSW Land Registry Services, Certificate of Title Volume 5135 Folio 13). A 1991 aerial photograph shows that, apart from more recent industrial and commercial development, the study area is in a similar condition to its current state (Plate 7).

Plate 4 **Extract from a 1978 aerial photograph, with the study area highlighted (Source: NSW Spatial Services 2018)**

Plate 5 **Extract from a 1986 aerial photograph, with the study area highlighted (Source: NSW Spatial Services 2018)**

Plate 6 **Detail of the 1986 aerial photogaph, showing plough marks in the cleared field area (Source: NSW Spatial Services 2018)**

Plate 7 Extract from a 1991 aerial photograph with the study area highlighted (Source: NSW Spatial Services 2018)

3.2 Previous archaeological work

A large number of cultural heritage surface (surveys) and sub-surface (excavations) investigations have been conducted throughout the region of NSW in the past 30 years. There has been an increasing focus on cultural heritage assessments in NSW due to ever increasing development, along with the legislative requirements for this work and greater cultural awareness of Aboriginal cultural heritage. The archaeology of the Sydney Basin region has been well documented through a large number of academic and impact assessment investigations over the past 30 years (Kohen 1986, Haglund 1980, Smith 1989, McDonald & Rich 1993). This is particularly evident in the Cumberland Plain, largely as a result of archaeological studies related to rapid urban development across the area. These studies have enabled a comprehensive model of archaeological site distribution to be developed for the Cumberland Plain, including the local area.

It is generally accepted that people have inhabited the Australian landmass for at least 65,000 years (Clarkson et al. 2017). The date of earliest occupation of the continent by Aboriginal people are subject to continued revision as more research is undertaken. Initial human occupation of the Sydney Basin is still uncertain and while there is some evidence for occupation in 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, dated to 30,735 ± 407 BP (Jo McDonald Cultural Heritage Management Pty Ltd 2005a, Jo McDonald Cultural Heritage Management Pty Ltd 2005b). Archaeological evidence of Aboriginal occupation of the Cumberland Plains indicates that the area was intensively occupied from approximately 4000BP (Dallas 1982, p.7). 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 sub-surface archaeological investigations, rather than actual evidence of the Aboriginal people prior to this time.

3.2.1 Regional overview

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

These studies have permitted a comprehensive model of archaeological site distribution to be developed for the Cumberland Plains, including the Penrith and Nepean region. The model suggests that archaeological sites are focused upon the higher order creeks (such as the Nepean River and South Creek), situated on the surrounding river terraces, lower slopes and to a lesser extent surrounding elevated areas. Confluences of major creeks are also significant for archaeological distribution. In these areas, the soil profile is often preserved and can be in excess of 70 centimetres, permitting good stratigraphic and temporal retention of archaeological sites.

Hanrahan (1981) undertook an archaeological survey for NSW Housing Commission that was bounded by the Great Western Highway in the north and the Western Freeway in the south. One artefact scatter site was recorded which Hanrahan (1981) described as extensive but disturbed stretching along the banks of Claremont Creek. The site was situated on exposed clay 30 metres from the Creek. The dominant raw material was red silcrete, and consists of cores and flakes.

Haglund (1984) organised the collection of a representative example of stone artefacts from the Claremont Creek site, previously identified by Hanrahan (1981), as a requirement of the NPWS prior to the proposed South Werrington residential development. Haglund (1984) collected 121 artefacts with silcrete being the dominant raw material, with mudstone and quartz also recorded. Artefacts were small and consist of cores and flakes. The site was determined to be a surface scatter with little chance of finding undisturbed stratified archaeological deposit.

Rhodes and Dunnet (1985) were commissioned by NPWS and City of Penrith to identify the Aboriginal cultural resource patterns within the boundaries of Penrith. A sample survey was undertaken based upon randomly selected units and areas of surface exposure. The survey identified 11 new sites. The study concluded sites occur in all major terrains, though abundance patterning and visibility characteristics of the archaeological material vary.

Environmental Resources Management (2003) was commissioned by Land Solutions Pty Ltd to conduct an Aboriginal archaeological assessment of two parcels of lands selected for development at Claremont Meadows. Two isolated finds and three artefact scatters were identified. The three artefact scatters were identified as an open area of archaeological deposit based on their position on a ridge crest above the South Creek floodplain. It was noted that the results of the survey was a reflection on erosion and visibility patterns rather than occupation across the landscape.

Environmental Resources Management (2006) undertook an archaeological salvage of the Claremont Meadows open archaeological deposit that was identified by ERM in 2003 prior to impacts from a proposed residential development. Approximately 2,000 artefacts were recovered from a total area of 141.5 metres squared in two excavation zones and the site was identified as a significant artefact assemblage. Environmental Resources Management (2006) suggested that the patterning could be related to complex activity zones with evidence for overlapping knapping floors. It was concluded that the site represents seasonal occupation of a landscape, previously thought to contain only limited evidence for Aboriginal occupation on the Cumberland Plain.

Biosis Research (2007) was engaged by Cloustons Associates on behalf of Penrith City Council to undertake an archaeological survey for the proposed South Creek Precinct Plan and Gipps Street Master Plan. The survey identified 11 sites and suggested that more sites may be present along South Creek. The assessment concludes that the resources provided within the South Creek catchment seem to have been a focus for Aboriginal settlement and exploitation, confirming earlier studies (Environmental Resources Management 2006, McDonald 2003).

3.2.2 Local overview

A number of Aboriginal cultural heritage investigations have been conducted within the region (within approximately 10 kilometres of the study area). Most of these investigations were undertaken as part of development applications and included surface and sub-surface investigations. These investigations are summarised below.

Brayshaw and McDonald (1994) were commissioned by the Australian Defence Industries (ADI) Properties Division, NSW to act as archaeological consultant for the rehabilitation of the former ADI site in St Marys. The model developed for the project predicted that archaeological material was likely to occur across the site, with areas of archaeological potential occurring where there has been limited prior surface disturbance, but the nature of sites will vary throughout. It was predicted that areas around first order streams would hold minimal evidence of occupation, likely representing background scatter, while evidence in the vicinity of second order streams would still be sparse but more focussed such as single episode knapping floors and one-off camp locations. Creek junctions may also be focus areas of activity with the stream ranking nodes likely influencing site sizes. A map of archaeological potential based on undisturbed areas was also prepared prior to the field investigation. The survey did not record new sites as part of the investigation as a systematic survey was to be undertaken as a separate assessment. The inspection of the portion of the ADI site containing the current study area (KMA1) was only perfunctorily surveyed, mainly on graded roads with good visibility. Surface artefacts were located, particularly on McGarritys Hill in the north-western corner. Examination of aerial photographs suggest there is less disturbance along the creek lines in this area and other small areas (not specified), which may have good potential for archaeological evidence.

McDonald and Mitchell (1994, cited by Jo McDonald Cultural Heritage Management Pty Ltd 2006) conducted an investigation of Aboriginal heritage contained within the former Australian Defence Industries (ADI) site located across Jordan Springs, Llandilo, Ropes Crossing and St Marys in the Penrith and Blacktown LGAs, to enable orderly management of heritage values as part of the development of the site. Over 45% of the site was identified as holding high conservation value for archaeology, which was proposed to be retained as a regional park. A strategic management model was developed for Aboriginal cultural heritage, which identified areas of previous land disturbance and applied a predictive model to the site. Areas with the least disturbance were classed as having high conservation potential, as was a representative range of landscape areas where it was predicted that archaeological sites would occur. Four archaeological management zones were established based upon archaeological sensitivity:

- Zone 1: Very high potential for intact archaeological evidence – potential conservation zone
- Zone 2: High potential for intact archaeological evidence
- Zone 3: Moderate potential for intact archaeological evidence
- Zone 4: Low – no potential for intact archaeological evidence – no further work required.

Biosis (2010) undertook a program of test excavations for the Western Sydney Recycled Water Initiative – Replacement Flows Project (WSRFP) undertaken between October 2008 and January 2009. As part of the testing program, a total of 17 test pits were excavated along a proposed pipeline

easement centreline within the slope and low-lying swampy area within AHIMS site 45-5-3319, located south of the Nepean Rugby Union Oval approximately 2 kilometres south-west of the study area. No artefacts were recovered from the excavations and two artefacts were recovered from the surface of the site, both of which were collected. It was concluded after the test excavations that the pipeline easement within site 45-5-3319 had been subject to a high degree of disturbance, and that there was little to no archaeological potential. The surface artefacts were not considered to be in primary context, most likely having washed into the area from the ridgeline above. The scientific significance of the tested extent of site 45-5-3319 was assessed as nil, and there were no identified archaeological constraints to the construction of the WSRFP pipeline within the pipeline easement (Biosis Pty Ltd 2010, pp.63–67).

Biosis (2011) undertook an ACHA to locate any Aboriginal archaeological sites or areas of sensitivity associated with several 33kV line route options proposed by Endeavour Energy. Two separate study areas were included in the assessment: Andrews Road Playing Fields (Project Area 1A) and Illawong Avenue (Project Area 1B) , and Ravenglass Place (Project Area 2), all located within Jordan Springs, approximately 375 metres west and 1.8 kilometres south-west of the current study area. It was predicted that artefact scatters, isolate artefacts and potential archaeological deposits (PAD) could potentially occur within the assessment areas, but low potential for modified trees to be present. Three existing AHIMS sites were located within Project Area 1A. No new sites were identified during the site investigation.

Archaeological & Heritage Management Solutions (2012) made updates to an Aboriginal Heritage Assessment initially prepared in 2006 for 164 Station Street, Penrith. Significant research and analysis was undertaken regarding the Cranebrook Terrace formation and its two stratigraphic units, the Richmond and Penrith units. Citing an assessment undertaken 1 kilometre west of the site where it is suggested that surface artefacts made from river pebble material may have originated from the underlying sandy-clay soils below surface topsoils, it is suggested that Aboriginal archaeological material could be contained within the A Horizon topsoils and the underlying upper 6 metres of alluvial soil deposit (Archaeological & Heritage Management Solutions 2012, pp.41, 50).

3.2.3 AHIMS site analysis

A search of the AHIMS database conducted on the 8 October 2018 (Client Service ID: 373910) identified 103 Aboriginal archaeological sites within a 5 kilometre search area centred on the study area (Table 5). None of these registered sites are located within the study area (Figure 7). AHIMS search results are provided in Appendix 1. Table 4 provides details of the registered sites located within the immediate 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 on 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.

Table 4 AHIMS search results

AHIMS site no.	Site name	Site type
45-5-2414	L1 (Penrith Lakeside Village)	Open camp site, artefact

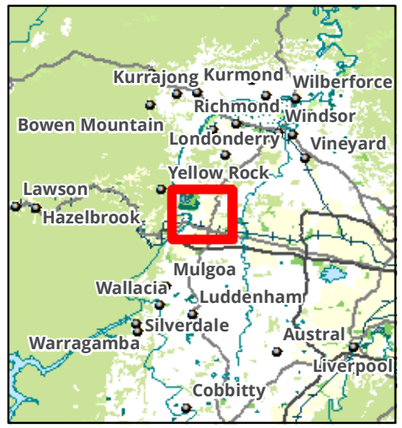
AHIMS site no.	Site name	Site type
45-5-2416[1]	L-1; Penrith Lakeside Village	Open camp site, artefact
45-5-3319	Western Sydney 7 and PAD	Artefact, PAD

Table 5 AHIMS site type frequency

Site type	Number of occurrences	Frequency (%)
Aboriginal ceremony and dreaming, artefact	1	0.97
Isolated find, artefact	17	16.50
Open camp site, artefact	54	52.43
Rock engraving	1	0.97
PAD, artefact	4	3.89
Artefact	26	25.24
Total	103	100.00

A simple analysis of the Aboriginal cultural heritage sites registered within the 5 kilometre search area indicates that indicates that the most common site type is an open camp site, artefact with 52.43% (n=54), followed by artefact with 25.24% (n=26) and isolated find, artefact with 16.50% (n=17).

[1] Duplication of AHIMS site 45-5-2414



Legend

Study area

AHIMS Record

Figure 7: AHIMS records near the study area

NOT TO BE MADE PUBLIC

0 290 580 870 1,160 1,450

Metres

Scale: 1:29,000 @ A3

Coordinate System: GCS GDA 1994

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3.3 Discussion

3.3.1 Predictive model

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

This model is based on:

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

Based on this information, a predictive model has been developed, indicating the site types most likely to be encountered during the survey and subsequent sub-surface investigations across the present study area (Table 6). The definition of each site type is described firstly, followed by the predicted likelihood of this site type occurring within the study area.

Table 6 Aboriginal site prediction statements

Site type	Site description	Potential
Flaked stone artefact scatters and isolated artefacts	Artefact scatter sites can range from high-density concentrations of flaked stone and ground stone artefacts to sparse, low-density 'background' scatters and isolated finds.	**High**: Stone artefact sites have been previously recorded in the region across a wide range of landforms including alluvial flats, and also within the study area; they have the high potential to be present in undisturbed areas within the study area.
Potential archaeological deposits (PADs)	Potential sub surface deposits of cultural material.	**Moderate to High**: PADs have been previously recorded in the region across a wide range of landforms including alluvial flats, and also within the study area. They have the potential to be present in undisturbed landforms.
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 to Moderate:** There is currently one recorded mythological stories for the study area.

Site type	Site description	Potential
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. As the nearest perennial water source is 1 kilometre away from the study area, there is a low potential of Shell Middens being present within the study area.
Modified trees	Trees with cultural modifications	**Low:** There is no record of any modified trees being within or surrounding the study area, due to, due to extensive vegetation clearing from the 1800's onwards, therefore the potential is low.
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, places where Aboriginal political events commenced or particular buildings.	**Low:** There are currently no recorded Aboriginal historical associations for the study area.
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.

Site type	Site description	Potential
Rock shelters with art and / or deposit	Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground characterised by cliff lines and escarpments. These naturally formed features may contain rock art, stone artefacts or midden deposits and may also be associated with grinding grooves.	**Low:** The sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space exist, which are not present in the study area.
Quarries	Raw stone material procurement sites.	**Low:** There is no record of any quarries being within or surrounding the study area.

4 Archaeological survey

A field survey of the study area was undertaken on 5 October 2018. The field survey sampling strategy, methodology and a discussion of results are provided below.

4.1 Archaeological survey objectives

The objectives of the survey were to:

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

4.2 Archaeological survey methodology

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

4.2.1 Sampling strategy

Due to swampy locations and areas of dense tall grasses, the survey effort targeted accessible areas in the two landform types within the portions of the study area which would be impacted by proposed works. This sampling was undertaken in order to gather data from the two landforms which would inform the assessment of the study area.

4.2.2 Survey methods

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

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

Where possible, identification of natural soil deposits within the study area was undertaken. Photographs and recording techniques were incorporated into the survey including representative photographs of survey units, landform, vegetation coverage, ground surface visibility (GSV) and the recording of soil information for each survey unit were possible. Any potential Aboriginal objects observed during the survey were documented and photographed. The location of Aboriginal cultural heritage and points marking the boundary of the landform elements were recorded using a hand-held Global Positioning System (GPS) and the Map Grid of Australia (MGA) (94) coordinate system.

4.3 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 overall effectiveness of the survey for examining the ground for Aboriginal sites was considered to be very low across the majority of the site due to very poor ground surface visibility (GSV) and significant ground disturbance in the north-western portion of the study area. Opportunities to examine the ground surface were extremely limited due to the poor GSV created by thick vegetation cover. The ground was inspected in areas of exposure where possible, mostly in the north-western corner of the study area; however, it was difficult to determine whether these areas were natural or modified surfaces resulting from earlier development.

The ability to identify obtrusive potential cultural heritage features within the study area was considered only moderate overall, due to long dense grasses and swampy vegetation across much of the study area (Plate X). However, visual identification still allowed for the identification of the two landforms present within the study area, and determining areas of archaeological sensitivity. Areas of remnant vegetation were present in a number of stands in the north-western portion of the study area.

4.4 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 2010b). Visibility within the majority of the study area was very low due to dense tall grasses and swamp vegetation, with some areas of exposed ground surface in the north-western corner. Visibility was at 0% on terrace edges (Plate 8) and at approximately 50% on flat terrace tops (Plate 9).

Plate 8 **Dense, long grass cover in the central portion of the study area, looking north-west towards the terrace edge landform**

Plate 9 **Areas of exposed ground surface in the north-western portion of the study area on the flat terrace tops landform**

4.5 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 2010b). Overall, approximately 10% of the ground surface within the study area was exposed, all of which was on the flat terrace tops in the north-western corner; these exposed areas are located in areas of disturbance, or may potentially be fill material introduced to the site from earlier development (Plate 9 and Plate 10).

Plate 10 **Areas featuring low visibility and exposure on the flat terrace top landform, facing north-west**

4.6 Disturbances

Disturbance in the study area is associated with natural and human agents. Natural agents generally affect small areas and include the burrowing and scratching in soil by animals, such as dogs, cats, 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 present within the current study area include: landscaping, levelling, earthworks and drainage associated with surrounding light industrial development (Plate 11, Plate 12); farming practices, such as initial vegetation clearance for creation of paddocks, fencing and stock grazing (Plate 13); and agricultural practices such as ploughing. Plough marks were not visible due to dense grass coverage, but they have been identified in historical aerials.

Plate 11 **Areas of levelling and earthworks on the flat terrace tops in the north-western portion of the study area, facing east**

Plate 12 **Man-made drainage channel on the north-western boundary of the study area, facing south-west**

Plate 13 **Evidence of former paddock divisions on the terrace edge landform in the central portion of the study area, facing east**

The north-western portion of the study area shows signs of possible levelling and deposition of spoil and waste materials to create a series of earthworks, while a levee has also been established east of an additional unmapped swampy area in the central-western portion of the study area (Plate 11, Plate 14). An electrical easement is present, running south-west through the eastern portion of the study area; this includes electricity poles as well as having been cleared and surfaced with pebbles and stones (mostly now overgrown) to act as a raised track through the swampy area (Plate 15). Several geotech holes were also identified within the densely grassed portion of the study area (Plate 16).

Plate 14 **Earthwork levee adjacent to the additional swamp area in the central-western portion of the study area, facing south**

Plate 15 **Electrical easement and raised track within the swampy area in the south-eastern portion of the study area, featuring pebbles overgrown with grass, facing south-west**

Plate 16 **Example of a geotech hole present in the central portion of the study area**

4.7 Archaeological survey results

A series of meandering transects were walked across two landforms as part of the sampling strategy (Figure 8). The methodology set out in Burke and Smith (2004, p.65) states that a single person can only effectively visually survey an area of two linear metres. One area of PAD was identified within the study area; no Aboriginal sites were identified within the study area. The results from the field survey have been summarised below and landform coverage details are provided in Table 7.

The areas of proposed works within study area were contained within two landform units, both of which were assessed as part of the survey. The western portion is contained within a flat terrace top, while the central portion is contained within a terrace edge landform. The eastern portion of the study area consists of a flat swampy area which will not be impacted by the proposed works. Both landforms had been subjected to some disturbance from historical farming activities, with the flat terrace top in the north-western portion of the study area having been disturbed by more recent industrial development located adjacent to the study area.

The overall effectiveness of the survey in identify any Aboriginal object which may be present within the study area was low. This is primarily attributable to the extremely low GSV within the study area, as well as these disturbances. The majority of the ground surface was covered by dense grass, and exposures were limited to areas of disturbance. Exposures within the study area were targeted in an attempt to identify any visible surface artefacts but none were located. The study area has been subjected to extensive clearing and no mature trees were identified within the area of proposed works, limiting the potential for scarred trees to be located within the study area. No sandstone rock outcroppings were located within the study area capable of supporting art sites or grinding grooves, and no midden or shell remains consistent with Aboriginal resource exploitation were visible within the study area at the time of survey.

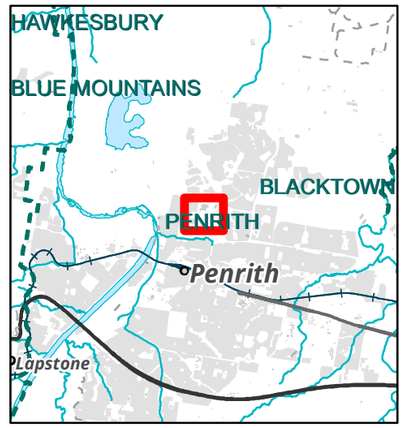
Plate 17 **North-western facing view of area of moderate archaeological potential**

Plate 18 **View of area of moderate archaeological potential, facing west**

Table 7 Survey coverage

Survey unit	Landform	Survey unit area (m²)	Visibility (%)	Exposure (%)	Effective coverage area (m²)	Effective coverage (%)
1	Terrace edge	45,931.34	0	0	0	0

Survey unit	Landform	Survey unit area (m²)	Visibility (%)	Exposure (%)	Effective coverage area (m²)	Effective coverage (%)
2	Flat terrace top	69,177.24	50	10	34.59	5



Legend

- Study area
- Survey track

Figure 8: Survey coverage

0 30 60 90 120 150

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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Albury, Ballarat, Melbourne,
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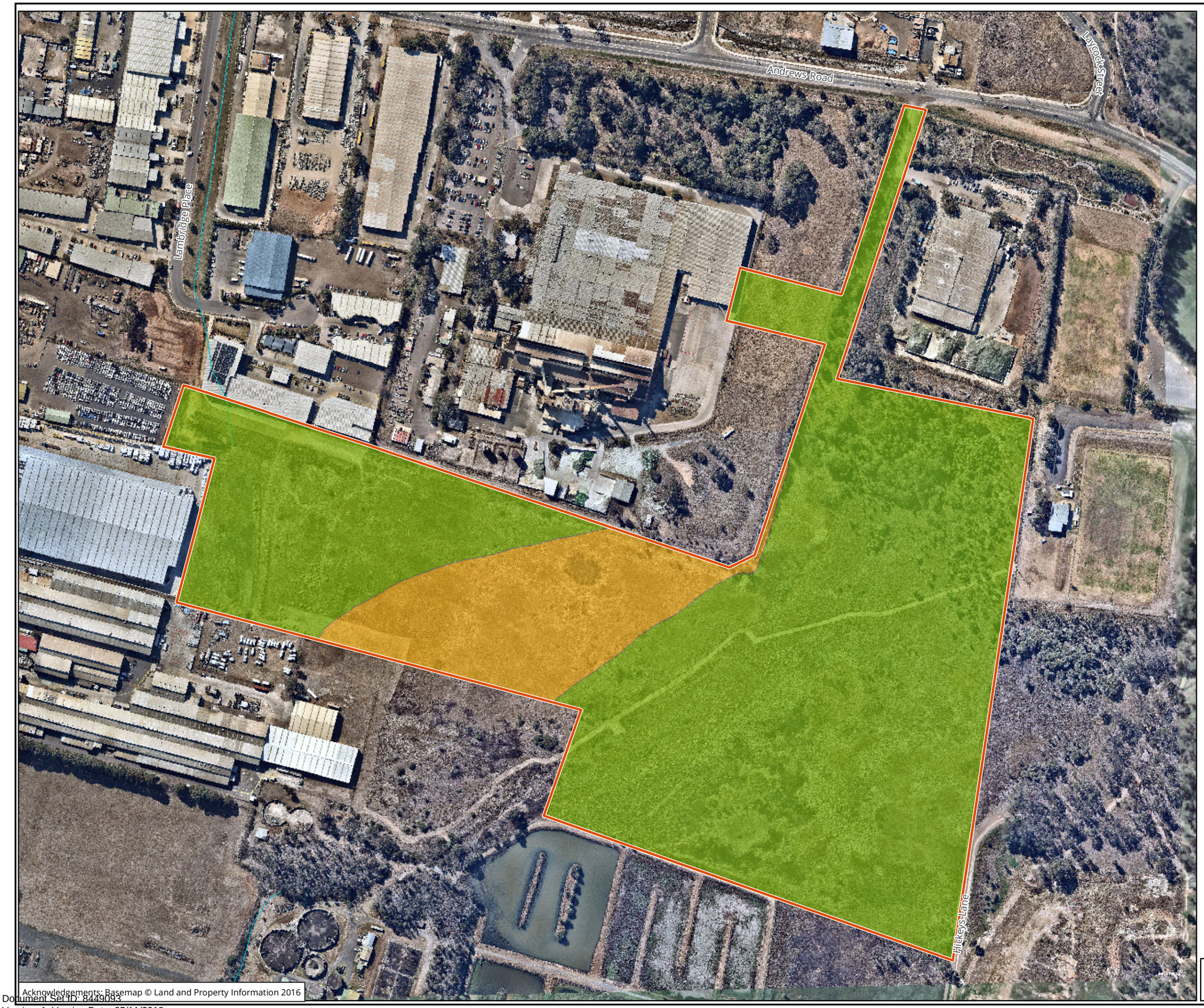
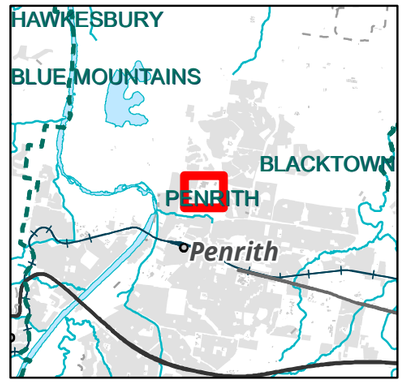
Matter: 28456
Date: 10 October 2018,
Checked by: JAC, Drawn by: DK, Last edited by: dkazemi
Location:P:\28400s\28456\Mapping
28456_F8_SurveyResult





Legend

Study area

Archaeological potential

Moderate

Low

Acknowledgements: Basemap © Land and Property Information 2016

Figure 9 Assessment of archaeological potential

0 50 100 150 200

Metres

Scale: 1:3,500 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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Biosis Pty Ltd

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

Matter: 28456
Date: 23 October 2018,
Checked by: JAC, Drawn by: DK, Last edited by: dkazemi
Location:P:\28400s\28456\Mapping
28456_F9_ArchaeologicalPotential

5 Analysis and discussion

The archaeological survey was heavily hampered by very limited ground surface visibility and, existing disturbance. However, an area of archaeological potential, PAD 1, was identified. This area is primarily associated with existing water courses and low-lying swampy areas within the study area. The following analysis has been undertaken for this area of archaeological potential.

5.1 Andrews Road PAD 1

The position of the rise consisting of a terrace edge and its interface with a flat terrace top located between a swampy area and first order streams in the north-western portion of the study area and to the south of the study area suggests this portion of the study area could have been a temporary camping site associated with resource gathering from the swamp and water course.

The raised elevation of the terrace edge and flat terrace top adjacent to several low lying swampy areas and watercourses suggest it may have been an opportunistic location for food or tool processing associated with hunter gathering activities in the swampy areas. Flood mapping undertaken for the Penrith LGA shows that the area of moderate archaeological potential is within an area designated as within the probable maximum flood extent within the Nepean River floodplain (Cardno Lawson Treloar Pty Ltd 2006). This suggests that the area of PAD is subject to infrequent inundation, and could potentially have been a largely reliable area of dry, higher ground adjacent to the swamp. The foothills and ridgelines east of the study area may have also provided shelter and a raised outlook for temporary occupation or camping sites.

Geotechnical investigations undertaken for the study area determined that there are areas of distinct and indistinct A Horizon topsoils overlying relatively deep silty alluvial soils within the terrace edge and adjacent parts of the flat terrace top, and underlying alluvial gravels (JK Geotechnics 2018). Historical aerials suggest that much of the terrace edge and flat terrace top in the area of proposed works has been subjected to historical ploughing, while the 1978 aerial appears to show further swampy locations surrounding the central ploughed field. Historical tree clearance and ploughing may have had an impact on the integrity of topsoils and higher subsoils. Ploughing and tree clearing are unlikely to have removed artefacts from the topsoil, but rather moved and/or damaged any artefacts present to a depth of approximately 20 centimetres. In light of this, there is potential for Aboriginal objects to be located within the A and B Horizon soils dating to the Holocene (up to 10,000 years BP), albeit within a disturbed context. It is possible that deeper subsoil deposits may remain intact, with infrequent episodes of inundation potentially depositing alluvial silts or displaced artefacts from other contexts into this area over time, or containing evidence of pre-Holocene occupation. However, with the estimated age of the Penrith Unit being 50,000-100,000 years BP, it is possible that these deeper subsoils were deposited prior to Aboriginal occupation.

There is also evidence of Aboriginal occupation in the immediate vicinity of the study area, with two registered AHIMS sites located north-west and east of the study area. AHIMS site 45-5-2414 features a number of artefacts and area of PAD north-west of the study area, while AHIMS site 45-5-3319 consisted of an isolated find and area of PAD to the east of the study area. While Biosis' excavations of AHIMS site 45-5-3319 did not identify any subsurface artefacts within the portions of the PAD excavated, two artefacts were recovered from the surface of the PAD site. This was interpreted as the result of run-off into the PAD area from the ridgeline above. With the wider area already featuring low density archaeological evidence, there is increased likelihood of further archaeological material being located within the study area.

5.2 Discussion of results

The results of the archaeological survey remain broadly consistent with the predictive statements made for this assessment. The area of PAD identified during the survey is largely similar to the results of previous assessments of potential archaeological deposits, located on elevated ground in close proximity to water sources and resource gathering areas but at low risk by inundation by floodwaters. Fibres from plant species noted during the survey would have provided a resource in the weaving and binding.

6 Scientific values and significance assessment

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

6.1 Introduction to the assessment process

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

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

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

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

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

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

6.2 Archaeological (scientific significance) values

Archaeological significance (also called scientific significance, as per the ICOMOS Burra Charter) refers to the value of archaeological objects or sites as they relate to research questions that are of importance to the archaeological community, including indigenous communities, heritage managers and academic archaeologists. Generally the value of this type of significance is determined on the basis of the potential for sites and objects to provide information regarding the past life-ways of people (Burke & Smith 2004, p.249, NPWS 1997).

Research potential

Research potential is assessed by examining site content and site condition. Site content refers to all cultural materials and organic remains associated with human activity at a site. Site content also refers to the site structure – the size of the site, the patterning of cultural materials within the site, the presence of any stratified deposits and the rarity of particular artefact types. As the site contents criterion is not applicable to scarred trees, the assessment of scarred trees is outlined separately below. The site content ratings used for archaeological sites are provided in Table 8. Site condition refers to the degree of disturbance to the contents of a site at the time it was recorded. The site condition ratings used for archaeological sites are provided in Table 9.

Table 8 Site contents ratings used for archaeological sites

Rating	Description
0	No cultural material remaining.
1	Site contains a small number (e.g. 0–10 artefacts) or limited range of cultural materials with no evident stratification.
2	Site contains a larger number, but limited range of cultural materials; and/or some intact stratified deposit

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

Table 9 Site condition ratings used for archaeological sites

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

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

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

Representativeness

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

Assessment of representativeness also takes into account the contents and condition of a site. For example, in any region there may only be a limited number of sites of any type that have suffered minimal disturbance. Such sites would therefore be given a high significance rating for representativeness, although they may occur commonly within the region. The representativeness ratings used for archaeological sites are provided in Table 10.

Table 10 Site representativeness ratings used for archaeological sites

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

Overall scientific significance ratings for sites, based on a cumulative score for site contents, site integrity and representativeness are provided in Table 11.

Table 11 Scientific significance ratings used for archaeological sites

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

Each site is given a score on the basis of these criteria – the overall scientific significance is determined by the cumulative score.

It is not possible to assess the archaeological or scientific significance of an area of archaeological potential without further investigation to establish the presence, nature and extent of subsurface deposits associated with the areas of archaeological potential. This is generally undertaken through a program of test excavation. As such, it is not currently possible to determine the significance of Andrews Road PAD 1, without further exploration of the area of PAD.

7 Impact assessment

As previously outlined, the proposed development consists of a new warehouse, which will include a dispatch office and amenities, and associated infrastructure. This will involve the installation of both light and heavy duty paving, foundations, services, site levelling and stabilisation, as well as vegetation clearing.

7.1 Predicted physical impacts

The construction of the warehouse and the infrastructure associated with the development will impact a large proportion of the area identified as holding archaeological potential within the study area.

A summary of impacts is provided below in Table 12.

Table 12 Summary of potential archaeological impacts

AHIMS Site No.	Site Name	Significance	Type Of Harm	Degree Of Harm	Consequence Of Harm
AHIMS # pending	Andrews Road PAD 1	To be determined	Direct	Partial	Partial loss of value

7.2 Management and mitigation measures

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

Avoidance of impact to archaeological and cultural heritage sites through design of the development is the primary mitigation and management strategy, and should be implemented where practicable. It is not possible for the proposed works to avoid impacts to the area of PAD within the study area, and as such the area of PAD within the study area will be impacted by the proposed DA.

It is recommended that an ACHA be undertaken in accordance with the consultation requirements and the code in order to consult with the Aboriginal community and to establish the presence, nature and extent of subsurface deposits associated with the areas of archaeological potential through a program of test excavation.

8 Recommendations

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

- predicted impacts to Aboriginal cultural heritage
- the planning approvals framework
- current best conservation practise, widely considered to include:
  - ethos of the Australia ICOMOS Burra Charter
  - the code.

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

Recommendation 1: ACHArequired in advance of physical impacts

In advance of any physical impacts within the study area, an ACHA must be undertaken to assess any impacts the proposed works will have on identified Aboriginal sites within the study area. The ACHA must be undertaken in accordance with the consultation requirements and the code. Any impacts to areas of high or moderate archaeological potential should be addressed through a program of test excavation in accordance with the code. This ACHA should be completed prior to the issue of Development Consent for this project.

Recommendation 2: No further work required for areas of low archaeological potential

No further assessment is required in areas of low archaeological potential, and works can proceed with caution, subject to the unexpected finds protocol in Recommendation 3.

Recommendation 3: Discovery of unanticipated heritage items

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 OEH. Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying the OEH and Aboriginal stakeholders.

Aboriginal ancestral remains

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

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

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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 : 28456 JAC

Client Service ID : 373910

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-2416	L-1;Penrith Lakeside Village;	AGD	56	286800	6264740	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists					**Permits**		
45-5-3326	ADI/FF-1	AGD	56	289922	6265112	Open site	Valid	Artefact : 1		99635,102450
	Contact T Russell	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3327	ADI/FF-6	AGD	56	289681	6266839	Open site	Valid	Artefact : 27		99635,102450
	Contact T Russell	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3329	ADI/FF-6b	AGD	56	289857	6266809	Open site	Valid	Artefact : 2		99635,102450
	Contact T Russell	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3331	ADI/FF-30	AGD	56	288835	6265442	Open site	Valid	Artefact : 1		99635,102155,102450,102573,103618
	Contact T Russell	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**	3057	
45-5-3332	ADI/FF-31	AGD	56	288950	6265366	Open site	Valid	Artefact : 19		99635,102155,102573
	Contact T Russell	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3333	ADI/FF-32	AGD	56	289935	6266340	Open site	Valid	Artefact : 1		102450
	Contact T Russell	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3317	Western Sydney 5	GDA	56	287679	6264900	Open site	Valid	Artefact : 1		100554,102450
	Contact Searle	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-3318	Western Sydney 6	GDA	56	287710	6264801	Open site	Valid	Artefact : 5		100554,102450
	Contact Searle	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-3319	Western Sydney 7 and PAD	GDA	56	287450	6264725	Open site	Valid	Artefact : 1, Potential Archaeological Deposit (PAD) : -		100554,102450
	Contact Searle	**Recorders**	Navin Officer Heritage Consultants Pty Ltd					**Permits**		
45-5-1025	ADI-24;	AGD	56	288540	6264980	Open site	Valid	Artefact : -	Isolated Find	102155,102450
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-3904	EPRSY 3(PAD)	GDA	56	284000	6263615	Open site	Partially Destroyed	Potential Archaeological Deposit (PAD) : -, Artefact : -		103762
	Contact	**Recorders**	Doctor.Alan Williams,Doctor.Alan Williams					**Permits**	3485	
45-5-1026	ADI-25;	AGD	56	288880	6264930	Open site	Valid	Artefact : -	Isolated Find	102155,102450,102573
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		

Report generated by AHIMS Web Service on 03/10/2018 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 283700 - 290700, Northings : 6261200 - 6268200 with a Buffer of 0 meters. Additional Info : ADD Assessment. Number of Aboriginal sites and Aboriginal objects found is 103

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-1027	ADI-26	AGD	56	288986	6265084	Open site	Valid	Artefact : -	Isolated Find	99635,102155,102450,102573,102577
	Contact	**Recorders**	Doctor.Jo McDonald,Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-1028	ADI-27	AGD	56	289080	6265230	Open site	Valid	Artefact : -	Open Camp Site	102155,102450,102577
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1029	ADI-28;	AGD	56	289670	6265140	Open site	Valid	Artefact : -	Isolated Find	102450,102573,102577,103618
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**	3057	
45-5-1030	ADI-29;	AGD	56	289860	6265020	Open site	Valid	Artefact : -	Isolated Find	102450,102577
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1031	ADI-30;	AGD	56	289650	6264760	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1032	ADI-31;	AGD	56	289650	6264790	Open site	Valid	Artefact : -	Isolated Find	102450
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1033	ADI-32;	AGD	56	289170	6266480	Open site	Valid	Artefact : -	Open Camp Site	102155,102450,102573,103618
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**	3057	
45-5-1034	ADI-33;	AGD	56	289470	6266490	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1035	ADI-34;	AGD	56	289520	6266540	Open site	Valid	Artefact : -	Open Camp Site	102450,103618
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**	3057	
45-5-1036	ADI-35;	AGD	56	289380	6265980	Open site	Valid	Artefact : -	Isolated Find	102450
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1037	ADI-36;	AGD	56	289490	6265690	Open site	Valid	Artefact : -	Isolated Find	102450
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1038	ADI-37;	AGD	56	289520	6265550	Open site	Valid	Artefact : -	Isolated Find	102450
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1039	ADI-38;	AGD	56	289420	6265540	Open site	Valid	Artefact : -	Isolated Find	102450
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1040	ADI-39;	AGD	56	289280	6265480	Open site	Valid	Artefact : -	Isolated Find	102155,102450,102573
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		

Report generated by AHIMS Web Service on 03/10/2018 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 283700 - 290700, Northings : 6261200 - 6268200 with a Buffer of 0 meters. Additional Info : ADD Assessment. Number of Aboriginal sites and Aboriginal objects found is 103

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-1041	ADI-40;	AGD	56	289270	6265510	Open site	Valid	Artefact : -	Open Camp Site	102155,102450,102573
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1042	ADI-41;	AGD	56	288980	6265790	Open site	Valid	Artefact : -	Isolated Find	102155,102450,102573,103618
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**	3057	
45-5-1043	ADI-42;	AGD	56	290140	6266120	Open site	Valid	Artefact : -	Isolated Find	102450,102577
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1046	ADI-45;	AGD	56	290500	6267030	Open site	Valid	Artefact : -	Isolated Find	102450
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1047	ADI-46;	AGD	56	290160	6267080	Open site	Valid	Artefact : -	Isolated Find	102450
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1048	ADI-47;	AGD	56	289710	6267130	Open site	Valid	Artefact : -	Isolated Find	102450,102577
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**	1312	
45-5-1049	ADI-48;	AGD	56	289680	6267140	Open site	Valid	Artefact : -	Open Camp Site	102450,102577
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**	1312	
45-5-1050	ADI-49;	AGD	56	289360	6266990	Open site	Valid	Artefact : -	Open Camp Site	102450,102577
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1053	ADI-52;	AGD	56	290380	6266310	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1054	ADI-53;	AGD	56	290420	6266360	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1056	ADI-55;	AGD	56	289080	6266060	Open site	Valid	Artefact : -	Open Camp Site	102155,102450,102573
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**		
45-5-1057	ADI-56;	AGD	56	289260	6266670	Open site	Valid	Artefact : -	Open Camp Site	102155,102450,102573,103618
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**	3057	
45-5-2406	ASD1;Kingswood;	AGD	56	290500	6261690	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists					**Permits**		
45-5-2407	ASD2;Kingswood;	AGD	56	290540	6261900	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists					**Permits**		

Report generated by AHIMS Web Service on 03/10/2018 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 283700 - 290700, Northings : 6261200 - 6268200 with a Buffer of 0 meters. Additional Info : ADD Assessment. Number of Aboriginal sites and Aboriginal objects found is 103

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-2414	L1 (Penrith Lakeside Village)	AGD	56	286800	6264740	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists					**Permits**	939,1694,1803	
45-5-0314	Penrith Lakes 28	AGD	56	286325	6267478	Open site	Valid	Artefact : -	Open Camp Site	256,260,526,1018,102450
	Contact	**Recorders**	Jim Kohen					**Permits**		
45-5-0326	Penrith Lakes 15	AGD	56	285428	6266546	Open site	Valid	Artefact : -	Open Camp Site	260,526,1018,102450
	Contact	**Recorders**	Jim Kohen					**Permits**	28	
45-5-0327	Penrith Lakes 16	AGD	56	285428	6266546	Open site	Valid	Artefact : -	Open Camp Site	260,526,1018,102450
	Contact	**Recorders**	Jim Kohen					**Permits**		
45-5-0328	Penrith Lakes 17	AGD	56	283617	6265596	Open site	Valid	Artefact : -	Open Camp Site	260,526,1018
	Contact	**Recorders**	Jim Kohen					**Permits**	28	
45-5-0329	Penrith Lakes 18	AGD	56	283617	6265596	Open site	Valid	Artefact : -	Open Camp Site	260,526,1018
	Contact	**Recorders**	Jim Kohen					**Permits**	28	
45-5-0330	Penrith Lakes 19	AGD	56	284496	6267442	Open site	Valid	Artefact : -	Open Camp Site	260,526,1018,102450
	Contact	**Recorders**	Jim Kohen					**Permits**	28	
45-5-0331	Penrith Lakes 20	AGD	56	286325	6267478	Open site	Valid	Artefact : -	Open Camp Site	260,526,1018,102450
	Contact	**Recorders**	Jim Kohen					**Permits**	28,1067	
45-5-0332	Penrith Lakes 21	AGD	56	284514	6266528	Open site	Valid	Artefact : -	Open Camp Site	260,526,1018,102450
	Contact	**Recorders**	Jim Kohen					**Permits**	28	
45-5-0334	Penrith Lakes 24	AGD	56	287257	6266581	Open site	Valid	Artefact : -	Open Camp Site	260,526,1018,102450
	Contact	**Recorders**	Jim Kohen					**Permits**		
45-5-0335	Penrith Lakes 26	AGD	56	287274	6265667	Open site	Valid	Artefact : -	Open Camp Site	260,526,1018,102450
	Contact	**Recorders**	Jim Kohen					**Permits**		
45-5-0336	Penrith Lakes 27	AGD	56	288189	6265685	Open site	Valid	Artefact : -	Open Camp Site	260,526,1018,102450
	Contact	**Recorders**	Jim Kohen					**Permits**		
45-5-1003	ADI-13;	AGD	56	289780	6266120	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	**Recorders**	Margrit Koettig,Rex Silcox,Miss.Marjorie Sullivan,Phil Hughes					**Permits**		
45-5-1006	ADI-16;	AGD	56	290000	6265580	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	**Recorders**	Margrit Koettig,Rex Silcox,Miss.Marjorie Sullivan,Phil Hughes					**Permits**		
45-5-1007	ADI-15	AGD	56	289800	6265500	Open site	Valid	Artefact : -	Open Camp Site	102450

Report generated by AHIMS Web Service on 03/10/2018 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 283700 - 290700, Northings : 6261200 - 6268200 with a Buffer of 0 meters. Additional Info : ADD Assessment. Number of Aboriginal sites and Aboriginal objects found is 103

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Margrit Koettig,Rex Silcox,Miss.Marjorie Sullivan,Phil Hughes					**Permits**		
45-5-0340	Penrith Regional Art Gallery	AGD	56	284048	6262220	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	260,1018,103155,103360
	Contact	**Recorders**	Charles.D Power					**Permits**		
45-5-0366	Emu Plains Emu Plains 4	AGD	56	285107	6264253	Open site	Valid	Artefact : -	Open Camp Site	1018,102450,103155,103360
	Contact	**Recorders**	Jim Kohen					**Permits**		
45-5-2277	L1	AGD	56	289150	6267600	Open site	Valid	Artefact : -	Open Camp Site	4154,102155,102573
	Contact	**Recorders**	Tony Kondek					**Permits**		
45-5-2278	L 2 (Springwood)	AGD	56	289150	6267590	Open site	Valid	Artefact : -	Open Camp Site	2430,102155,102573
	Contact	**Recorders**	Tony Kondek					**Permits**		
45-5-1020	ADI-12	AGD	56	290040	6266350	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	**Recorders**	Margrit Koettig,Rex Silcox,Miss.Marjorie Sullivan,Phil Hughes					**Permits**		
45-5-1021	ADI-14;	AGD	56	289780	6265650	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	**Recorders**	Margrit Koettig,Rex Silcox,Miss.Marjorie Sullivan,Phil Hughes					**Permits**		
45-5-1023	ADI-22;	AGD	56	289330	6265200	Open site	Valid	Artefact : -	Open Camp Site	102155,102573,102577,103618
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**	3057	
45-5-1024	ADI-23	AGD	56	288700	6265510	Open site	Valid	Artefact : -	Isolated Find	102155,102450,102573
	Contact	**Recorders**	Doctor.Jo McDonald,Ms.Jenni Bate					**Permits**		
45-5-0703	WD64	AGD	56	290560	6264630	Open site	Valid	Artefact : -	Open Camp Site	1380
	Contact	**Recorders**	Laura-Jane Smith					**Permits**		
45-5-0708	WD69	AGD	56	290380	6264960	Open site	Valid	Artefact : -	Open Camp Site	1380,102450
	Contact	**Recorders**	Laura-Jane Smith					**Permits**		
45-5-0709	WD70	AGD	56	289970	6265060	Open site	Valid	Artefact : -	Open Camp Site	1380,102450
	Contact	**Recorders**	Laura-Jane Smith					**Permits**		
45-5-0710	WD71	AGD	56	290510	6264510	Open site	Valid	Artefact : -	Open Camp Site	1380
	Contact	**Recorders**	Laura-Jane Smith					**Permits**		
45-5-0711	WD-72	GDA	56	290490	6264290	Open site	Destroyed	Artefact : -	Open Camp Site	1380,102577
	Contact	**Recorders**	Laura-Jane Smith,GML Heritage Pty Ltd + Context - Surry Hills,Ms.Erin Mein					**Permits**	3647	
45-5-0539	RP3 Peach Tree Creek	AGD	56	284920	6262050	Open site	Valid	Artefact : -	Open Camp Site	1018,103155,103360
	Contact	**Recorders**	Elizabeth Rich					**Permits**		

Report generated by AHIMS Web Service on 03/10/2018 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 283700 - 290700, Northings : 6261200 - 6268200 with a Buffer of 0 meters. Additional Info : ADD Assessment. Number of Aboriginal sites and Aboriginal objects found is 103

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-0540	RP4 Peach Tree Creek	AGD	56	284960	6262120	Open site	Valid	Artefact : -	Open Camp Site	103155,103360
	Contact	**Recorders**	Elizabeth Rich					**Permits**		
45-5-0541	RP5 Penrith Leagues Club	AGD	56	285350	6262560	Open site	Valid	Artefact : -	Open Camp Site	102450,103155,103360
	Contact	**Recorders**	Elizabeth Rich					**Permits**		
45-5-0281	Cranebrook Creek, CC/1	AGD	56	285150	6266723	Open site	Valid	Aboriginal Ceremony and Dreaming : -, Artefact : -		260,526,1018,102450
	Contact	**Recorders**	Jim Kohen					**Permits**	28	
45-5-0290	The Island	AGD	56	285661	6263989	Open site	Valid	Artefact : -	Open Camp Site	260,526,1018,102450,103155,103360
	Contact	**Recorders**	Jim Kohen					**Permits**		
45-5-0589	Penrith Lakes 29	AGD	56	284300	6266280	Open site	Valid	Artefact : -	Open Camp Site	1064
	Contact	**Recorders**	Jim Kohen					**Permits**	28	
45-5-0590	Penrith Lakes 31	AGD	56	284610	6266550	Open site	Valid	Artefact : -	Open Camp Site	1064,102450
	Contact	**Recorders**	Jim Kohen					**Permits**	28	
45-5-0591	Penrith Lakes 30	AGD	56	284230	6266400	Open site	Valid	Artefact : -	Open Camp Site	1064,102450
	Contact	**Recorders**	Jim Kohen					**Permits**	28	
45-5-0790	Jamison_and Blaikie Roads;	AGD	56	284750	6261800	Open site	Valid	Artefact : -	Open Camp Site	1633,103155,103360
	Contact	**Recorders**	Pam Dean-Jones					**Permits**		
45-5-0593	Penrith Lakes 32	AGD	56	286250	6267700	Open site	Valid	Artefact : -	Open Camp Site	11,526,1063
	Contact	**Recorders**	Jim Kohen					**Permits**	1067	
45-5-0522	Penrith P/1	AGD	56	285520	6263940	Open site	Valid	Artefact : -	Open Camp Site	1018,102450,103155,103360
	Contact	**Recorders**	Jim Kohen					**Permits**		
45-5-3587	ADI-FF11	AGD	56	290527	6266912	Open site	Partially Destroyed	Artefact : 21		102450,103618
	Contact	**Recorders**	Mr.Mark Rawson					**Permits**	3057,3728	
45-5-3598	ADI: FF/30 (Springwood)	GDA	56	288835	6265442	Open site	Valid	Artefact : 1		102155,102450
	Contact	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3599	ADI: FF/31 (Springwood)	GDA	56	288950	6265366	Open site	Valid	Artefact : 19		102450
	Contact	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3600	ADI: FF/32 (Springwood)	GDA	56	289935	6266340	Open site	Valid	Artefact : 2		102450
	Contact	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		

Report generated by AHIMS Web Service on 03/10/2018 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 283700 - 290700, Northings : 6261200 - 6268200 with a Buffer of 0 meters. Additional Info : ADD Assessment. Number of Aboriginal sites and Aboriginal objects found is 103

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-3603	ADI-FF2 (Springwood)	GDA	56	290490	6264290	Open site	Valid	Artefact : 7		
	Contact	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3604	ADI-FF4 (Springwood)	GDA	56	290423	6265994	Open site	Valid	Artefact : 1		102450
	Contact	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3605	ADI-FF5 (Springwood)	GDA	56	290345	6266066	Open site	Valid	Artefact : 2		102450
	Contact	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3606	ADI-FF6 (Springwood)	GDA	56	289681	6266839	Open site	Valid	Artefact : 27		102450
	Contact	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3607	ADI-FF7 (Springwood)	GDA	56	289857	6266800	Open site	Valid	Artefact : 2		102450
	Contact	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3608	ADI-FF8 (Springwood)	GDA	56	290096	6266847	Open site	Valid	Artefact : 1		102450
	Contact	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3609	ADI-FF9 (Springwood)	GDA	56	290210	6266840	Open site	Valid	Artefact : 2		102450
	Contact	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-3610	ADI-FF10 (Springwood)	GDA	56	290368	6266912	Open site	Valid	Artefact : 8		102450
	Contact	**Recorders**	Jo McDonald Cultural Heritage Management see GML					**Permits**		
45-5-0707	WD68	AGD	56	290490	6264950	Open site	Valid	Artefact : -	Open Camp Site	1380,102450
	Contact	**Recorders**	Laura-Jane Smith					**Permits**		
45-5-4302	TNR-3	GDA	56	288545	6265150	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**	3619	
45-5-5019	High St PAD	GDA	56	285850	6262985	Open site	Valid	Potential Archaeological Deposit (PAD) : 1		103872
	Contact	**Recorders**	Comber Consultants Pty Limited,Ms.Alandra Tasire					**Permits**		
45-5-2491	Coreeen Ave 1	AGD	56	287070	6263430	Open site	Partially Destroyed	Artefact : -	Open Camp Site	98259,102450, 103155,10336 0
	Contact	**Recorders**	Helen Brayshaw,Tony Kondek					**Permits**	1367	
45-1-0219	Penrith Lakes 39	AGD	56	284930	6267150	Open site	Valid	Artefact : -	Open Camp Site	2446,102450
	Contact	**Recorders**	Jim Kohen					**Permits**		
45-5-3816	Emu Plains Rail Stabling Yards	GDA	56	284015	6263583	Open site	Destroyed	Artefact : 1		
	Contact	**Recorders**	Doctor.Alan Williams,Doctor.Alan Williams					**Permits**	3485	
45-5-3817	Emu Plains Rail Stabling Yards1	GDA	56	284138	6263601	Open site	Destroyed	Artefact : 1		
	Contact	**Recorders**	Doctor.Alan Williams,Doctor.Alan Williams					**Permits**	3282	
45-5-4331	IF-25-1	GDA	56	290605	6264570	Open site	Destroyed	Artefact : 1		
	Contact	**Recorders**	GML Heritage Pty Ltd + Context - Surry Hills,Miss.Sam Cooling,Ms.Erin Mein					**Permits**	3647	

Report generated by AHIMS Web Service on 03/10/2018 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 283700 - 290700, Northings : 6261200 - 6268200 with a Buffer of 0 meters. Additional Info : ADD Assessment. Number of Aboriginal sites and Aboriginal objects found is 103

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 28456 JAC

Client Service ID : 373910

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-4361	Peachtree Creek PAD	GDA	56	285590	6263560	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		103360
	Contact	**Recorders**	Mr.Oliver Brown					**Permits**	3664,3688	
45-5-4920	45-5-4873 reburial	GDA	56	290480	6262491	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mr.Neville Baker,Mr.Neville Baker,Sydney Water-Parramatta,Sydney Water-Parran					**Permits**		
45-5-4873	229 Victoria Street	GDA	56	290420	6262435	Open site	Destroyed	Artefact : -		
	Contact	**Recorders**	Mr.Neville Baker,Mr.Neville Baker,Sydney Water-Parramatta,Sydney Water-Parran					**Permits**	4096	

Report generated by AHIMS Web Service on 03/10/2018 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 283700 - 290700, Northings : 6261200 - 6268200 with a Buffer of 0 meters. Additional Info : ADD Assessment. Number of Aboriginal sites and Aboriginal objects found is 103