Alex Avenue Public School, Schofields

Archaeological Report

DRAFT REPORT

Prepared for Schools Infrastructure NSW

13 March 2019

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Registered Aboriginal Parties

- Aboriginal Archaeology Service
- Barking Owl Aboriginal Corporation
- Butucarbin Aboriginal Corporation
- Darug Aboriginal Land Care
- Darug Boorooberongal Elders Aboriginal Corporation
- Darug Land Observations
- Darug Tribal Aboriginal Corporation
- Deerubbin Local Aboriginal Land Council
- Didge Ngunawal Clan
- Kamilaroi Yankuntjatjara Working Group
- Merrigarn Indigenous Corporation
- Muragadi
- Murra Bidgee Mullangari Aboriginal Corporation

Government Departments

- Office of Environment and Heritage
- National Native Title Tribunal

Client

- Hayball Pty Ltd: Natalia Krysiak and Rob Chan
- TSA Management: Craig Butler and Jacqueline Sellen

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Glossary

ACHA	Aboriginal Cultural Heritage Assessment
AHIP	Aboriginal Heritage Impact Permit
AHIMS	Aboriginal Heritage Information Management System
BP	Before present
CBD	Central Business District
Consultation requirements	*Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010b)
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
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
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
Study area	Part of Lot 4, DP 1208329, and part of Lot 121, DP 1203646
the Code	*Code of practice for archaeological investigation of aboriginal objects in NSW* (DECCW 2010a)

Summary

Biosis Pty Ltd was commissioned to undertake an Aboriginal Cultural Heritage Assessment (ACHA) of the proposed development of the Alex Avenue Public School at 34-38 Schofields Road, Schofields, New South Wales (NSW) (the study area). The proposed development will be assessed as a State Significant Development (SSD) under Section 89(c) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 1 of the State Environmental Planning Policy (State and Regional Development) 2011(State and Regional Development SEPP) (SSD 18_ 9368). The Secretary's Environmental Assessment Requirements (SEARs) issued for this development (22 June 2018) specify that an ACHA must be undertaken to identify, describe and document the Aboriginal heritage values that exist across the whole area that would be affected by the development in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010a) (the Code). Impacts on Aboriginal cultural heritage values are also to be assessed and documented in the ACHA, and demonstrate attempts to avoid impact upon those heritage values, and outline any measures proposed to mitigate impacts. Consultation with the Aboriginal community is also required in accordance with the Department of Environment Climate Change and Water document (DECCW) document, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010b) (Consultation Requirements).

The study area is situated approximately 7.8 kilometres north-north-west of Blacktown and approximately 34.5 kilometres north-west of the Sydney central business district (CBD). The study area contains a crest which gradually descends to the west in the northern portion, and a simple slope descending south towards an open depression and a third order non-perennial stream, which is located outside of the study area, in a wider landscape of gentle slopes.

There are 94 Aboriginal cultural heritage sites registered with the Aboriginal Heritage Information Management System (AHIMS) register in the vicinity of the study area, with no registered sites located within the study area. The western portion of the study area has been subject to previous assessment and was included within an Aboriginal Heritage Impact Permit (AHIP) C000550 issued to Landcom, trading as UrbanGrowth NSW, which commenced on 11 September 2014. The AHIP is for a period of five years, and is due to expire on 11 September 2019. There are no sites listed on the AHIP or in AHIMS which are located within the study area.

The Aboriginal community was consulted regarding the heritage management of the project throughout its lifespan. Consultation has been undertaken as per the process outlined in the Consultation Requirements and is documented in the ACHA report for this project.

The survey was conducted on 20 November 2018. The overall effectiveness of the survey for examining the ground for Aboriginal sites was deemed low. This was attributed to vegetation cover restricting ground surface visibility (GSV) combined with a low amount of exposures. No previously unrecorded Aboriginal cultural heritage sites were identified during the field survey. One area of moderate archaeological potential, Alex Avenue PS potential archaeological deposit (PAD) 1, was identified on part of the crest and ridgeline and extending to the simple slope and open depression within the study area.

The proposed development will impact the area of moderate archaeological potential identified during the survey. Test excavations were proposed in order to confirm the nature and extent of any archaeological deposits which may be present within the study area.

Test excavations were conducted within the area of moderate archaeological potential between 18 and 26 February 2019. A total of 31 test pits were excavated as part of the test excavations and a total of three

artefacts were recovered. The test excavations resulted in the identification of two new Aboriginal sites: Alex Avenue PS 01 (AHIMS pending), and Alex Avenue PS 02 (AHIMS pending).

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 areas containing Alex Avenue PS 01 and Alex Avenue PS02 within the study area, and as such Alex Avenue PS 01 and Alex Avenue PS02 will be impacted by the proposed SSD project.

Alex Avenue PS 01 and Alex Avenue PS 02 have been assessed as holding low scientific significance. The two sites contained within the study area represent opportunistic background scatter and do not warrant further investigation. Accordingly, no further archaeological works are required within the study area prior to development impacts. However, a Care and Control Agreement should be established in consultation with the RAPs for the artefacts recovered from Alex Avenue PS 01 and Alex Avenue PS 02.

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

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

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

Management recommendations

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

Recommendation 1: Conditions of AHIP C000550

Although SSD projects are not required to comply with Part 6 of the *National Parks and Wildlife Act 1974* (NPW Act), the Office of Environment and Heritage (OEH) advises that conditions of valid AHIPs are followed by SSDs in order to reduce the risk of impacting Aboriginal heritage values.

OEH also advises that the holder of the AHIP should be contacted to confirm the works that are intended on the area covered by the AHIP.

Recommendation 2: No further archaeological works required for Alex Avenue PS 01 and Alex Avenue PS 02

It is recommended that no further archaeological works are required for Alex Avenue PS 01 and Alex Avenue PS 02 prior to development impacts.

Recommendation 3: Preparation and lodgement of AHIMS site cards for Alex Avenue PS 01 and Alex Avenue PS 02

It is recommended that AHIMS site cards are prepared and lodged with AHIMS for newly identified sites Alex Avenue PS 01 and Alex Avenue PS 02, and that the site numbers are included in the final version of this report.

Following development impacts it will be necessary to update these AHIMS records with AHIMS site impact recording forms for Aboriginal sites Alex Avenue PS 01 and Alex Avenue PS 02. This should occur within four months following completion of development impacts or as otherwise stated in SSD approval conditions.

Recommendation 4: Long term care and control of artefacts

In consultation with TSA Management on behalf of School Infrastructure NSW (SINSW), it has been determined that there are a number of areas within the study area which will not be subject to development or landscaping as part of the proposed works and will be maintained as a natural ground areas in the south-eastern portion of the study area. It is proposed that the artefacts will be reburied on site somewhere within this location.

Recommendation 5: 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.

Recommendation 6: Continued consultation with registered Aboriginal stakeholders

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

Recommendation 7: Lodgement of final report

A copy of the final report will be sent to the RAPs, the client, OEH and the AHIMS register for their records.

1 Introduction

1.1 Project background

This ACHA has been prepared by Biosis on behalf of the Schools Infrastructure NSW (the Applicant). It accompanies an Environmental Impact Statement (EIS) in support of SSD Application (SSD 18_9368) for the new Alex Avenue Public School at the corner of Farmland Drive and future realignment of Pelican Road in Schofields, NSW (the study area) (Figure 1 and Figure 2). The study area is legally described as proposed Lots 1 and 2, being part of existing Lot 4 in DP1208329 and Lot 121 in DP1203646.

The new school will cater for approximately 1,000 primary school students and 70 full-time staff upon completion. The proposal seeks consent for:

- Construction of a 2-storey library, administration and staff building (Block A) comprising:
  - School administrative spaces including reception.
  - Library with reading nooks, makers space and research pods.
  - Staff rooms and offices.
  - Special programs rooms.
  - Amenities.
  - Canteen.
  - Interview rooms.
  - Presentation spaces.
- Construction of four 2-storey classroom buildings (Block B) containing 40 homebases comprising:
  - Collaborative learning spaces.
  - Learning studios.
  - Covered outdoor learning spaces.
  - Practical activity areas.
  - Amenities.
- Construction of a single storey assembly hall (Block C) with a performance stage and integrated covered outdoor learning area (COLA). The assembly hall will have OOSH facilities, store room areas and amenities.
- Associated site landscaping and open space including associated fences throughout and games courts.
- Pedestrian access points along both Farmland Drive and the future Pelican Road.
- Substation on the north-east corner of the site.
- School signage to the front entrance.

All proposed school buildings will be connected by a covered walkway providing integrated covered outdoor learning areas. School staff will use the Council car park for the adjacent sports fields pursuant to a Joint Use agreement. The proposed School pick up and drop off zone will also be contained within the future shared car park and will be accessed via Farmland Drive.

The Aboriginal Cultural Heritage Assessment was required by the SEARs for SSD 18_9368 issued on 22 June 2018 and updated on 2 October 2018 and on 30 January 2019. This table identifies the SEARs and relevant reference within this report.

Table 1 SEARs and relevant references issued on 22 June 2018, 2 October 2018 and 30 January 2019

SEARs item	Report reference
Identify and describe the Aboriginal cultural heritage values that exist across the whole area that would be affected by the development and document these in an Aboriginal Cultural Heritage Assessment Report (ACHAR). This may include the need for surface survey and test excavation. The identification of cultural heritage values must be conducted in accordance with the Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW (OEH 2010), and guided by the Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW (DECCW 2011).	Section 4 and 5 of AR
Consultation with Aboriginal people must be undertaken and documented in accordance with the Aboriginal cultural heritage consultation requirements for proponents 2010 (DECCW 2010). The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the ACHAR.	Section 4 and Appendix 1 of the ACHAR
Impacts on Aboriginal cultural heritage values are to be assessed and documented in the ACHAR. The ACHAR must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the ACHAR must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to OEH.	Section 7 of AR and section 6 of ACHAR

The western portion of the study area has been subject to previous assessment and was included within AHIP C000550, issued to Landcom, trading as UrbanGrowth NSW, and commencing on 11 September 2014. The AHIP is for a period of five years, and is due to expire on 11 September 2019. There are no sites listed on the AHIP or in AHIMS which are located within the study area.

1.2 Study area

The study area is located approximately 4.3 kilometres west of Rouse Hill and approximately 35.6 kilometres north-west of the Sydney CBD (Figure 1). It encompasses approximately two hectares of private land.

The study area is within the:

- Blacktown Local Government Area (LGA)
- Parish of Gidley

- County of Cumberland

The study area is currently bounded on its northern side by Farmland Drive and Lot 121, DP 1203646, on its western side by Lot 121, DP 1203646, by Lot 121, DP 1203646 and Lot 4, DP 1208329 on its southern side, and by Lot 2, DP 1209060 on its eastern side.

1.3 Planning approvals

The proposed development will be assessed as a SSD under Section 89(c) of the EP&A Act and Schedule 1 of the SEPP (State and Regional Development) 2011. Other relevant legislation and planning instruments that will inform the assessment include:

- Blacktown Development Control Plan 2015
- Blacktown LEP 2015
- *National Parks and Wildlife Amendment Act 2010*
- NPW Act

1.4 Objectives of the investigation

The objectives of the investigation can be summarised as follows:

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

1.5 Investigators and contributors

The roles, previous experience and qualifications of the Biosis project team involved in the preparation of this archaeological report are described below in Table 2.

Table 2 Investigators and contributors

Name and qualifications	Experience summary	Project role
Alexander Beben BA (Hons), MA	Alex has twelve years archaeological experience and has conducted over 200 heritage projects across Australia and internationally in the UK and Italy. He has extensive experience in the successful completion of Aboriginal and historical assessments, archaeological surveys, excavations, permit applications and management plans. Alex is accomplished in obtaining approvals under the NSW *National Parks and Wildlife Act 1974* and NSW *Heritage Act 1977*. He has operated as the heritage consultant within large multidisciplinary teams tasked with managing heritage values under the EP&A Act and *Environment Protection and Biodiversity Act 1999*. Alex's extensive and varied experience with both public and private sector clients has enabled him to forge close relationships with Aboriginal stakeholders and government regulators. Alex is frequently able to leverage these relationships to ensure that his approach to projects meets the expectations of parties involved. Alex has been involved in multiple projects from master planning through to development application stage and is experienced in ensuring that heritage values are mitigated in a manner that ensures the project is able to proceed.	• Project director • Attendance at project meetings • Technical advice
Amanda Atkinson BA (Arch/Paleo). Grad Dip. Arch	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 Aboriginal and Historical assessments, archaeological surveys, excavations, permits and management plans. She is accomplished in obtaining approvals under the NPW Act and NSW *Heritage Act 1977*. 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 the Lachlan River valley. Amanda has extensive experience in the successful completion of Aboriginal and Historical assessments, archaeological surveys, excavations, permits and management plans.	• Quality assurance

Name and qualifications	Experience summary	Project role
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 • Quality assurance
Taryn Gooley **BASc (Hons)**	Taryn has been based in Newcastle since 2012 and has successfully completed numerous projects throughout the Newcastle, Port Stephens, Lake Macquarie, Central Coast, Hunter Valley, and North Western NSW regions. Taryn has extensive experience in undertaking remote archaeological surveys and large scale archaeological testing and salvage excavation programs. Taryn has participated in and managed a number of long term archaeological programs under Part 4 and Part 5 of the EP&A Act. Her areas of expertise include archaeological and heritage management advice, archaeological excavation and survey, artefact analysis, Aboriginal community consultation, technical report writing, and preparing cultural heritage management plans. Taryn is also accomplished in obtaining approvals under the NPW Act. Taryn has conducted numerous archaeological assessments for a diverse client base including Local Government, Roads and Maritime Services, the Australian Rail Track Corporation, Sydney Water, National Parks and Wildlife Service, Department of Primary Industry and Water, resource companies, architectural firms, engineering firms, and private developers.	• Technical advice
Charlotte Allen **BA (Hons)**	Charlotte joined Biosis in 2017 and is currently an Archaeologist based in Sydney, NSW. During this time, she has provided crucial support to project managers by conducting background research, field investigations and preparing reports for projects in Sydney and eastern and western NSW. Charlotte has experience with desktop research, Aboriginal and historical excavations in Australia and the UK, and the recording and analysis of cultural material. Charlotte has also undertaken a number of Aboriginal and historical heritage assessments, managing projects and conducting consultation with Aboriginal stakeholders.	• Project manager • Report author • Aboriginal community consultation

Name and qualifications	Experience summary	Project role
Anthea Vella BA, MAHM	Anthea graduated from Flinders University with a Bachelor of Archaeology and has also recently completed her Master of Archaeology and Heritage Management thesis at Flinders University. She has experience with desktop assessments, project administration, collating internal and external research, and reporting. Anthea also has experience in Aboriginal test excavations, and Historical excavations.	• Background research
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.	• Data analysis • Test excavations

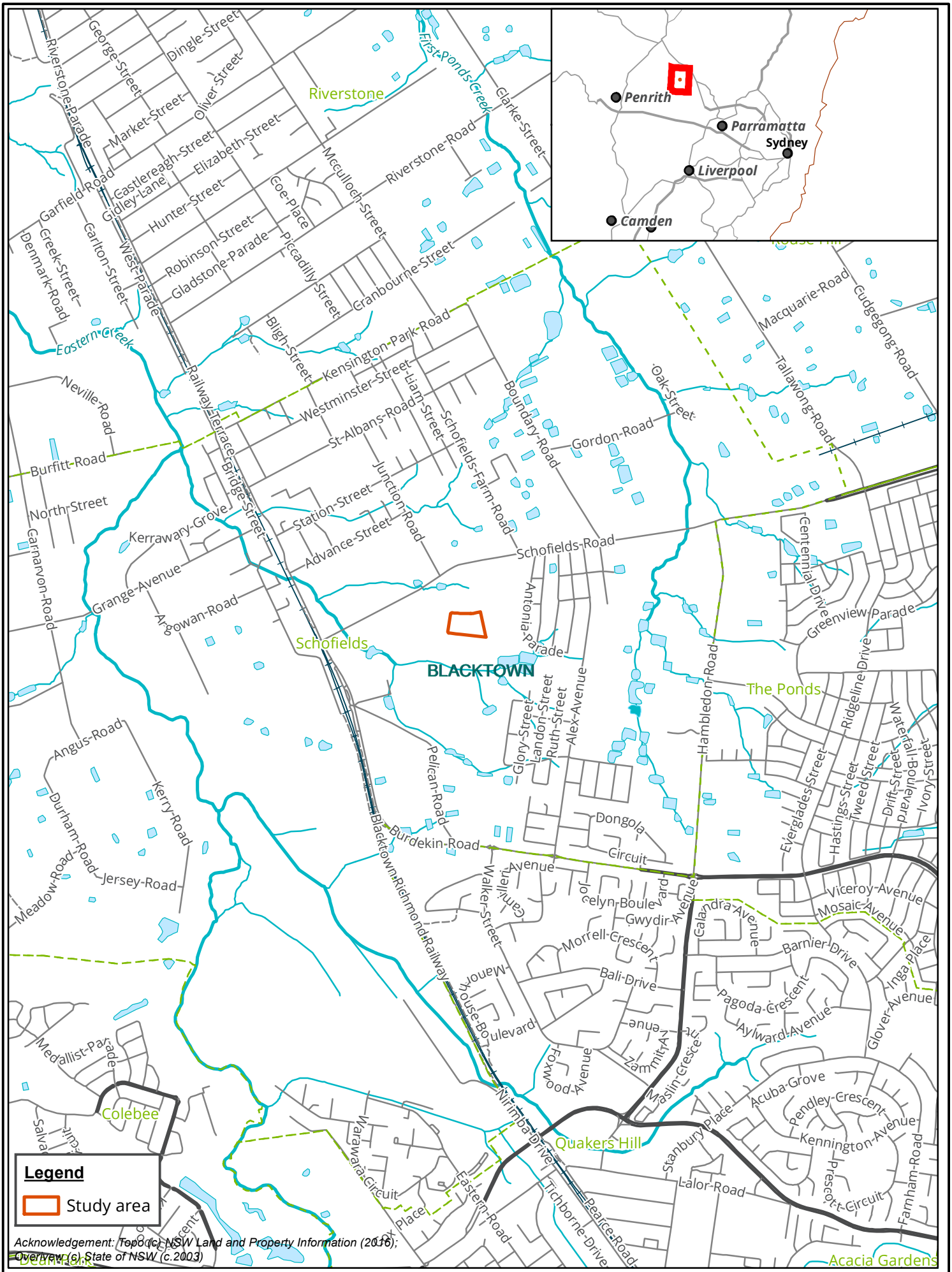
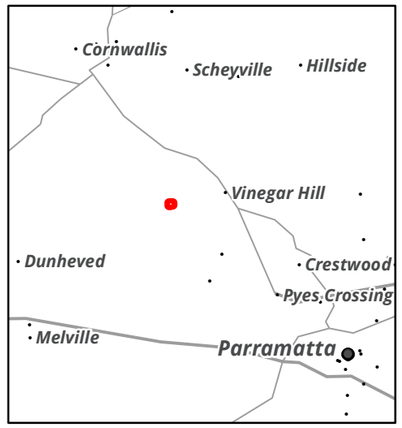


Figure 1:Location of the study area

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

Matter: 27715
Date: 23 August 2018,
Checked by: AV, Drawn by: DK, Last edited by: skumar
Location:P:\27700s\27715\Mapping\



Legend

Study area

Figure 2: Study area detail

0 9 18 27 36 45

Metres

Scale: 1:800 @ A3

Coordinate System: GDA 1994 MGA Zone 55

Biosis Pty Ltd

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

Matter: 27715,
Date: 14 September 2018,
Checked by: AV, Drawn by: DK, Last edited by: skumar
Location:P:\27700s\27715\Mapping
27715_F2_ProjectArea.mxd

Acknowledgements: Basemap © Land and Property Information 2016

2 Proposed development

School Infrastructure NSW are proposing to develop a new school on a Greenfields site with capacity for 1,000 students and 70 staff members. The study area will incorporate part of Lot 4, DP 1208329, and part of Lot 121, DP 1203646 (Plate 1, Plate 2, Plate 3, Plate 4). The project involves the following elements:

- Construction of a 2-storey library, administration and staff building (Block A) comprising:
  - School administrative spaces including reception.
  - Library with reading nooks, makers space and research pods.
  - Staff rooms and offices.
  - Special programs rooms.
  - Amenities.
  - Canteen.
  - Interview rooms.
  - Presentation spaces.
- Construction of four 2-storey classroom buildings (Block B) containing 40 homebases comprising:
  - Collaborative learning spaces.
  - Learning studios.
  - Covered outdoor learning spaces.
  - Practical activity areas.
  - Amenities.
- Construction of a single storey assembly hall (Block C) with a performance stage and integrated covered outdoor learning area (COLA). The assembly hall will have OOSH facilities, store room areas and amenities.
- Associated site landscaping and open space including associated fences throughout and games courts.
- Pedestrian access points along both Farmland Drive and the future Pelican Road.
- Substation on the north-east corner of the site.
- School signage to the front entrance.

Plate 1 Proposed development - landscape

Plate 2 Proposed development - ground floor

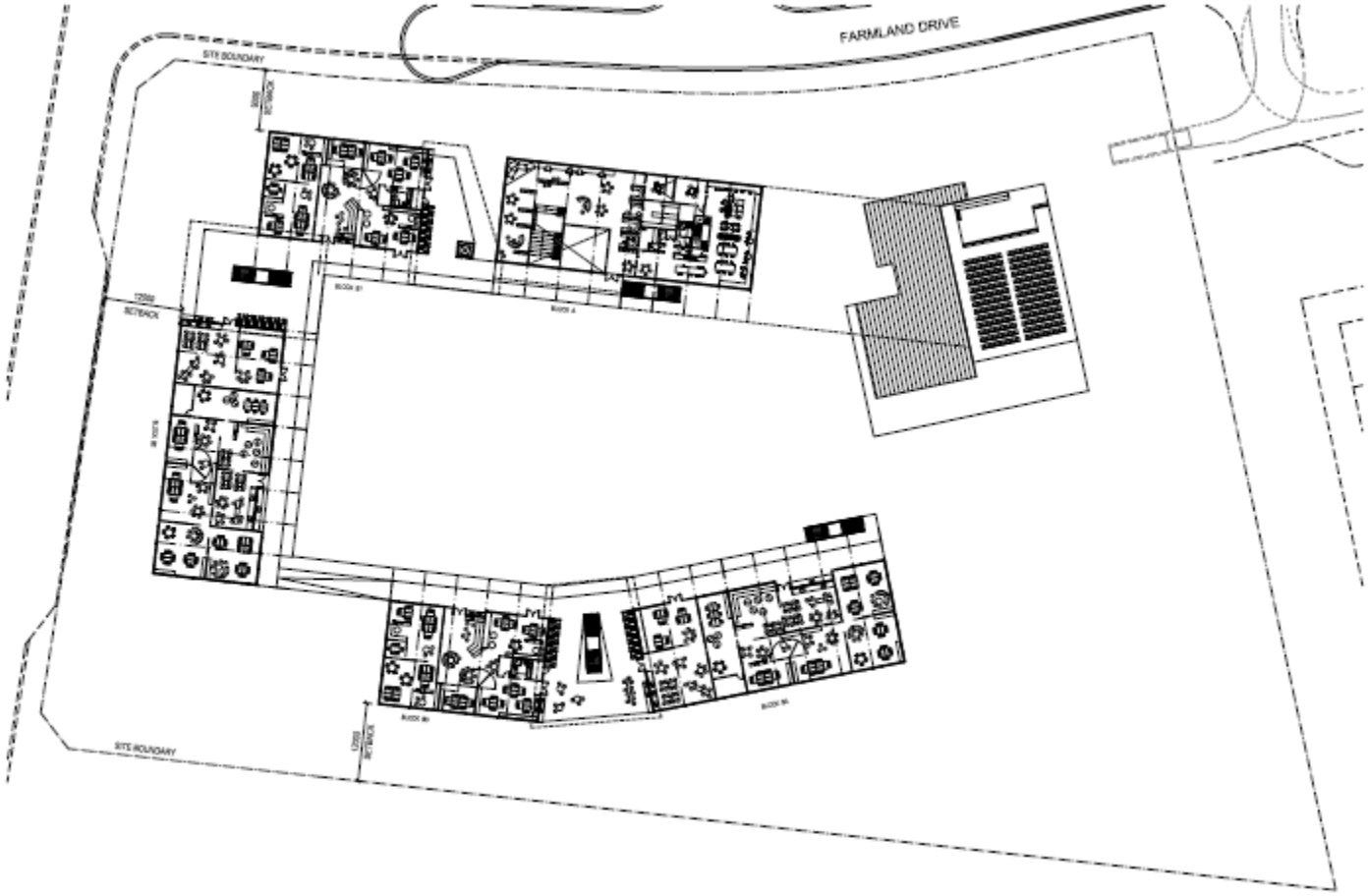


Plate 3 Proposed development - level one

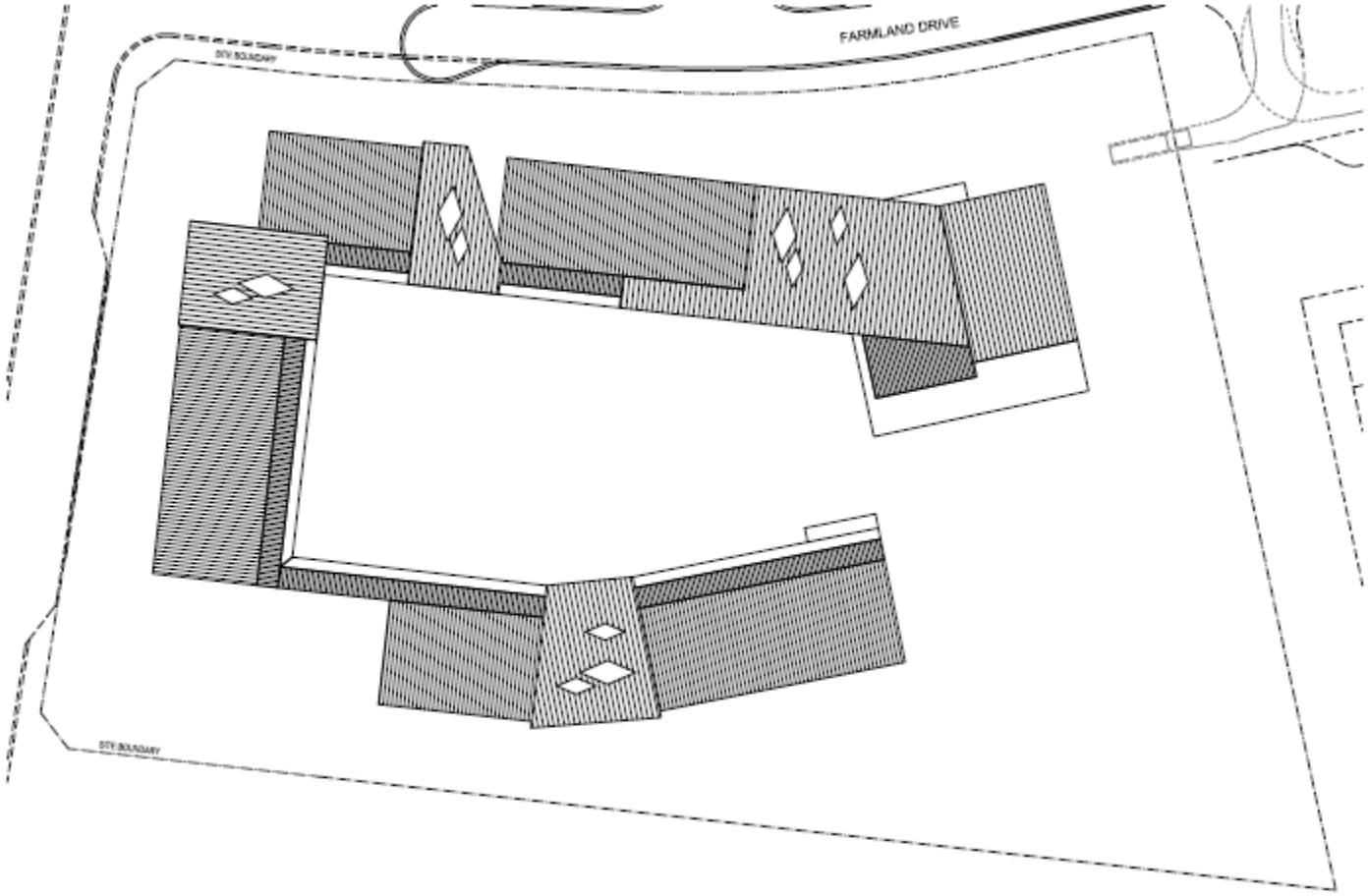


Plate 4 Proposed development - roof

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 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 study area is contained within the Wianamatta Group geological formation, specifically the Bringelly Shale geological unit. The Bringelly Shale formation is primarily composed of shale, with occasional calcareous claystone, laminate, and coal (Bannerman & Hazelton 1990, p.28). The formation also contains subsidiary sandstone bands, varying in thickness from one inch to five feet (Lovering 1954).

Common landform elements within these systems include hillslopes, crests, drainage depressions, valley flats, and stream channels. A review of topographic maps of the study area indicates that it is dominated by gentle slopes. Landform units present in the vicinity of the study area include crests, alluvial plains, hillslopes, and creek banks. The study area contains a crest which gradually descends to the west in the northern portion, and a simple slope descending south towards an open depression and a third order non-perennial stream, which is located outside of the study area.

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 the locations of campsites as they would have been more likely to provide a stable source of water and by extension other resources which would have been used by Aboriginal groups.

The stream order system used for this assessment was originally developed by Strahler (1952). It functions by adding two streams of equal order at their confluence to form a higher order stream, as shown in Plate 5. As stream order increases, so does the likelihood that the stream would be a perennial source of water.

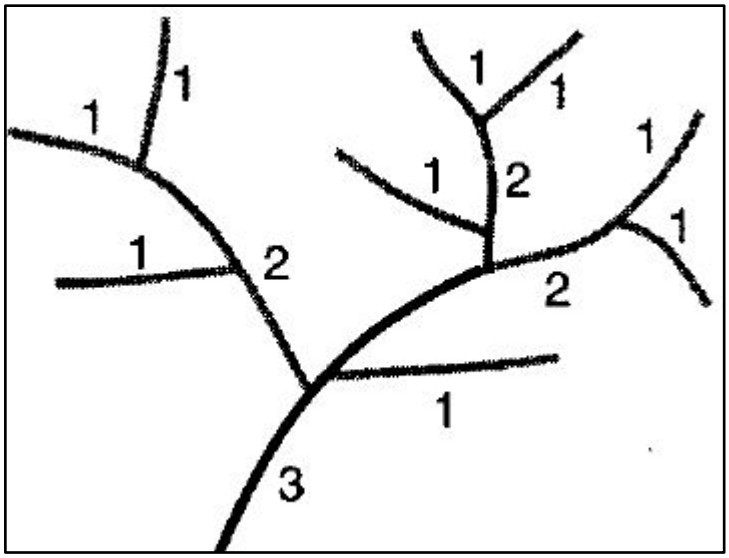


Plate 5 Diagram showing Strahler stream order (Ritter et al. 1995, p.151)

The nearest water course to the study area is a third order creek line approximately 150 metres to its south. First Ponds Creek, a second order stream, is located approximately 850 metres east of the study area, while approximately 1.5 kilometres to the west is Eastern Creek, a fourth order creek line, which would have provided a more stable source of water. Flood mapping undertaken by Blacktown City Council indicates that the study area is outside of any flood risk extent areas (Plate 6).

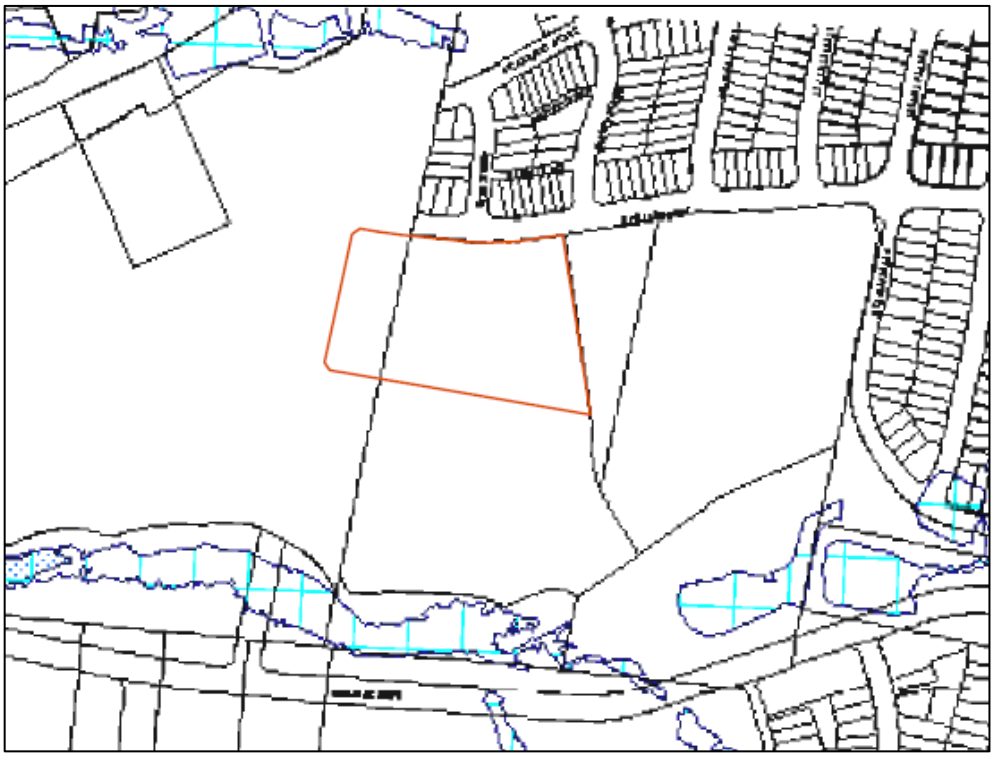


Plate 6 Flood risk extent areas in the vicinity of the study area (Source: Blacktown City Council)

3.1.2 Soil landscapes

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

The study area is contained within the Blacktown soil landscape. This landscape is characterised by its low reliefs and gentle slope, and is generally associated with a landform pattern of gently undulating rises. The local relief is around 30 metres, with slopes of 5 per cent. The soil characteristics of this landscape are described in Table 3 below.

Table 3 Blacktown soil landscape characteristics (Bannerman & Hazelton 1990, pp.29–30)

Soil material	Description
bt1—Friable brownish black loam	This is a friable brownish black loam to clay loam with moderately pedal subangular blocky (2 – 20 mm) structure and rough-faced porous ped fabric. This material occurs as topsoil (A horizon). Colour is brownish black (10YR 2/2) but can range from dark reddish brown (5YR 3/2) to dark yellowish brown (10YR 3/4). Rounded iron indurated fine gravel-sized shale fragments and charcoal fragments are sometimes present. Roots are common.
bt2—Hardsetting brown clay loam	This is a brown clay loam to silty clay loam which is hardsetting on exposure or when completely dried out. It occurs as an A2 horizon. This material is water repellent when extremely dry. Colour is dark brown (7.5YR 4/3) but can range from dark reddish brown (2.5YR 3/3) to dark brown (10YR 3/3). Platy, iron indurated gravel-sized shale fragments are common. Charcoal fragments and roots are rarely present.
bt3—Strongly pedal, mottled brown light clay	This is a brown light to medium clay with strongly pedal polyhedral or sub-angular to blocky structure and smooth-faced dense ped fabric. This material usually occurs as subsoil (B horizon). Colour is brown (7.5YR 4/6) but may range from reddish brown (2.5YR 4/6) to brown (10YR 4/6). Frequent red, yellow or grey mottles occur often becoming more numerous with depth. Fine to coarse gravel-sized shale fragments are common and often occur in stratified bands. Both roots and charcoal fragments are rare.
bt4—Light grey plastic mottled clay	This is a plastic light grey silty clay to heavy clay with moderately pedal polyhedral to subangular blocky structure and smoothfaced dense ped fabric. This material usually occurs as deep subsoil above shale bedrock (B3 or C horizon). Colour is usually light grey (10YR 7/1) or, less commonly, greyish yellow (2.5YR 6/2). Red, yellow or grey mottles are common. Strongly weathered ironstone concretions and rock fragments are common. Gravel-sized shale fragments and roots are occasionally present. Charcoal fragments are rare.

On crests and ridges there can be up to 30 centimetres of friable brownish black loam (bt1) overlying 10-20 centimetres of hardsetting brown clay loam (bt2) and up to 90 centimetres strongly pedal brown mottled light clay (bt3). Soil horizons are generally clear and total soil depth is <100 centimetres, though bt1 material is occasionally absent. On upper slopes and midslopes there can be up to 30 centimetres of bt1 overlying 10-20 centimetres of bt2 and 20-50 centimetres of bt3, under which lies up to 100 centimetres of a light grey plastic mottled clay (bt4). Soil depth is <200 centimetres, and similar to crests and ridges soil horizons are clear and bt1 may be absent. On lower side slopes there can be up to 30 centimetres of bt1 overlying 10-30 centimetres

of bt2 and 40-100 centimetres of bt3, under which usually lies <100 centimetres of bt4; soil horizons are clear and total depth is >200 centimetres (Bannerman & Hazelton 1990, p.30).

Subsurface artefacts in the Blacktown soil landscape are typically located in the A horizon topsoil. In the Blacktown soil landscape, it is likely that any subsurface artefacts would be identified in the upper two stratigraphic profiles (bt1 and bt2). The soils described in Table 3 align closely with profiles described in nearby excavations at the Rouse Hill Anglican College, on the northern side of Rouse Road (Stephanie Garling Archaeological Consulting 2000, p.45). The descriptions given by Stephanie Garling Archaeological Consulting (2000) suggest that the bt1 profile had largely eroded away from the study area, and that the majority of the artefacts identified came from the bt2 profile. Raw material sources in the vicinity of the study area include silcrete quarries at Riverstone and Plumpton Ridge, which are located approximately 1 kilometre west (Archaeological & Heritage Management Solutions 2015, p.18).

Geotechnical investigations were undertaken in 2017 and 2018. Areas of stockpiling were noted in the central portion. Three boreholes were established within the study area in the 2017 investigations, which displayed similar soils in varying colours throughout, namely clayey silt up to 20-50 centimetres, overlying a silty clay extending to a depth of 110-200 centimetres, underlain by sandstone. Borehole 3 in the north-eastern portion of the study area identified 20 centimetres of silty sand fill material containing organic material and traces of clay (JK Geotechnics 2017). Similar results were found in the 2018 investigation, with 24 boreholes established (Greencap 2018).

3.1.3 Landscape resources

While the diverse natural environment would have provided vast and plentiful floral and faunal resources and the temperate climate would have made the area suitable for year-round occupation, the distance of the study area from permanent water sources would have detracted from its appeal as a long term occupation site. Although extensively cleared today, the Blacktown Soil Landscape typically supports dry sclerophyll forest; predominantly species of eucalypt, including Forest Red Gum, Narrow Leaved Ironbark, and Grey Box (Bannerman & Hazelton 1990, p.29). Broad Leaved Ironbark and White Stringy Bark are also occasionally present.

Within the Cumberland subregion of the Sydney Basin Bioregion there is a variety of vegetation types present, with Grey Box, Forest Red Gum, Narrow-leaved Ironbark woodland, and Spotted Gum are present on shale hills. 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 Sush, and Juncus with Parramatta Red Gum is noted around lagoons and swamps (NSW National Parks and Wildlife Service 2003, p.193).

Native fauna that would have been present in the vicinity of the study area include: Australian Wood Duck, White-faced Heron, Eastern Long-necked Tortoise, Eastern Water Skink, Garden Skink, Welcome Swallow, Purple Swamphen, as well as arboreal fauna including owls, Ring- and Brush-tailed Possums, and gliders.

Plant resources were used in a variety of ways. Fibres were twisted into string which was used for many purposes including the weaving of nets, baskets and fishing lines. String was also used for personal adornment. Bark from eucalypts was used in the provision of shelter; a large sheet of bark being propped against a stick to form a gunyah (Attenbrow 2002). Swamp oak bark could be used for the making of canoes, and smooth-barked apple for the making of baskets and bowls.

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).

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 located within a land grant of 100 acres (40.4686 hectares) initially made to Josh Ward in 1815, and later made to Joseph Pye on 19 October 1831 by Crown grant (Plate 7) (NSW Department of Lands, Vol. 1101 Fol. 101, Colonial Secretary's Office 1831). The study area remained under the ownership of the Pye family until 1938. The Pye family were known as orchardists and also grazed cattle, so it is possible that orcharding and/or grazing activities may have taken place within the study area (Windsor and Richmond Gazette 1897, 8; AHMS 2015). In 1938, part of the Pye lands were sold to Joseph and Harold Langlade, who established 'Langlade's Dairy'; several dairy-related structures were constructed east of the study area (AHMS 2015). It is likely the study area continued to be used for grazing purposes under their ownership, and that of subsequent owners, including the Geddes from 1949-c.1960 (master butcher), Gordons from 1960-1973 (horse trainer) and Jones' from 1973 (farmer) (NSW Department of Lands, Vol. 1932 Fol. 207).

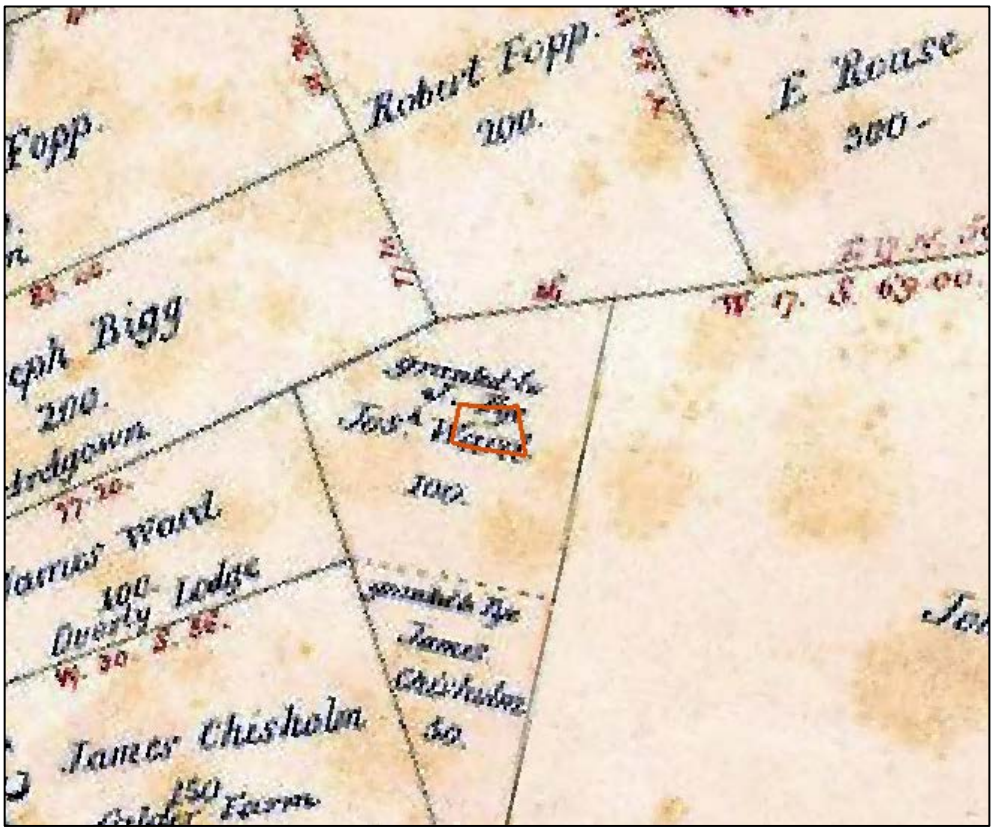


Plate 7 Extract from an 1833 Gidley Parish Map, with the study area highlighted (Source: NSW Land Registry Services)

Aerial photographs from the mid-20th century onwards reveal detail of the use and disturbance of the study area (Plate 8, Plate 9, Plate 10, Plate 11, Plate 12, Plate 13, Plate 14, Plate 15, Plate 16, Plate 17). Table 4 provides a summary of the changes to the study area from 1956 to 2018.

Table 4 Analysis of aerial photographs of the study area

Year	Comments
1956	A large proportion of the study area appears to have been ploughed, specifically in the northern sections. The southern areas retain some bushland but app has been partially cleared.

Year	Comments
1961	Significant changes to the study area, with the installation of an unsealed oval track in the north-eastern portion of the study area; this may have been a horse track considering the ownership of the study area by a horse trainer at this time. Possibly some earthworks or terracing in the south and south-eastern portions of the study area. Some bushland has been retained in the south-eastern corner, and plough marks are also strongly evident.
1965	Similar to previous aerial, with the track less defined and sparser bushland in the south-eastern corner.
1970	The track appears to be out of use, having been grown over. Bushland in the south-eastern corner appears to be in similar condition to the previous aerial.
1978	Very little evidence of the track remains; possibly used for grazing animal stock.
1982	Several tracks run through the study area, and potentially an earthwork in the north-eastern corner.
1991	Western portion of the study area has been developed for agricultural purposes, with grass cover appearing sparse in this area.
2005	An informal track appears to run across the south-eastern corner of the study area near the area of bush, while grass cover has increased in the western portion, with some earth scours remaining.
2009	The track running across the south-eastern corner is more defined, suggesting heavier use, with a further track running north-south in the central portion of the study area. There is an area of exposure in the south-western corner.
2018	Introduction of residential development north of the study area has resulted in some removal of topsoil along the northern boundary, and possible deposited materials just south of this exposure..

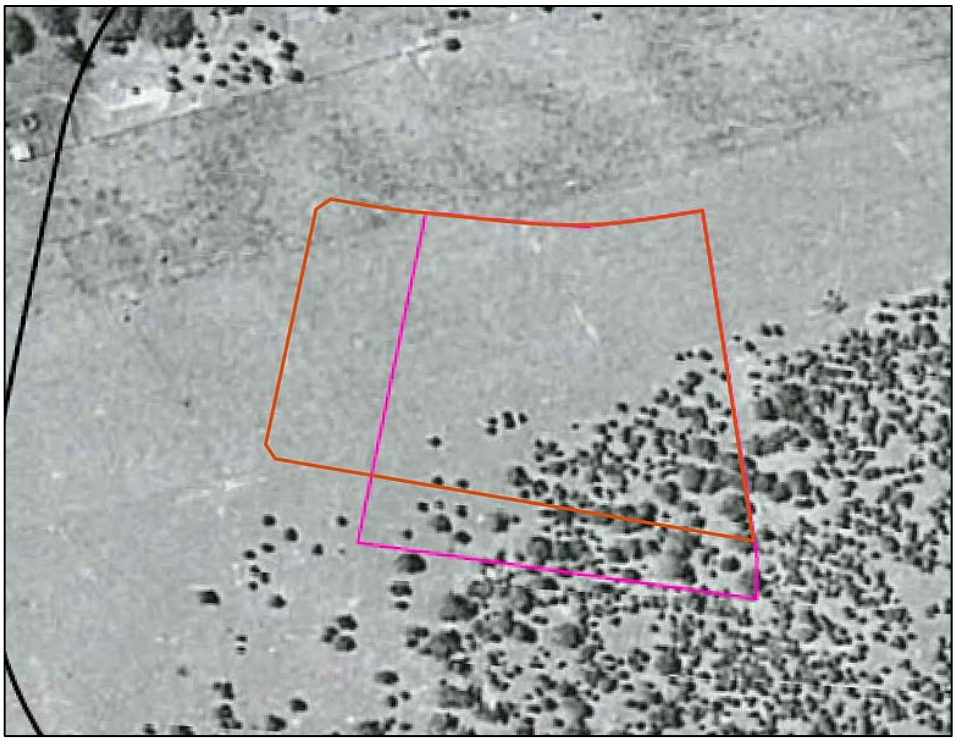


Plate 8 **1956 aerial of the study area, with the study area highlighted in red (please note the pink outline is the area assessed in Environmental Investigation Services 2017) (Source: Environmental Investigation Services 2017)**

Plate 9 **1961 aerial of the study area, with the study area highlighted in red (please note the pink outline is the area assessed in Environmental Investigation Services 2017) (Source: Environmental Investigation Services 2017)**

Plate 10 **1965 aerial of the study area, with the study area highlighted in red (please note the pink outline is the area assessed in Environmental Investigation Services 2017) (Source: Environmental Investigation Services 2017)**

Plate 11 **1970 aerial of the study area, with the study area highlighted in red (please note the pink outline is the area assessed in Environmental Investigation Services 2017) (Source: Environmental Investigation Services 2017)**

Plate 12 1978 aerial of the study area (Source: NSW Spatial Services 2018)

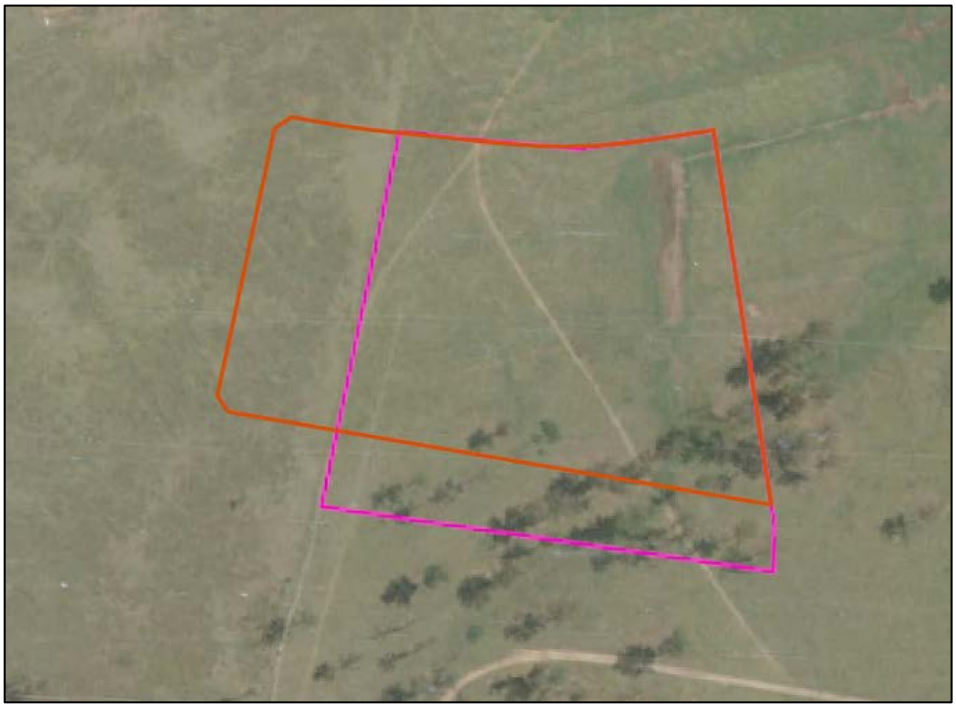


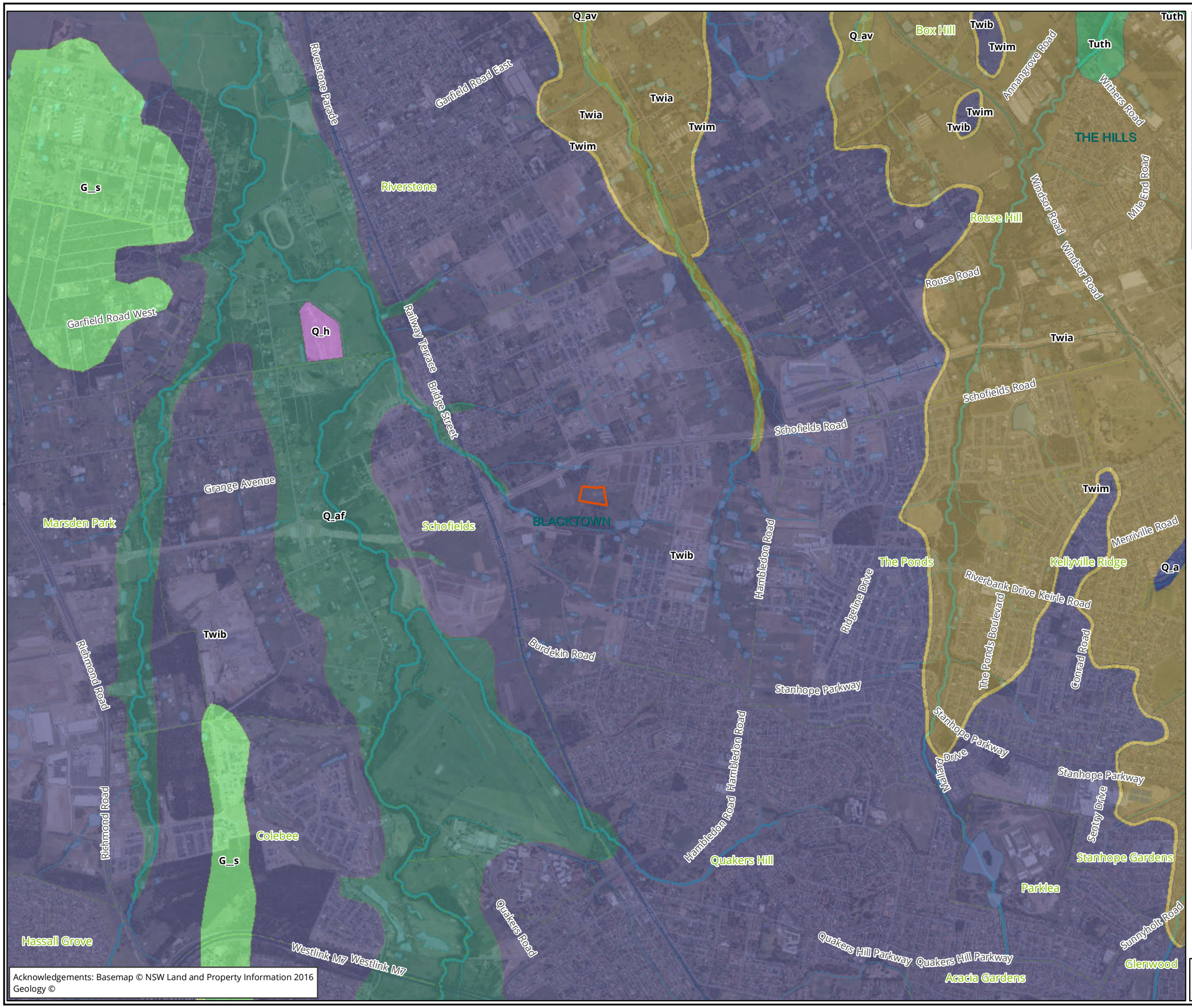
Plate 13 1982 aerial of the study area, with the study area highlighted in red (please note the pink outline is the area assessed in Environmental Investigation Services 2017) (Source: Environmental Investigation Services 2017)

Plate 14 **1991 aerial of the study area, with the study area highlighted in red (please note the pink outline is the area assessed in Environmental Investigation Services 2017) (Source: Environmental Investigation Services 2017)**

Plate 15 **2005 aerial of the study area, with the study area highlighted in red (please note the pink outline is the area assessed in Environmental Investigation Services 2017) (Source: Environmental Investigation Services 2017)**

Plate 16 **2009 aerial of the study area, with the study area highlighted in red (please note the pink outline is the area assessed in Environmental Investigation Services 2017) (Source: Environmental Investigation Services 2017)**

Plate 17 **2018 aerial of the study area, with the study area highlighted in red (Source: GoogleMaps 2018)**



Legend

Geological units

- Alluvial floodplain deposits
- Alluvial valley deposits
- Alluvium
- Anthropogenic deposits
- Ashfield Shale
- Bringelly Shale
- Hawkesbury Sandstone
- Minchinbury Sandstone
- Saint Marys Formation

Figure 3: 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 55

N

biosis

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

Matter: 27715,
Date: 10 September 2018,
Checked by: AV, Drawn by: DK, Last edited by: skumar
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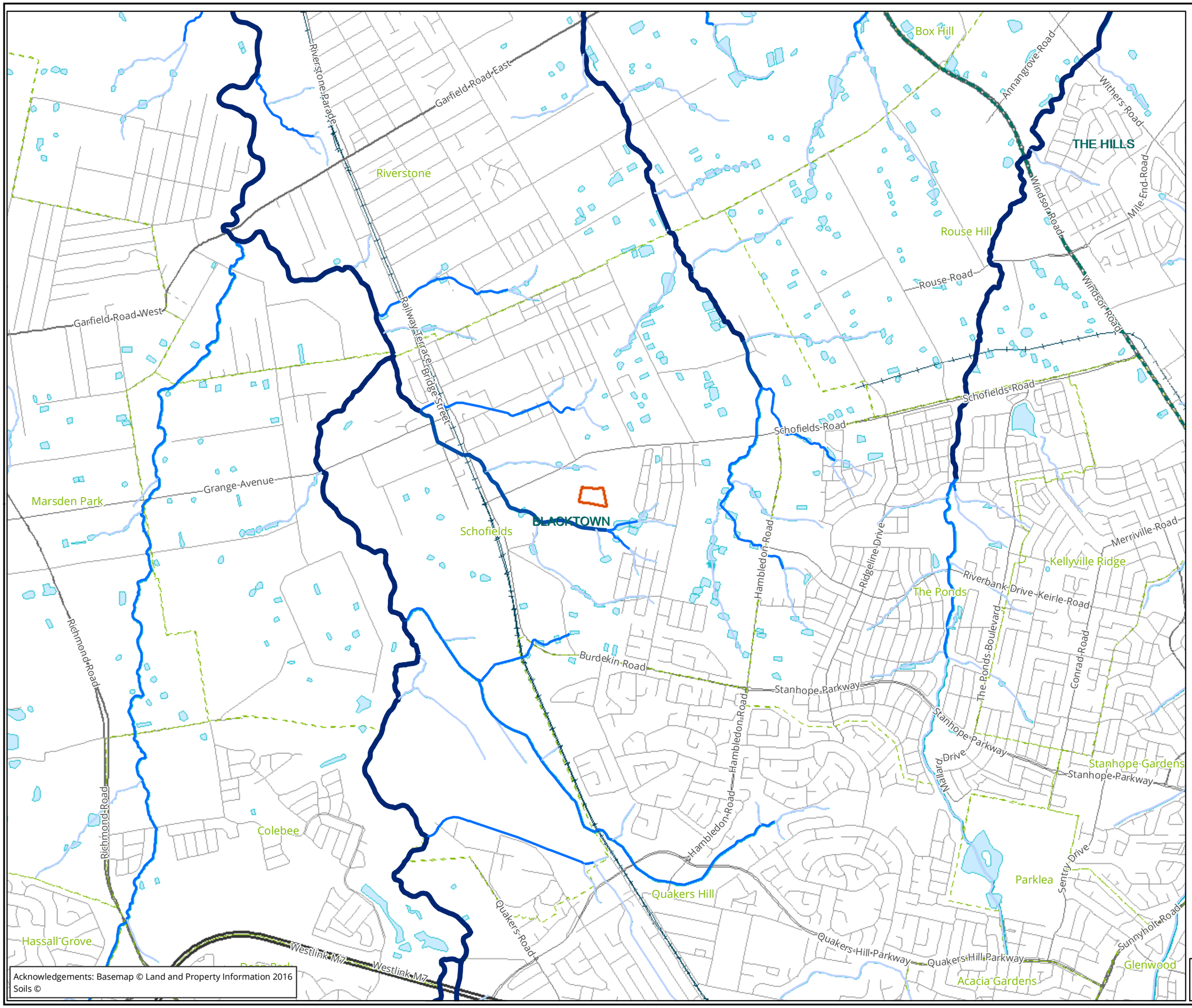
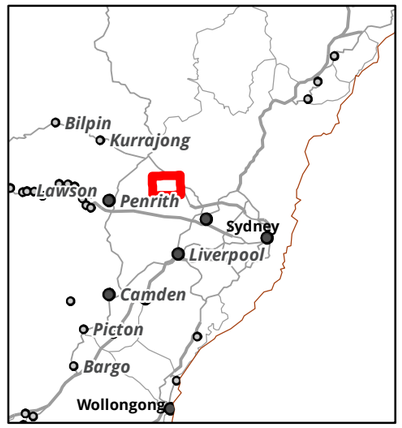
27715_F3_Geology.mxd





Legend

- Study area
- Canal-Drain
- NaturalWatercourse

Strahler Order

- 1
- 2
- 3
- 4

Figure 5: Hydrology in the vicinity of the study area

0 260 520 780 1,040 1,300

Metres

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

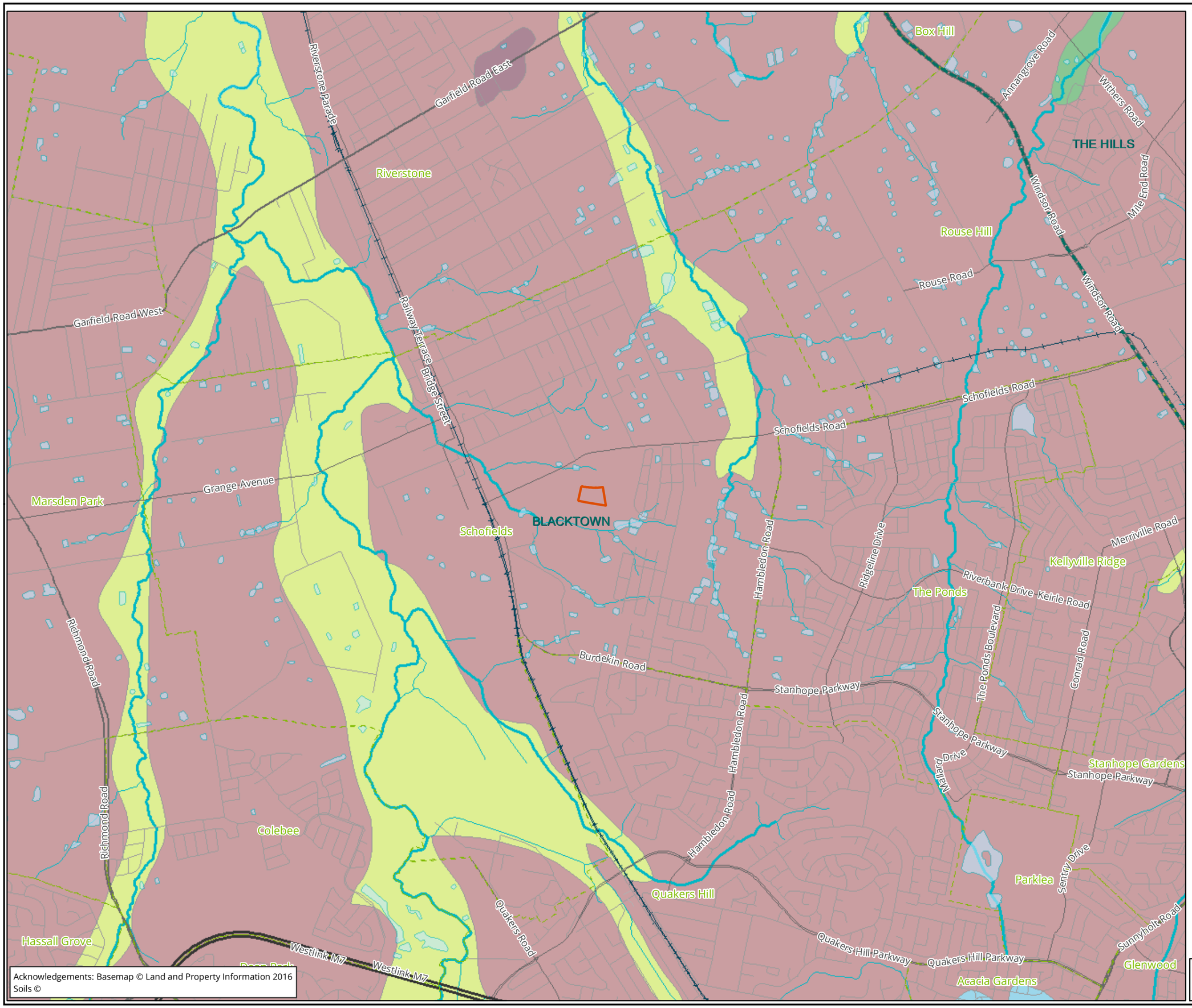
N

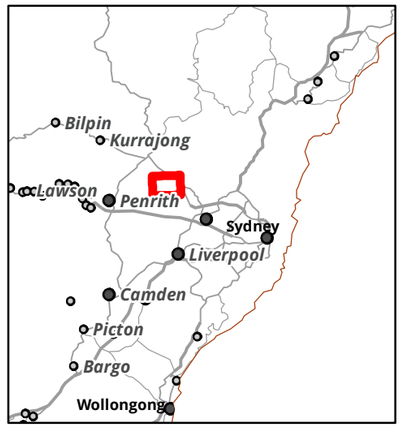
Biosis Pty Ltd

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

Acknowledgements: Basemap © Land and Property Information 2016
Soils ©

Matter: 27715,
Date: 23 August 2018,
Checked by: AV, Drawn by: DK, Last edited by: skumar
Location:P:\27700s\27715\Mapping
27715_F4_Hydrology.mxd





Legend

Study area

Soil landscape units

- BERKSHIRE PARK
- BLACKTOWN
- GYMEA
- LUDDENHAM
- SOUTH CREEK

Figure 5: 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 55

Biosis Pty Ltd

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

Matter: 27715,
Date: 14 September 2018,
Checked by: AV, Drawn by: DK, Last edited by: skumar
Location:P:\27700s\27715\Mapping
27715_F5_Soil.mxd

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 the last 50,000 years (Allen & O'Connell 2003). Dates of the earliest occupation of the continent by Aboriginal people are subject to continued revision as more research is undertaken. The timing for the human occupation of the Sydney Basin is still uncertain. While there is some possible evidence for occupation of the region around 40,000 years ago, the earliest known radiocarbon date for the Aboriginal occupation of the Sydney Basin is associated with a cultural / archaeological deposit at Parramatta, which was dated to 30,735 ± 407 before present (BP) (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 4,000 years BP. 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 Blacktown region and Cumberland Plain. 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.

Stephanie Garling Archaeological Consulting (2000) completed test excavations on two areas of potential (RHAC2 and RHAC3). Testing was completed in advance of the construction of the Rouse Hill Anglican College. The program of testing was completed following an archaeological survey which identified one stone artefact and two PADs. These areas were assessed as having moderate to high potential based on:

- Close proximity to food and water sources in the form of Second Ponds Creek.
- Gentle hillslopes in the area, which formed a potentially suitable camping location.
- The presence of previously excavated sites in the vicinity, which had contained significant deposits.
- Predictive modelling, which suggested that higher densities of artefactual material may be present within the study area.
- A lack of disturbance identified within the study area.
- The presence of the study area on Shale Lowlands, which had previously been assessed as a threatened landscape on the Cumberland Plain in terms of disturbance.

Stephanie Garling Archaeological Consulting also brought together background research from various sources relating to sources of raw artefact material in relation to the study area (Table 5).

Table 5 Distance to known sources of raw material for artefacts from the study area (Stephanie Garling Archaeological Consulting 2000, p.37)

Raw material type						
Nearest sources of surface stone (km)	**Silcrete**	**Silicified tuff**	**Petrified wood**	**Quartz**	**Quartzite**	**Igneous**
Hawkesbury sandstone	-	-	-	1.2	-	-
Scheyville	10	10	-	-	10	-
South Windsor	-	11	-	-	11	-
Nepean River Agnes Banks	-	21	-	21	21	21
Riverstone	3	-	4	4	-	-
Echo Vale	8	8	8	-	8	8
Sirius Place	-	12	-	12	12	-
Marsden Park	6.5	-	6.5	-	6.5	-
Plumpton Ridge	6	-	6	-	-	-
Bells Creek 2	8	-	-	-	-	-
ADI Dunheved (St Marys)	13	13	13	-	13	-
Plumpton Park	9.5	-	-	-	-	-
Blacktown 1	9	-	-	-	-	-

Test excavations at both sites identified subsurface deposits, with the results summarised in Table 6.

Table 6 Results of test excavations conducted by Stephanie Garling Archaeological Consulting (2000)

Site	Extent of excavations	Number of artefacts recovered	Density (artefact / metres squared)
RHAC2	32 metres squared Six 1 x 1 metre test pits Two open areas	942	29.44
RHAC3	15 metres squared Fifteen 1 x 1 metre test pits	7	0.47

Within RHAC2, localised knapping floors were identified, with the largest containing 812 artefacts. Excavations in this area identified a relatively intact knapping floor with a central area of high density and a lower density peripheral area. It was noted that a high number of backed artefacts (47) were identified in the assemblage, and that the primary raw material was silcrete. The site was assessed as having moderate significance, as while a large number of artefacts were recovered, it was considered that the deposit was relatively unstratified, and as such as unable to provide a chronology for Aboriginal occupation in the area (Stephanie Garling Archaeological Consulting 2000, p.80).

The low density of artefacts identified at RHAC3 led to it being classed as 'background scatter' with it being considered unlikely that camping or knapping took place at this site, with it being suggested that local Aboriginal groups may have favoured the lower hillslope closer to Second Ponds Creek. This site was classed as having low potential.

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

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

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

AHMS (2015) conducted an Aboriginal cultural heritage assessment for the proposed earthworks on part of the former Schofields aerodrome. A number of previous assessments and investigations resulted in the identification of several Aboriginal archaeological sites and areas of sensitivity within the study area. Further background research and the results of the AECOM survey indicated that there were two sites with PADs located within the study area. The field investigation consisted of test excavations. A total of 46 pits were excavated and 507 artefacts were recovered. The excavations allowed a revision of earlier interpretations of the previously identified sites. It was found that these sites were significantly disturbed and the surface artefacts were likely to have been introduced in gravel. Artefacts were present in high densities in the deeper soils in close proximity to the watercourse.

Biosis (2017) undertook an Aboriginal due diligence assessment and historical heritage advice for a proposed small scale concrete and sandstone crushing plant at Edward Street, approximately 2.1 kilometres north-west

of the study area. The assessment included background research and an archaeological survey. The study area had been impacted by the construction of various structures and vegetation clearance. The archaeological survey of the study area did not identify any new archaeological sites or any areas of PAD.

Extent (2017a) were commissioned by Design Cubicle to complete an Aboriginal heritage due diligence assessment at 166 Guntawong Road, Riverstone. A desktop assessment and site visit determined it is unlikely that Aboriginal materials would be present across most of the southern portion of the property due to previous land use and disturbance that had truncated the soil profile, specifically the A1 horizon where Aboriginal objects are commonly found. However, a small area in the northern part of the property, located within proximity to the dam, was considered to be relatively undisturbed and therefore considered to have potential to contain Aboriginal objects.

Extent (2017b) were commissioned by Guntawaong Estate Pty Ltd to undertaken an Aboriginal heritage due diligence assessment of 172 Guntawong Road, Riverstone. The assessment was undertaken for a proposed residential redevelopment of the site. The site inspection revealed that majority of the subject area had been previously disturbed and/or cleared. It was noted that a first order drainage line was once present but had been subject to modification by heavy machinery to construct a dam. No Aboriginal objects were observed around the watercourse or within the study area.

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.

Dallas (1982) completed a survey at Riverstone, Schofields, and Quakers Hill. Background research completed by Dallas indicated that it was likely that artefact sites and culturally modified trees would occur within the study area, and that based on previous work completed by Haglund, artefact sites were most likely to occur on high points adjacent to or between creeklines (Dallas 1982, pp.7–8).

Dallas' survey included the current study area. The assessment identified seven artefact scatters and four isolated artefacts in the surveyed area. One of the isolated finds, ISF2, was located south of the current study area, and is described as a yellow-orange banded chert notched and nosed scraper located on the edge of a dry creek bed (Dallas 1982, p.15).

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

- "It is predicted that the size (density and complexity) of archaeological features will vary according to the permanence of water (i.e. ascending stream order), landscape unit and proximity to lithic resources in the following way:
- In the headwaters of upper tributaries (i.e. first order creeks) archaeological evidence will be sparse and represent little more than a background scatter.
- In the middle reaches of minor tributaries (second order creeks) will be archaeological evidence for sparse but focussed activity (e.g. one-off camp locations, single episode knapping floors).

- In the lower reaches of tributary creeks (third order creeks) will be archaeological evidence for more frequent occupation. This will include repeated occupation by small groups, knapping floors (perhaps used and reused), and evidence of more concentrated activities.
- On major creek lines, such as the lower reaches of Second Ponds and Caddies Creeks (fourth order), there will be archaeological evidence for more permanent or repeated occupation. Sites will be complex and may even be stratified.
- Creek junctions may provide foci for site activity; the size of the confluence (in terms of stream ranking nodes) could be expected to influence the size of the site.
- Ridgetop locations between drainage lines will usually contain limited archaeological evidence, although isolated knapping floors or other forms of one-off occupation may be in evidence in such a location.
- Naturally outcropping silcrete will have been exploited and evidence for extraction activities (decortication, testing and limited knapping) would be found in such locations.
- Sites in close proximity to an identified stone source would cover a range of size and cortex characteristics. As one moves away from the resource, the general size of artefacts in the assemblage should decrease, as should the percentage of cortex. The increasing number of new (in particular) silcrete sources has made the testing of the distance decay model (Dallas & Witter 1983) more difficult, and suggests that this model is a poor mechanism for explaining raw material preferences around the Plain." (Jo McDonald Cultural Heritage Management 2002, pp.15–16).

This predictive model, and variations upon it, has formed the base standard for predictive modelling in the Cumberland Plain region for the past decade, with a large numbers of reports drawing on it to develop their own predictions of sites that will be present in a given area. Stream order is given precedence as an indicator of permanent, reliable watercourses, which in the Cumberland Plain occurs at the confluence of two second or third order creeks (Jo McDonald Cultural Heritage Management 2002, p.12). The local predictive model stated that: surface artefacts (predominantly silcrete) were likely to occur in open locations on shale bedrock, but were unlikely to be present in large numbers unless in a disturbed context. Areas of PAD should be marked based on low disturbance caused by previous land use. Shelter sites would not be found, but open grinding grooves may be found in sandstone or shale/sandstone transition areas. There was some potential for scarred trees to occur in areas of original vegetation. The survey identified four new sites within its study area, as well as eighteen previously recorded sites and nine PADs (which were not recorded as sites in the AHIMS register). Of these sites, four were isolated finds, seven were open camp sites, ten were open camp sites with PADs, and one was an open camp site with grinding groove. The majority of these sites were located in the Ashfield Shale or Quaternary Alluvium geological formations. The majority of artefacts identified by survey were made of silcrete.

Jo McDonald Cultural Heritage Management (2006) undertook salvage excavations within the Colebee Release Area in advance of the development of residential areas and a golf course, south-west of the study area. Seven sample areas were investigated, primarily located on grassed open slopes between Eastern Creek and the upper slopes of Plumpton Ridge, which was part of a gently undulating landscape, which sloped down from the ridge to the creek. Over 80,000 artefacts were recovered, with only a small number of pits across the sample areas being artefactually sterile. Silcrete was the most common material, with silicified tuff, silicified wood and quartz also being recovered in significant numbers. The majority of silcrete artefacts were considered debitage. It is noted that Plumpton Ridge has been considered a silcrete quarry since the early 1980s. The results of the lithics analysis demonstrated that the highest densities of silcrete artefacts were located on the upper ridge slopes of the subject area, closest to Plumpton Ridge, and also on the banks of Eastern Creek.

Cultural Heritage Connections (2007) completed an Aboriginal archaeology and cultural heritage impacts assessment report for Integral Energy in advance of the development of the proposed Rouse Hill electrical substation on the corner of Schofields Road and Cudgegong Road. The assessment included background research and consultation and collated the results of previous assessments on the site. A total of eight test pits measuring 1 metre by 1 metre had been excavated on the site two years prior to a maximum depth of 350 millimetres. A total of 28 stone artefacts were identified by testing, with the report recommending further assessment take place in the form of salvage excavation prior to impacts on site.

ENSR AECOM (2008, cited by Archaeological & Heritage Management Solutions 2015, pp.39–40) undertook an archaeological sample survey of the Alex Avenue and Riverstone Growth Precincts, which included the current study area. The survey identified 37 Aboriginal archaeological sites, 12 of which were located within the Alex Avenue Precinct. Site types identified include 18 isolated finds, five low-density artefact scatters and four artefact scatters, five archaeological deposits and four areas of PAD, three areas of natural silcrete occurrence and two potential scarred trees. A predictive model was also developed; areas which contained cultural material were classed as high archaeological potential, and areas of similar environment and landform as holding moderate archaeological potential. The current study area is situated in an area of moderate archaeological potential, likely attributed to the presence of the ridgeline and nearby water sources (Plate 18).

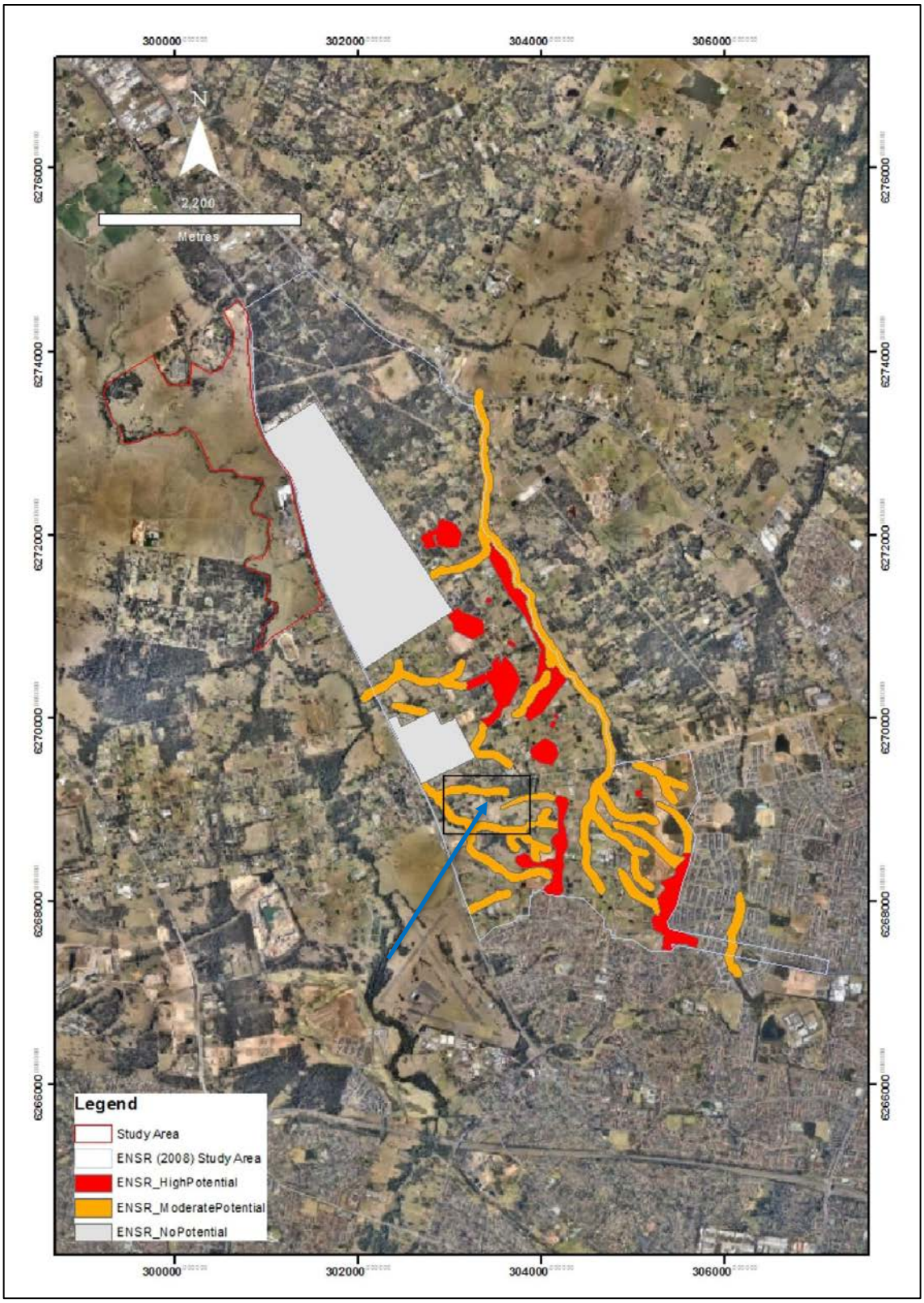


Plate 18 **Predictive modelling of archaeological potential undertaken by ENSR AECOM (2008, cited by Archaeological & Heritage Management Solutions 2015, p.40); the approximate location of the study area is indicated by the blue arrow, with the black box indicating the neighbouring site**

AECOM (2010) undertook an archaeological review of the Riverstone and Alex Avenue Precincts for the Department of Planning. The project was intended to provide further information on two Aboriginal sites (RAA11 and RAA23 (AHIMS site 45-5-4474)) which were assessed by ENSR in 2008. RAA11, bounded by Westminster Street, Chester Street and Kensington Park Road (north of the current study area) had been previously assessed as a silcrete source area due to the high concentration of silcrete cobbles/fragments/pieces within the Riverstone portion of the ENSR assessment area. A site inspection undertaken by AECOM in 2009 aimed to clarify the nature and extent of naturally occurring silcrete across this location. The site was reassessed as being 0.7 hectares, occurring from the 50 metre topographic contour and above, significantly reducing the size of the area of naturally occurring silcrete. It is noted that silcrete typically occurs on high ground within the St Marys Formation, which caps the Wianamatta Shales in high locations along the Riverstone ridge and Colebee further east. Restoration of this site was recommended in consultation with Aboriginal stakeholders. RAA23 (AHIMS site 45-5-4474) within 114 Alex Avenue, Schofields (east of the study area), was originally recorded as background scatter and an archaeological deposit/PAD measuring 200 by 200 metres. The site was reassessed as being considerably disturbed after new information was provided by the property owners. This along with general soil conditions and other disturbances suggest that it is unlikely for stratified archaeological deposits to be present at RAA23 and of low archaeological significance. Furthermore, two areas of PAD identified by ENSR, RAA3 and RAA8, were revised as not holding archaeological potential due to a reassessment of landforms and hydrology, and heavy disturbance (respectively). A third PAD, RV30, was considered to still retain archaeological potential and recommended test excavations if impacts were proposed for that location.

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

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

This model was based on the findings of Australian Museum Business Services (1998, 2000), Jo McDonald Cultural Heritage Management (2002), and a number of other surface and subsurface investigations that have taken place in the vicinity of Area 20. It noted that the results of multiple excavations had indicated that low artefact densities were consistently recorded on upper slopes and crests in the area (Kelleher Nightingale Consulting 2010, p.17). It was also noted that previous predictive models had placed a large emphasis on the idea that more complex sites would be identified in close proximity to streams, but that that potential had been demonstrated by the results of excavations carried out by Therin (2004), which had identified artefacts in a range of landforms, but that the highest artefact densities were located in the margins of Second Ponds Creek. The majority of sites identified in the survey were located on lower and mid slopes, with some being present on upper slopes and crests as well as one on a creek flat. A total of 19 artefact sites and 7 PADs were identified during the survey. The results of the survey largely confirm the predictive statements made in the predictive model. Stone artefacts formed the majority of identified sites, and were located across a variety of landforms, as well as being well distributed throughout the study area. The majority of sites were located

away from upper slopes and crests, and those that were located on these landforms were low density scatters and isolated finds (although it is noted that all scatters were of low density). The sites with the largest artefact counts were located within 150 metres of Second Ponds Creek. As the assessment did not involve subsurface investigations, it is not possible to judge the accuracy of that portion of the predictive model.

Austral Archaeology (2013) were engaged to undertake an Aboriginal Cultural Heritage Assessment of 14 Schofields Road (formerly Lot 12, DP 1133321), which contains the western portion of the study area. This assessment followed on from ENSR's 2008 assessment of the Riverstone and Alex Avenue precincts. The predictive statements developed for the assessment noted that stone artefact scatters and PADs are likely to be present due to the proximity of a third order stream; however, this depends on the level of disturbance within the site. Scarred trees, burials, rockshelters, shell middens, grinding grooves and stone arrangements were considered not likely to occur. The survey paid close attention to areas of the least disturbance so as to focus on arras of the highest archaeological sensitivity. Two new isolated artefacts (a chert proximal flake with bending initiation and possible use wear and a non-diagnostic quartz flake with cortex) were identified during the survey (AHIMS site 45-5-4202), in an area of clay exposure south of the current study area and adjacent to an unnamed creek; no area of PAD was associated with this site. Disturbance mapping assessed the portion of the current study area contain within this report as low to moderate (market gardens) (north-western corner) and low (erosion) (western portion). The assessment recommended the application for an AHIP to allow harm to the newly identified surface artefacts identified within the site, which was subsequently granted (AHIP C0000550), and includes the western portion of the current study area.

Archaeological & Heritage Management Solutions (2015) were commissioned to prepare a preliminary Aboriginal heritage assessment for 14 Schofields Road, Schofields, which contains part of the western portion of the study area. The survey identified three small artefact scatters and one isolated find, located within 200 metres of the third order stream to the south; one of these scatters (AHIMS site 45-5-4628) consists of silcrete artefacts and is located south of the current study area. These artefacts were identified in open exposures featuring shallow topsoils that had been heavily impacted and eroded. It was proposed that the artefacts had likely been originally located higher on the slope near the ridgeline, and redeposited either by natural soil erosion or earthworks. It was assessed that no areas of PAD were associated with the finds due to their locations and historical disturbances within the assessment area.

Futurepast (2015) prepared an Aboriginal Due Diligence assessment for 14 and 34-38 Schofields Road, Schofields, south of the current study area, in advance of a proposed residential subdivision. Following consideration of the hydrology, topography, including the presence of the Plumpton ridgeline running through the centre of 14 Schofields Road, and available resources in the surrounding landscape and erosion disturbance, it was predicted likely that Aboriginal objects could be present on the ground surface. While no Aboriginal objects or areas of PAD were identified during the site inspection, the assessment considered there to be high potential for Aboriginal objects to be present on the ground surface. However, taking into account existing assessments for surrounding sites, these would likely be of low significance. No further investigations were recommended for the subject area.

Biosis (2016) conducted an Aboriginal Cultural Heritage Assessment including test excavations for Blacktown City Council in advance of the proposed Rouse Road Upgrade, located 2.3 kilometres north-east of the current study area. Predictive modelling undertake for the assessment concluded that there was a very high likelihood that the assessment would identify stone artefacts, and a high likelihood that areas of potential would be identified during the survey, with the rationale behind this presented in Table 7.

Table 7 Aboriginal site prediction statements (Biosis Pty Ltd 2016, p.43)

Site type	Potential
Flaked Stone Artefact Scatters and Isolated Artefacts	**High:** This site type has been recorded in all locally noted soil landscapes and landforms, as well as being the most common site type in relation to both geological formations underlying the study area. When looking at the AHIMS data this site type is the most dominant within the local region. This site type will be recorded on average 158 metres and 208 metres from permanent and ephemeral water sources respectively. Artefacts scatters in this area appear to be located closer to permanent creeks. Artefact scatters are also very common in close proximity to Second Ponds creek, a third order stream which flows through the study area. This site type has also been recorded at various heights throughout the landscape ranging from 27 metres to 72 metres above sea level, and is located primarily on hillslopes, however it is present across all landforms, being less common on crests.
PADs	**High:** This site type has been recorded locally within the Blacktown soil landscape, which covers all of the study area. They have also been identified locally in the Ashfield and Bringelly shale formations, which cover the study area. This site type represents the second highest recorded site type within the wider area, after artefact scatters. The majority of previously recorded PADs occur within 100 metres of water sources and are located most commonly on hillslopes, but also in alluvial plains and creek banks at the edges of watercourses. The study area contains Second Ponds Creek, a permanent water source which has previously had PADs identified in close proximity to it, increasing the likelihood of identifying this site type.

The results of Biosis' predictive modelling suggested that sites were most likely to be identified in association with first and third order creeklines, with sites occurring in relatively large numbers up to 400 metres from both permanent and ephemeral water courses.

The survey did not identify any new Aboriginal sites, with the lack of stone artefacts being identified mostly attributed to the grass cover over the study area, as well as large areas of disturbance associated with Rouse Road. Based on the results of the assessment the study areas was classed into areas of high, moderate, and low archaeological potential, and further investigation undertaken in the form to test excavation. Areas of low potential were associated with areas of disturbance, typically those which had already been developed, areas of moderate potential with lesser disturbed areas considered to have the potential to contain intact subsurface deposits, and areas of high potential typically associated with the margins of Second Ponds Creek.

Test excavations identified stone artefacts at two previously recorded sites (RH/SP 17 and RH/A20P 11), and identified three new archaeological deposits (Table 8). The most common raw material was silcrete (87%), followed by quarts (12%).

Table 8 Results of test excavations conducted by Biosis (2016, pp.89–90)

Site	Landform	Surface artefacts	Artefacts recovered during excavation	Total number of stone artefacts
RH/SP 17 (#45-5-3108)	Alluvial plain	7	170	177
RH/A20P 11 (#45-5-3926)	Alluvial plain	1	5	6
RR-AD1 (#45-5-4739)	Alluvial plain and creek bank	N/A	11	11

Site	Landform	Surface artefacts	Artefacts recovered during excavation	Total number of stone artefacts
RR-AD2 (#45-5-4740)	Alluvial plain	N/A	1	1
RR-AD3 (#45-5-4738)	Hillslope	N/A	1	1
Total	-	8	188	196

Comber Consultants (2016) completed an Aboriginal archaeological assessment for 56 Cudgegong Road, approximately 3.8 kilometres north-east of the study area, in advance of a proposed residential subdivision and development at the site. The assessment included background research, survey, and the formulation of management recommendations relating to the site. Background research for the project indicated that there was a high potential for artefact sites and subsurface archaeological deposits to be present, particularly given the close proximity of the site to Second Ponds Creek. The site survey did not identify any Aboriginal sites, as the ground surface was largely obscured by grass. Based on the results of the assessment, Comber recommended that the site be subject to archaeological testing to determining if an AHIP would be required under the NPW Act, as the site had the potential to contain subsurface archaeological deposits.

Biosis (2018) was commissioned by Hayball to undertake an Aboriginal cultural heritage due diligence assessment for Riverstone High School, 71 McCulloch Street, Riverstone. During the site survey areas of previous disturbance were noted and recorded. Areas of ground surface exposure were targeted in order to identify any Aboriginal objects within the study area. No previously unrecorded sites or objects were located during the site survey. One previously identified site, QH 3 Quakers Hills (AHIMS #45-5-0359) could not be relocated during the site survey. It was concluded that the development will not impact the northern portion of the study area.

3.2.3 AHIMS site analysis

An extensive search of the AHIMS database was conducted on 22 August 2018 (Client service ID: 365832). The search identified 94 Aboriginal archaeological sites within a 2 kilometre search area, centred on the proposed study area (Figure 6, Table 9). None of these registered sites are located *within* the study area. The mapping coordinates recorded for these sites were checked for consistency with their descriptions and location on maps from Aboriginal heritage reports where available. These descriptions and maps were relied where notable discrepancies occurred.

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

Table 9 AHIMS site type frequency

Site type	Number of occurrences	Frequency (%)
Artefact	74	78.7%
Artefact, PAD	10	10.6%
Open campsite – artefact	6	6.4%
Artefact, PAD, modified tree	1	1.1%
Artefact, ochre quarry	1	1.1%

Site type	Number of occurrences	Frequency (%)
PAD	2	2.1%

A simple analysis of the Aboriginal cultural heritage sites registered within a 2 kilometre search with a 200 metre buffer of the study area indicates that the dominant site type are artefacts, either as isolated artefacts or scatters, representing 78.79% (n=74), followed by PAD and artefact sites accounting for 10.6% (n=10), and open campsites featuring artefact(s) taking up 4% (n=6). The remaining sites included an artefact, PAD and modified tree site (1.1%, n=1) and an artefact and ochre quarry site (1.1%, n=1). All of the above sites appear to be located in proximity to perennial and non-perennial water sources surrounding the study area.

A number of AHIMS sites are in close proximity to the study area. AHIMS site 45-5-4202 consists of two surface stone artefacts (chert proximal flake and quartz flaked piece) approximately 88 metres south of the study area, eroding out of a large exposure. AHIMS site 45-5-4472 is an isolated artefact (chert flake) located approximately 49 metres north of the study area, said to be eroding out of an orange clay exposure. AHIMS site 45-5-4476 is an isolated artefact (silcrete flake) located on a track approximately 211 metres south of the study area; this artefact was considered to not be in situ. AHIMS site 45-5-4564 consists of three artefacts (silcrete flaked piece, quartz flake and chert flaked piece) located approximately 170 metres east of the study area, also in an area of exposure. AHIMS site 45-5-4626 is an isolated artefact (silcrete distal fragment) located in a clay exposure approximately 88 metres west of the study area. AHIMS site 45-5-4628 is an artefact scatter (13 red silcete flakes) eroding out of an exposure approximately 29 metres south of the study area.

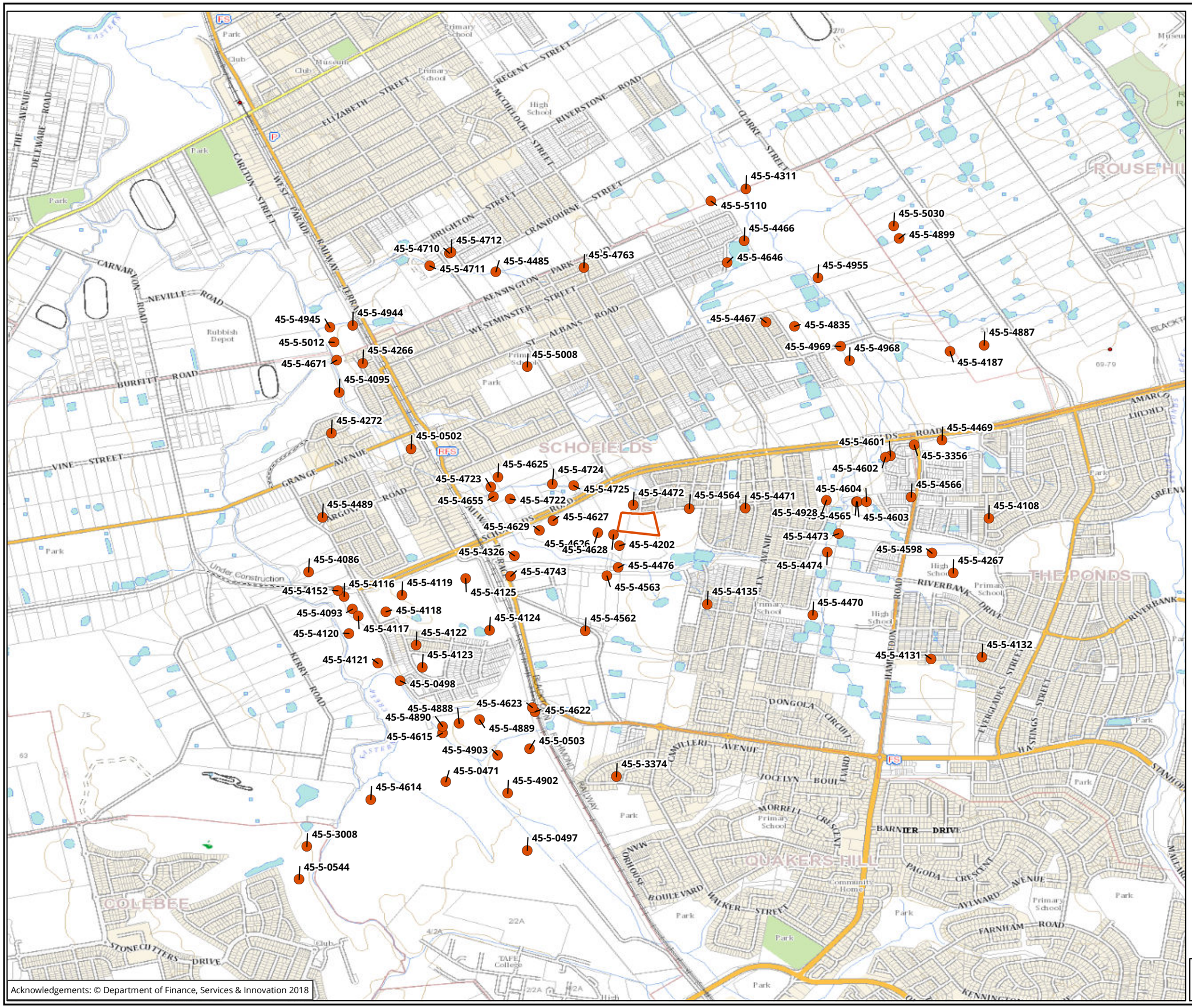


Figure 6: AHIMS search results in the vicinity of the study area

NOT TO BE MADE PUBLIC

0 200 400 600 800 1,000

Metres
Scale: 1:20,000 @ A3
Coordinate System: GCS GDA 1994

Biosis Pty Ltd

Ballarat, Brisbane, Canberra, Melbourne, Sydney,Wangaratta & Wollongong

Matter: 27715
Date: 10 September 2018,
Checked by: skumar, Generated by: skumar
Location:P:\27700s\27715\Mapping
27715_F6_AHIMS.mxd

3.3 Discussion

3.3.1 Predictive statements

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 10). The definition of each site type is described firstly, followed by the predicted likelihood of this site type occurring within the study area.

Table 10 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: Flaked stone artefacts are an extremely common site type in a local and regional context, and have the potential to be identified across a variety of landforms. In addition to this, a number of stone artefacts have previously been identified on a lot adjoining the study area.
PADs	Deposits of shells accumulated over either singular large resource gathering events or over longer periods of time.	High: PADs have previously been identified across a variety of landforms in the local area, as well as within the study area. Previous testing within the local area has also demonstrated that there is the potential for subsurface archaeological deposits to be present in the area.
Shell middens	Raw stone material procurement sites.	Low: shell midden sites have not been recorded within the vicinity of the study area.
Quarries	Potential sub surface deposits of cultural material.	Low: there is no record of any quarries being within the study area, and only one record of an ochre quarry within 2.2km of the study area.

Site type	Site description	Potential
Modified trees	Trees with cultural modifications	Low: scarred trees are not a common site type within the vicinity of the study area. Due to extensive vegetation clearance only a small number of mature native trees have survived within the study area.
Grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	Low: the underlying geology of the study area lacks the sandstone required for the presence of this site type.
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.
Rock shelters with art and / or deposit	Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground characterised by cliff lines and escarpments. These naturally formed features may contain rock art, stone artefacts or midden deposits and may also be associated with grinding grooves.	Low: the sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space exist, which are not present within the study area
Aboriginal ceremony and dreaming sites	Such sites are often intangible places and features and are identified through oral histories, ethnohistoric data, or Aboriginal informants.	Low: there are currently no recorded mythological stories for the study area.
Post-contact sites	These are sites relating to the shared history of Aboriginal and non-Aboriginal people of an area and may include places such as missions, massacre sites, post-contact camp sites and buildings associated with post-contact Aboriginal use.	Low: there are no post-contact sites previously recorded in the study area and historical sources do not identify one.
Aboriginal places	Aboriginal places may not contain any 'archaeological' indicators of a site, but are nonetheless important to Aboriginal people. They may be places of cultural, spiritual or historic significance. Often they are places tied to community history and may include natural features (such as swimming and fishing holes), places where Aboriginal political events commenced or particular buildings.	Low: there are currently no recorded Aboriginal historical associations for the study area.

4 Archaeological survey

A field survey of the study area was undertaken on 20 November 2018 by Charlotte Allen (Archaeologist, Biosis) and Steven Randall (Aboriginal Cultural Heritage Officer, Deerubbin LALC). The field survey sampling strategy, methodology and a discussion of results are provided below.

4.1 Archaeological survey objectives

The objectives of the survey were to:

- Provide Deerubbin LALC an opportunity to view the study area and to discuss previously identified Aboriginal object(s) and/or place(s) in or within close proximity to the study area.
- Attempt to re-identify Aboriginal archaeological sites and/or Aboriginal places 45-5-2628 and 45-5-4202 previously identified in the vicinity of the study area.
- Undertake a systematic survey of the study area targeting areas with the potential for Aboriginal heritage.
- Identify and record Aboriginal archaeological sites visible on the ground surface.
- Identify and record areas of PAD.

4.2 Archaeological survey methodology

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

4.2.1 Sampling strategy

The survey effort targeted areas of exposures in all landforms (including each occurrence of a specific landform type that will be impacted) that will potentially be impacted by proposed works.

4.2.2 Survey methods

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

- Aboriginal objects or sites present in the study area during the survey.
- Survey coverage.
- Any resources that may 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 (94) coordinate system.

4.3 Constraints to the survey

With any archaeological survey there are several factors that influence the effectiveness (the likelihood of finding sites) of the survey. The factors that contributed most to the effectiveness of the survey within the study area were low ground visibility due to grass coverage and low exposures.

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 2010a). Visibility in areas of exposure within the study area was moderate, averaging at approximately 65% (Plate 19 and Plate 20). Grass coverage was extensive, with isolated areas ground visibility, namely caused by erosion or disturbance.

Plate 19 Example of moderate ground surface visibility in the central portion of the study area

Plate 20 **Example of moderate ground surface visibility in the north-western portion of the study area**

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 2010a). Overall, the study area displayed few areas of exposure due to heavy grass coverage, with approximately 4% of the ground surface within the study area exposed. Those areas of exposure that were identified appears to have largely been caused by erosion through run-off (Plate 20) and vehicle tracks (Plate 21).

Plate 21 **Example of erosion caused by vehicle tracks in the north-western corner of the study area**

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 wombats, foxes, rabbits and wallabies, and sometimes exposure from slumping or scouring. Disturbances associated with recent human action are prevalent in the study area and cover large sections of the land surface. The agents include farming practices, such as initial vegetation clearance for creation of paddocks, fencing and stock grazing (Plate 22); agricultural practices such as fruit orchards and ploughing for crops; and animal management such as training tracks. Evidence of ploughing, orcharding and animal management identified in historical aerials of the study area were not visible during the survey due to the dense grass coverage present at the time of inspection. As per the historical aerials, trees were present in the south-eastern corner of the study area, with the remainder having been cleared (Plate 23, Plate 24).

Plate 22 **Evidence of former paddock and property boundaries in the western portion of the study area**

Plate 23 **View of tree coverage in the south-eastern corner of the study area, facing east**

Plate 24 **Typical view of cleared areas within the study area, facing east**

More recent disturbances noted during the survey include overgrown deposited materials and stockpiling in the northern portion of the study area near Farmland Drive (Plate 25, Plate 26). The study area had also been recently subjected to geotechnical testing; this was evident in the form of redeposited soils in numerous locations (Plate 27).

Plate 25 **Area of overgrown deposited materials in the northern portion of the study area, facing east**

Plate 26 **Overgrown stockpile in the central northern portion of the study area, facing south-west**

Plate 27 **Example of geotechnical investigations within the study area, looking south**

4.7 Archaeological survey results

A series of meandering transects were walked across two landforms as part of the sampling strategy (Figure 7). 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. No Aboriginal sites and one PAD was identified in the study area (Plate 28, Plate 29). The results from the field survey have been summarised in Table 11.
The study area contains two landform units, both of which were assessed as part of the survey. The northern portion is contained within a crest and ridgeline, while the southern portion is contained within a simple slope which descends south towards a third order non-perennial stream and open depression, both of which are outside of the study area. Both landforms have been subjected to some disturbance from historical farming and pastoral activities.

The overall effectiveness of the survey in identifying any Aboriginal objects which may be present within the study area was low. This is primarily attributable to the extremely low GSV within the study area. 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; trees in the south-eastern portion of the study area were inspected but no scars or modifications were identified. 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.

The study area is in the vicinity of several registered AHIMS sites. AHIMS site 45-5-4628, a silcrete artefact scatter south of the study area, was relocated and inspected during the survey (Plate 30, Plate 31, Plate 32). AHIMS site 45-5-2628 was not located within the study area boundaries. AHIMS site 45-5-4202, another artefact scatter located south of the study area, could not be relocated during the survey.

Plate 28 **View towards area of area of archaeological potential, looking north-west**

Plate 29 **View of area of archaeological potential, looking east**

Plate 30 **View of part of AHIMS site 45-5-4628**

Plate 31 **Detail of silcrete artefacts within AHIMS site 45-5-4628**

Plate 32 **Detail of further silcrete artefacts within AHIMS site 45-5-4628**

Table 11 Survey coverage

Survey unit	Landform	Survey unit area (m²)	Visibility (%)	Exposure (%)	Effective coverage area (m²)	Effective coverage (%)
1	Crest and ridgeline	10062.38801	90%	2%	181.1229842	1.8%
2	Simple slope	8085.596312	40%	5%	161.7119262	2.0%
3	Open depression	1856.672567	65%	4%	42.2393009	2.3%

4.8 Discussion

The archaeological survey was heavily hampered by very limited ground surface visibility and, existing disturbance. However, an area of archaeological potential, Alex Avenue PS PAD 1, was identified. This area is primarily associated with existing water courses in the vicinity of the study area. The following analysis has been undertaken for this area of archaeological potential.

4.8.1 Alex Avenue PS PAD 1

The presence of a crest and ridgeline through the northern part of the study area and the presence of third and first order streams to the south and north suggest that this portion of the study area could have been a suitable location for a temporary camp site associated with resource gathering from the aforementioned watercourses. The raised location of the crest and ridgeline indicates that it may have been an opportunistic place for food or tool processing related to hunter gathering activities near the creeklines. Flood mapping undertaken by Blacktown City Council indicates that the study area of higher ground would not have been subject to inundation, and likely provided a reliable area of dry, higher ground in close proximity to two streams.

Predictive modelling undertaken by ENSR AECOM (2008, cited by Archaeological & Heritage Management Solutions 2015, pp.39–40) identified the study area as holding moderate archaeological potential. However, the assessment of the adjacent property at 14 Schofields Road by Archaeological & Heritage Management Solutions (2015) did not identify any areas of PAD due to historical disturbances within the assessment area. However, the silcrete artefact scatter located just south of the study area (AHIMS site 45-5-4628) was assessed as not being associated with PAD, but rather proposed that the artefacts had likely been originally located higher on the slope near the ridgeline and redeposited down the slope due to erosion or earthworks.

Geotechnical investigations undertaken in 2017 and 2018 and visual inspection of exposures south of the study area suggest that the study area contains shallow silty and sandy topsoils (Plate 31), overlying residual clayey silt and silty clay soils, followed by clays (JK Geotechnics 2017, Greencap 2018). 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, where the soil begins to transition from a clayey silt to silty clay. Excavations at the Rouse Hill Anglican College, on the northern side of Rouse Road, found that bt1 profile had largely eroded away from the study area, and that the majority of the artefacts identified came from the bt2 profile, which seems to correspond with the clayey silt layer identified during the geotechnical investigations (Stephanie Garling Archaeological Consulting 2000).

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.

Legend

Study area

Survey track

Acknowledgements: Basemap © Land and Property Information 2016

Figure 8: Survey coverage

0 10 20 30 40 50

Metres

Scale: 1:1,000 @ A3

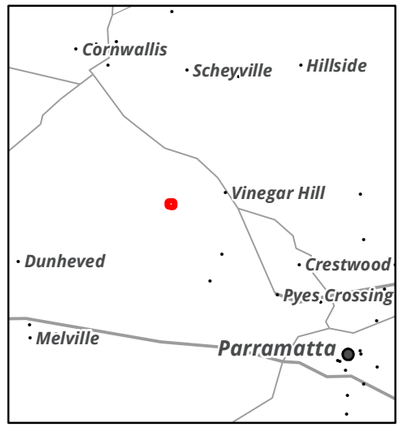
Coordinate System: GDA 1994 MGA Zone 55

N

Biosis Pty Ltd

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

Matter: 27715,
Date: 20 December 2018,
Checked by: AV, Drawn by: DK, Last edited by: dkazemi
Location:P:\27700s\27715\Mapping
27715_F8_SurveyCoverage.mxd



Legend

Study area

Archaeological potential

Low

Moderate

Figure 8: Assessment of archaeological potential

0 9 18 27 36 45

Metres

Scale: 1:800 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

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Albury, Ballarat, Melbourne,
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Matter: 27715,
Date: 17 December 2018,
Checked by: CLA, Drawn by: AEDM, Last edited by: amurray
Location:P:\27700s\27715\Mapping
27715_AR_F8_ArchPotential.mxd

5 Test excavation

Following the results of the field survey a test excavation program was undertaken to characterise the extent, nature and archaeological (scientific) value of Aboriginal cultural heritage within the area of PAD within the study area. The test excavations program was undertake by Biosis archaeologists Charlotte Allen, Ashley Bridge, James Cole and Maggie Butcher. Fieldwork was attended by members of the following RAP groups:

- Barking Owl Aboriginal Corporation
- Darug Aboriginal Land Care
- Deerubbin Local Aboriginal Land Council
- Kamilaroi Yankuntjatjara Working Group.

The test excavations were conducted in accordance with Requirement 16a of the Code. The sampling strategy, methodology and results of the test excavation program are discussed below

5.1 Test excavation objectives

The principle objectives of the test excavations are to identify and understand the nature, extent and significance of any areas of PAD within the study area. This will further our knowledge of Aboriginal archaeological site patterning within the study area and enable the predictive model to be further tested and refined.

The aims of the testing program are to:

- Determine whether sub-surface archaeological deposits exist within the study area and to establish the extent and nature of such deposits.
- Identify if the archaeological material occurs in an intact, undisturbed context, by examining the soil profile and stratigraphy.
- Analyse and interpret any archaeological finds (such as stone artefacts, hearths, etc.) recovered during the testing program.
- Inform current knowledge of Aboriginal occupation and land use models of the region.
- Provide management and mitigation measures for Aboriginal archaeological objects located during the subsurface testing program.
- Test the predictive model and answer the research questions developed as part of this assessment.

5.2 Research questions

Research questions provide a framework for undertaking sub-surface investigations and ensure that the information collected during the sub-surface testing program contributes to the knowledge of the sites and the broader archaeological record. Research questions include:

- Do non-disturbed or minimally-disturbed soil profiles exist within areas of archaeological potential?
- What is the nature of the lithic assemblages?
- Is the lithic typology similar to the assemblages from other subsurface excavations in the region?

- Are any of the archaeological materials of significance?
- What management is appropriate? Does the area warrant further investigation?

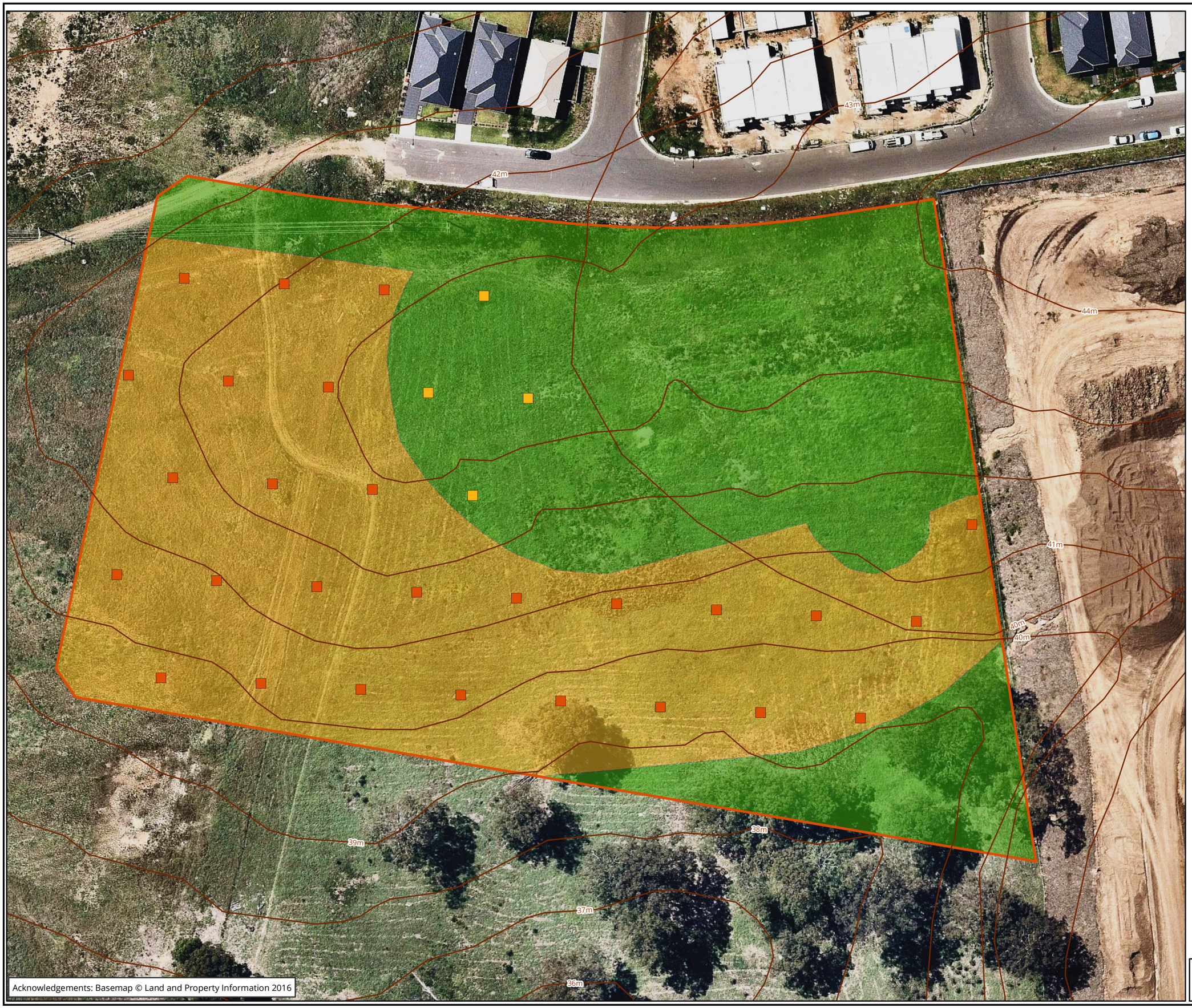
5.3 Test excavation methodology

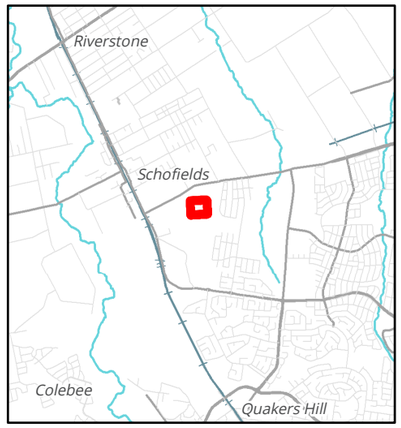
Test excavations were conducted in accordance with the Code and conformed to the below methodology:

- Test excavations were conducted in 50 by 50 centimetre units.
- The test excavation units were excavated by hand (inclusive of trowels, spades and other hand tools) along transects at intervals of between 10 – 20 metres or other justifiable and regular spacing (being no smaller than five metres).
- The first test pit within the PAD area was excavated in 5 centimetre spits; the subsequent test pits conducted within the site or PAD area were then excavated in 10 centimetre spits or stratigraphic units (whichever is smaller) to the base of Aboriginal object-bearing units being the removal of the A-horizon soil deposit down to the sterile clays or bedrock layer (B-horizon).
- Where the depth of deposit prevented reaching sterile deposits within the 50 by 50 centimetre test pit, it was proposed that additional 50 by 50 centimetre test pits would be excavated adjacent to the original test pit (for example expanding the test pit to 50 by 100 centimetres) to reach the sterile deposits.
- Test pits may be combined and excavated as necessary in 50 by 50 centimetre units for the purposes of further understanding site characteristics. Note that under the code, the maximum area that can be excavated in any one continuous area is three metres squared (3 m^2).
- The Code dictates that the maximum surface area of all test excavation units must be no greater than 0.5% of the PAD or area being investigated.
- All excavated soil was sieved in 3 millimetre sieves.
- All cultural material was collected, bagged and clearly labelled. They will be temporarily stored in the Biosis office for analysis (at 14/17-27 Power Ave, Alexandria NSW 2015).
- For each test pit that is excavated, the following documentation will be taken:
  - unique test pit identification number
  - GPS coordinate of each test pit
  - Munsell soil colour and texture
  - amount and location of cultural material within the deposit
  - nature of disturbance where present
  - stratigraphy
  - archaeological features (if present)
  - photographic records
  - spit records.
- Test excavation units were backfilled as soon as practicable.
- An AHIMS Site Impact Recording form will be completed and submitted to the AHIMS Registrar for any sites impacted during test excavations.

- In the event that suspected human remains are identified works will immediately cease and the NSW Police and OEH will be notified.
- Test excavations will cease when enough information* has been recovered to adequately characterise the objects present with regard to their nature and significance.

**Enough information is defined by OEH as meaning "the sample of excavated material clearly and self-evidently demonstrates the deposit's nature and significance. This may include things like locally or regionally high object density: presence of rare or representative objects: presence of archaeological features: or locally or regionally significant deposits stratified or not."* (DECCW 2010a).





Legend

- Study area
- Contour

Archaeological potential

- Low
- Moderate

Proposed test pits

- Initial
- Follow-on

Figure 9: Proposed test pit location

0 8 16 24 32 40

Metres
Scale: 1:700 @ A3
Coordinate System: GDA 1994 MGA Zone 55

N

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Albury, Ballarat, Melbourne,
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Matter: 29496,
Date: 01 March 2019,
Checked by: CLA, Drawn by: AEDM, Last edited by: amurray
Location:P:\29400s\29496\Mapping
29496_F9_ProposedTestPits.mxd

5.4 Test excavation results

A total of 31 test pits were excavated within Alex Avenue PS PAD 1 (Plate 34, Plate 35, Plate 37, Plate 36 and Figure 10). Individual test pit and soil analysis results are provided in Appendix 2. Results are shown in Table 12 and a detailed discussion of results is provided below.

5.4.1 Alex Avenue PS PAD 1

A total of 31 test pits were excavated at Alex Avenue PS PAD 1 at approximately 20 metre intervals in order to determine the extent and nature of any sub-surface deposits which may be present within the study area. Three artefacts were identified in three test pits (Figure 10). All artefacts were located either within a silty clay or silty sand. While 27 test pits were planned, the presence of artefacts in TP11, TP12 and TP27 prompted the establishment of a further four test pits in the vicinity of the artefact bearing test pits.

Soil composition varied across the study area. On the crest and ridgeline landform, the soil profile featured three stratigraphic contexts, and generally consisted of a silty sand of low compaction ranging in colour from pale brown to dark yellowish brown, overlying a moderately compacted silty clay varying from yellowish brown to dark brown, followed by a highly compacted red clay (Plate 33). For those test pits excavated within the open depression landform, soil profiles were mixed. Upper contexts varied from brown to light brown silty sand, sandy silt or a loamy silt with compaction increasing with depth, ultimately overlying a highly compacted red clay. It is possible this variation may have been caused by erosion soils from the crest, ridgeline and slope into the open depression. The majority of test pits displayed an interface layer featuring clay mottling or nodules which increased in density with depth.

Plate 33 Section of TP3, facing noth, showing typical soil profiles on the crest and ridgeline landform

Soil profiles across the slope landform also varied, with the main observation being that there was generally an increase in clay content within the upper contexts in comparison to those in the open depression and crest and ridgeline landforms. Topsoils and upper contexts generally consisted of silty sands or silty clays, and

occasionally loamy silts, ranging in colour from grey to very dark brown, with compaction broadly increasing with depth. Clay content within the soils also increased with depth, and most excavation units displayed the same interface layer noted above featuring clay mottling or nodules increasing with depth. The final soil deposit in all pits on the slope landform was a highly compacted clay, ranging in colour from red, yellowish red, very dark greyish brown and yellow grey, with some instances of yellow mottling (Plate 34).

Inclusions across the study area generally included rootlets, charcoal flecks, manganese nodules and ironstone nodules.

These soils generally conform to the descriptions of the Blacktown soil landscape in Table 3.

Plate 34 Section of TP20, showing a typical soil profile in the slope landform, facing north

In some instances, a layer of fill was present above the topsoils, for example in TP5 (Plate 35), TP7 and TP8, which contained stone fragments and was of high compaction. In some instances the topsoils appear to have been removed or eroded away, for example in TP25. The majority of clay within the study area was red; however, several pits deviated from this, presenting a yellow grey clay in TP17, and a mottled yellow and red clay in TP6, TP19 and TP28.

Plate 35 Section of TP5, showing the fill deposit, facing north

Several anomalies were identified in the soil profiles within Alex Avenue PS PAD 1. One test pit, TP15, reached a depth of 900 millimetres and contained six soil profiles (Plate 36). These consisted of a brown silty clay of medium compaction overlying a similarly compacted dark brown clayey silt. Below these a strong brown sandy silt of medium compaction was present, followed by a highly compacted light yellowish brown sandy silt. Underlying this was a moderately compacted brown silty sand lens deposit, finally reaching a red highly compacted clay. It is possible that TP15 may have been located in a former open depression which has subsequently been filled in over time. In TP21, a dark reddish grey highly compacted loamy silt lens was identified in the north-western corner of the test pit at a depth of 240-290 millimetres; this lens overlaid a highly compacted red clay, beneath a dark brown silty loam of low compaction (Plate 37). A number of large charcoal fragments were recovered from TP19; these were situated at the interface of a brown clayey silt of low compaction and a highly compacted red clay with yellow mottles. Disturbance in TP6 is believed to have been related to geotechnical investigations.

Plate 36 Section of TP 15, facing north

Plate 37 Section of TP21, showing the loamy silt lense in the north-western corner, facing north

Table 12 Test excavation results by PAD

PAD	Landform	PAD area (m^2)	Area tested (m^2)	PAD effectively tested (%)	No. of sites	No. of artefacts
Alex Avenue PS PAD 1	Crest and ridgeline	3,018.51	2	0.1	0	0
	Slope	7,095.88	5	0.1	2	2
	Open depression	450.19	0.75	0.2	1	1

5.4.2 Archaeological sites identified

There were no existing registered AHIMS sites located within the study area. The test excavation program confirmed the presence of two sub-surface artefact sites within the study area (Figure 10). Site results are included below.

Alex Avenue PS 01 (AHIMS pending)

Alex Avenue PS 01 consists of two artefacts, a grey brown chert distal fragment, recovered from Spit 3, TP11 and silcrete medial fragment, recovered from Spit 2, TP12, in a silty clay deposit located on a simple slope in the south-western portion of the study area (Plate 38, Plate 39). Soils at this location consisted of three stratigraphic layers. Topsoils ranged from a dark brown silty clay of low compaction to a dark yellowish brown silty sand of low compaction. These overlaid a moderately compacted dark brown silty clay to a moderately compacted red silty clay followed by a highly compacted red clay. The base of this deposit was reached at 350 millimetres.

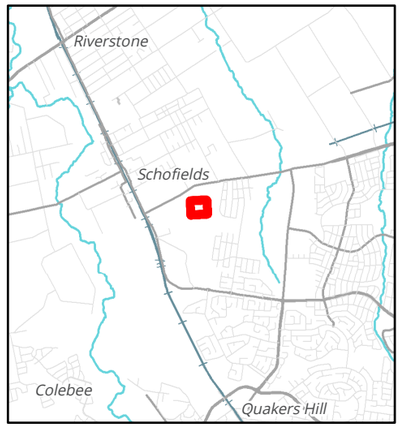
Plate 38 Overview of TP11 in Alex Avenue PS 01 (AHIMS pending), facing north

Plate 39 Section of TP12 in Alex Avenue PS 01 (AHIMS pending), facing north

Alex Avenue PS 02 (AHIMS pending)

Alex Avenue PS 02 consists of a single artefact, a complete silcrete flake, recovered from Spit 2, TP27, located on the edge of an open depression landform in the south-eastern portion of the study area (Plate 40). Soils at this location consisted of three stratigraphic layers, including a brown moderately compacted sandy silt, overlying a highly compacted brown silty sand, followed by a highly compacted red clay. The base of this deposit was reached at 380 millimetres.

Plate 40 Overview of TP27 within Alex Avenue PS 02 (AHIMS pending), facing north



Legend

- Study area
- Contour

Archaeological potential

- Low
- Moderate

Test excavation results

- No artefacts
- Artefacts present

Figure 10: Test excavation results

0 8 16 24 32 40

Metres
Scale: 1:700 @ A3
Coordinate System: GDA 1994 MGA Zone 55

N

biosis

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

Matter: 29496,
Date: 05 March 2019,
Checked by: CLA, Drawn by: AEDM, Last edited by: amurray
Location:P:\29400s\29496\Mapping
29496_F10_TestExcavationResults.mxd

5.5 Sub-surface artefact analysis

The following analysis has been undertaken for the sub-surface assemblage of the study area excavated as part of the test excavation program. A total of three Aboriginal artefacts were identified and recorded from the program of test excavations. Several non-Aboriginal artefacts were also recovered, including glass and metal fragments, as well as one item of non-artefactual material.

The artefact analysis addresses a series of themes including:

- spatial distribution
- stone raw material procurement
- stone reduction technology.

Stone artefacts collected from the excavations were labelled by transect, pit and spit to locate them vertically and horizontally within the study area. Artefacts were collected and then individually analysed by Biosis. The recording form prompts the user to record all relevant artefact attributes; this enabled a typological, technological and metrical analysis of the assemblage to be undertaken. Analysis was undertaken using a standard set of digital Vernier caliper, scale, and stereographic microscope. All measurements were recorded in millimetres to one decimal place. Appendix 3contains the detailed sub-surface lithics recordings.

Collected artefacts were transported to a temporary storage location consisting of a locked storage cabinet in the Biosis Sydney Office at Unit 14, 17-27 Power Avenue, Alexandria, for lithic analysis.

The analysis of artefacts recorded during the sub-surface excavations has been undertaken as a whole assemblage in order to characterise the artefact assemblage present within the study area.

5.5.1 Artefact distribution

Alex Avenue PS PAD 1 is located on slope, open depression and crest and ridgeline landforms in the Cumberland Plain. A total of three artefacts were recovered from the western and eastern portion of the PAD (Table 13). Two artefacts (66%) were recovered in the eastern portion in TP11 and TP12, which are approximately 26 metres apart. One artefact (33%) was recovered from the western portion in TP27, which is located approximately 110 metres east of TP12.

Table 13 Distribution of artefacts within Alex Avenue PS PAD 1

Test pit no.	Artefact count
11	1
12	1
27	1

An analysis of the artefact densities within the landforms within the PAD show a trend in the intensity of use within the study area. While the artefact densities are generally very low, the open depression landform has the highest density level (1.3 artefacts per square metre), and the slope landform has the highest count of recovered artefacts present (n=2) (Table 14).

Table 14 Artefact densities by landform

Landform within PAD	Area excavated (m^2)	Artefacts (n)	Artefacts per m^2
Crest and ridgeline	2	0	0
Slope	5	2	0.4
Open depression	0.75	1	1.3

In terms of vertical distribution, the highest density of artefacts were recovered from a depth of 100-200 millimetres (66%, n=2), with artefact densities decreasing downwards in the soil profile from this depth (Table 15. This suggests that the period of highest density occupation within Alex Avenue PS PAD 1 occurred during the deposition of the 100-200 millimetre soils, with occupation dropping off after this depositional period.

Table 15 Vertical distribution of artefacts

Test pit no.	Depth (mm)	Artefact count
11	100-200	1
12	100-200	1
27	200-300	1

5.5.2 Artefact composition

Flakes

Flakes and broken flakes make up 100% (n=3) of the sub-surface assemblage (Table 16).

Table 16 Artefact type frequency

Artefact type	Number	Frequency (%)
Complete flake	1	33%
Medial fragment	1	33%
Distal fragment	1	33%
TOTAL	3	100

An analysis of flake features was undertaken and included an analysis of platform type, and termination type. This was done to characterise the nature of the flaked assemblage and to allow assumptions to be made on the level of the knapper's skill and technology strategies. A flaked platform was identified on the complete flake; no platform was present on the medial or distal fragments.

Flake platforms are the remnants of a core from which a flake was removed and can provide useful information about the way a core was reduced, during what stage of reduction the flake was removed at and the skill of the knapper (Holdaway & Stern 2004, p.119). Platforms that are produced in the reduction of a raw material include a number of different types. Cortical platforms contain unmodified surfaces still containing the outer surface or cortex of a core and indicate early reduction (Holdaway & Stern 2004, p.119). Flaked platforms contain one to two flake scars and indicate a later stage of reduction compared to cortical flakes

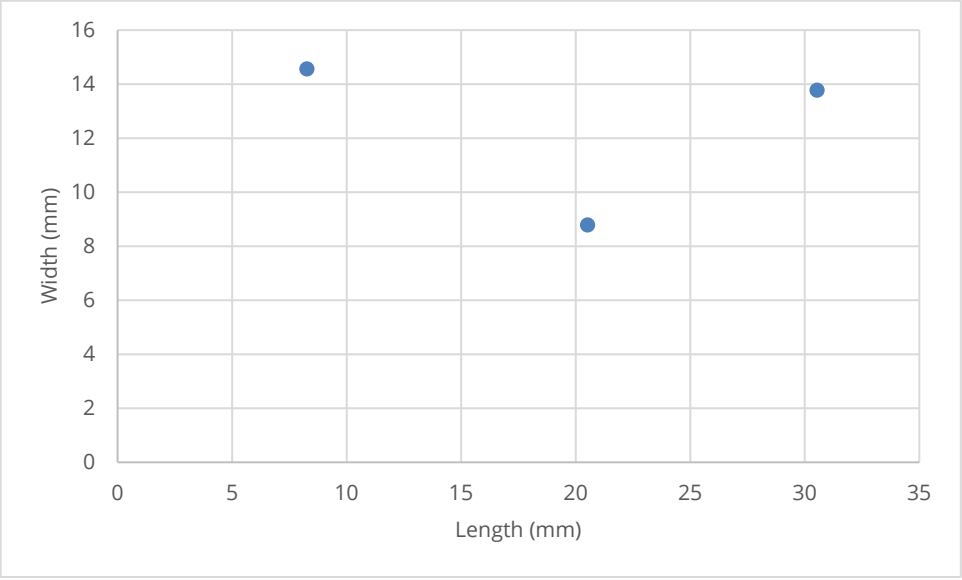
(Holdaway & Stern 2004, pp.119–20). Facetted platforms contain more than two flake scars and are representative of, late stage reduction (Holdaway & Stern 2004, p.119). Crushed platforms occur when a flake platform has been damaged and no platform attributes can be recorded (Holdaway & Stern 2004, p.120). These platforms often occur when flakes are struck from unsuitable platforms and can indicate an inexperienced knapper.

An analysis of termination types was also undertaken for the two artefacts exhibiting a termination. The complete flake featured a feather termination (50%, n=1), while the distal fragment featured a hinge termination (50%, n=1). Feather terminations are achieved when the knapper has struck the core at an appropriate distance from the core edge with the appropriate amount of force, meaning the knapper is showing some degree of control in the process (Holdaway & Stern 2004, pp.132–133). The remaining two artefacts featuring terminations consisted of plunge and hinge terminations. Hinge terminations are most often produced when there is not enough force to detach a feather terminated flake, such as when a core is struck too far from the platform edge or an incorrect striking angle is used. Plunge terminations occur more frequently when too much force is used in striking flakes from a core.

Table 17 Termination types within the assemblage

Platform type	Count	Percentage (%)
Plunge	1	50
Feather	1	50
TOTAL	2	100

The overall size of artefacts within an assemblage can provide insight into the intensity and stages of reduction present at a site. Over half of the artefacts within the assemblage measure less than 21 millimetres lengths and widths, suggesting the majority of artefacts are small in size and indicative of later stage or intensive reduction (Graph 1).



Graph 1 Size distribution of artefacts

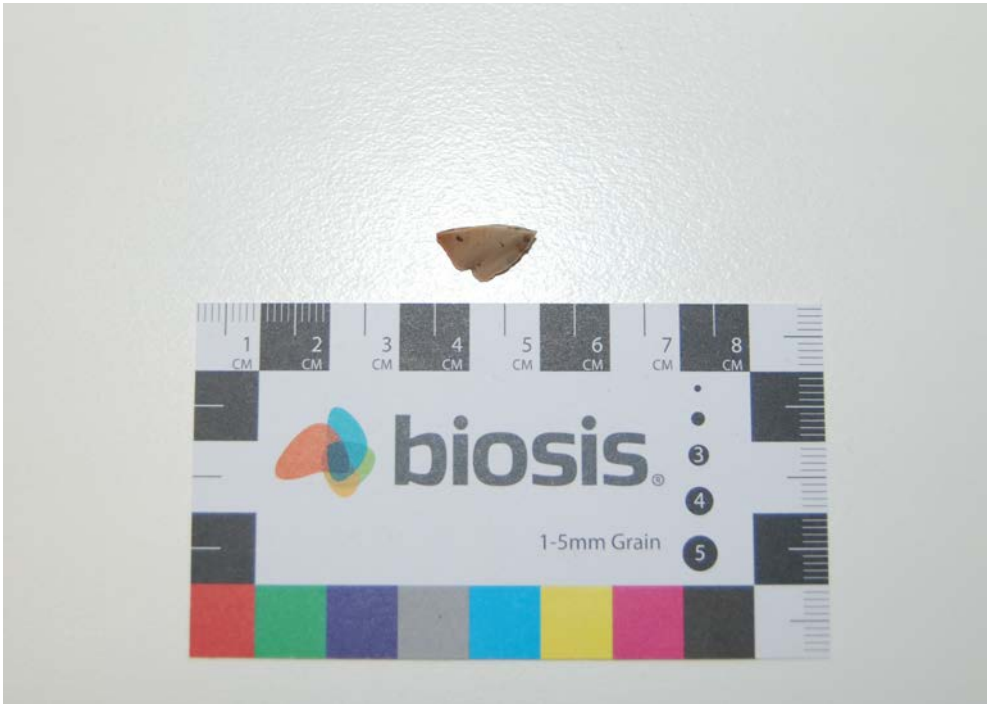


Plate 41 **Chert distal fragment from Spit 3, TP11, within Alex Avenue PS 01 (AHIMS pending)**

Plate 42 **Silcrete medial fragment from Spit 2 TP12, within Alex Avenue PS 01 (AHIMS pending)**

Plate 43 Complete silcrete flake from Spit 2, TP27 in Alex Avenue PS 02 (AHIMS pending)

Raw material

The dominant material was silcrete, accounting for 66% (n=2) of the assemblage, followed by chert at 33% (n=1) (Table 18). The item of non-artefactual material was also silcrete. While significantly lower artefact densities are present, these results are similar to those investigations at the Rouse Hill Anglican College (Stephanie Garling Archaeological Consulting 2000), the Colebee Release Area (Jo McDonald Cultural Heritage Management Pty Ltd 2006) and Rouse Road Upgrade (Biosis Pty Ltd 2016) where silcrete was the dominant material. Assessments undertaken in the immediate vicinity of the study area also identified a chert proximal flake in a surface site (AHIMS site 45-5-4202) (Austral Archaeology 2013) and three artefact scatters consisting of red and yellow silcrete and chert, and an isolated silcrete artefact (AHIMS sites 45-5-4626, 45-5-4627, 45-5-4628, 45-5-4629) present on eroded exposures (Archaeological & Heritage Management Solutions 2015).

Table 18 Artefact material frequency

Material	Number	Frequency (%)
Silcrete	2	66%
Chert	1	33%
TOTAL	3	100

6 Analysis and discussion

6.1 Discussion of results

The general pattern confirms that the majority of sites are located in areas that have abundant resources, are close to permanent water sources and have good vantage points over the surrounding area. Areas that are further away from permanent and ephemeral water sources have fewer archaeological sites present. Ethnographic accounts suggest that Aboriginal groups were highly mobile, largely dispersed and were moving seasonally for resource exploitation and/or ceremonial activities.

The predictive statements formulated in Section 3.3.1 were based on the results of the AHIMS search and the regional and local studies of the area. It predicted a high archaeological potential for flaked stone artefact scatters and a high archaeological potential for PADs to be present. It was also predicted that there was low archaeological potential for shell middens, quarries, modified trees, grinding grooves, burials, rock shelters with art and / or deposit, Aboriginal ceremony and dreaming sites, post-contact sites and Aboriginal places to be present within the study area.

The results of the archaeological survey were largely consistent with the predictive statements. Given the low GSV, no new sites in the form of surface artefact scatters were identified. It is also possible that historical disturbances including tree clearances, ploughing and animal grazing could have displaced any intact surface artefact scatters. This does not necessarily mean that artefacts are not present within the subsurface. Therefore, an area of moderate archaeological potential was identified with the potential for subsurface deposits to be present (Figure 8).

The results of the test excavations confirmed the presence of sub-surface artefacts within Alex Avenue PS PAD 1. The locations of these sites according to landform and distance from water sources are consistent with the predictive statements in Section 3.3.1. The test excavations resulted in two newly identified sites: Alex Avenue PS 01; and Alex Avenue PS 02.

Subsurface artefacts within the Blacktown soil landscape are typically located in the upper two stratigraphic horizons. These soils align closely with profiles described in nearby excavations which suggest that the A1 horizon has largely eroded away and that the majority of the artefacts identified came from the A2 horizon (Stephanie Garling Archaeological Consulting 2000, Biosis Pty Ltd 2016). This is consistent with the results of the test excavations undertaken in Alex Avenue PS PAD 1. For all sites within the study area subject to test excavation, all of the artefacts were recovered from spits 2 and 3, located within the upper two stratigraphic horizons.

The presence of the artefacts on the slope and open depression landforms suggest the objects may have washed down the slope from higher ground, and as such may not be in their original context. It is not surprising that fewer artefacts were found here given the greater distance from Second Ponds Creek and is therefore consistent with the predictive statement that sites will be closer to permanent water sources, despite being within an elevated landform. The low density of artefacts identified in Alex Avenue PS PAD 1 indicate that Alex Avenue PS 01 and Alex Avenue PS 02 are 'background scatter'; it is considered unlikely that camping or knapping took place at these sites. It is likely that Aboriginal groups may have favoured the lower slope areas closer to the unnamed creek south of the study area, or Eastern Creek, west of the study area.

The results of the current investigations largely conform to the predictive statements presented in Section 3.3.1. While no surface artefact sites were identified, a very low density artefact-bearing deposit was confirmed in the south-western and south-eastern portions of the study area through the test excavation program, presenting two separate artefact sites: Alex Avenue PS 01; and Alex Avenue PS 02.

6.2 Research questions responses

This section provides detailed responses to the research questions, based on the results above.

Do non-disturbed or minimally disturbed soil profiles exist within areas of archaeological potential?

There was evidence of previous disturbance noted within the areas subject to test excavations. Areas that had evidence of ground disturbance were located throughout the study area in association with ploughing activities, erosion of topsoils and presence of fill material overlying topsoils in various locations; evidence of geotechnical testing was also identified in one test pit unit. Despite these disturbances, the soil profile below the A1 horizon topsoils contained minimal sub-surface disturbance. All three artefacts recovered from the test excavations were located within the upper 10-30 centimetres of deposit, which appeared to be less disturbed soil profiles.

What is the nature of lithics assemblage?

The lithic items recovered from the test excavations displayed knapping on silcrete and chert. The assemblage contained one complete flake, one proximal flake fragment and one distal flake fragment. The distal flake displayed evidence of retouch, and the complete flake featured a flaked platform. All artefacts were recovered from a depth of 10-30 centimetres.

Is the lithic typology similar to the assemblages from other subsurface excavations in the region?

The number of artefacts recovered from Alex Avenue PAD 1 was significantly smaller than the assemblages recovered from excavations at Rouse Road (Biosis Pty Ltd 2016), the proposed Rouse Hill (Stephanie Garling Archaeological Consulting 2000) and Colebee Release Area (Jo McDonald Cultural Heritage Management Pty Ltd 2006), and as such it is difficult to make meaningful comparisons. However, materials and artefact types present largely similar results. Statistically, silcrete is the dominant material at all four sites, while similar artefact types, being complete, proximal and distal flakes, were present at Rouse Road (Biosis Pty Ltd 2016). Furthermore, the surrounding AHIMS sites, consisting mainly of surface artefact scatters, also present similar materials and artefact types; chert and silcrete flakes and flake fragments located either on the ground surface or eroding out of the topsoils have been recorded in the immediate vicinity of the study area (AHIMS sites 45-5-4202, 45-5-4626, 45-5-4627, 45-5-4628, 45-5-4629) (Austral Archaeology 2013, Archaeological & Heritage Management Solutions 2015). While the assemblage contains three artefacts, the typology largely aligns with the surrounding assemblages and sites within the local area and region.

Are any of the archaeological materials of significance?

The artefacts recovered from the test excavations are not considered to be significant in terms of their material, type or distribution, and are unlikely to shed light on occupation patterns or raw material procurement for the area. The artefacts from Alex Avenue PS 01 and Alex Avenue PS 02 are considered to be 'background scatter', with camping or knapping unlikely to have taken place at this location.

What management is appropriate? Does the area warrant further investigation?

No further investigation is warranted within the study area due to the very low density of artefacts recovered during the test excavations and low significance of the artefacts themselves.

7 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.

7.1 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.

7.2 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 19. 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 20.

Table 19 Site contents ratings used for archaeological sites

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

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

Table 20 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 21.

Table 21 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 22.

Table 22 Scientific significance ratings used for archaeological sites

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

Each site is given a score on the basis of these criteria – the overall scientific significance is determined by the cumulative score. This scoring procedure has been applied to the Aboriginal archaeological sites identified during the sub-surface testing. The results are in Table 23.

7.2.1 Statements of archaeological significance

The following archaeological significance assessment is based on Requirement 11 of the code. Using the assessment criteria detailed in Scientific Values and Significance Assessment, an assessment of significance was determined and a rating for each site was determined. The results of the archaeological significance assessment are given in Table 23 below.

Table 23 Scientific significance assessment of archaeological sites recorded within the study area

Site name	Site content	Site condition	Representativeness	Scientific significance
Alex Avenue PS 01	1	1	1	3 - Low
Alex Avenue PS 02	1	1	1	3 - Low

Table 24 Statements of scientific significance for archaeological sites recorded within the study area

Site name	Statement of significance
Alex Avenue PS 01	Alex Avenue PS 01 consists of two sub-surface artefacts, a chert distal fragment with a hinge termination and retouch evidence, and a silcrete medial fragment, located on a slope landform approximately 180 m north of an unnamed third order creekline connected to Eastern Creek, approximately 1.5 km west of the site. The site contains moderate levels of disturbance from historical farming activities and represents a common site type within the area. Alex Avenue PS 01 is considered to be representative of opportunistic background scatter. The site has no direct historical or aesthetic associations, and has low scientific significance. The significance of Alex Avenue PS 01 has been assessed as low.
Alex Avenue PS 02	Alex Avenue PS 02 consists of a single isolated sub-surface artefact, a complete silcrete flake with a flaked platform and feather termination, located on a slope landform approximately 180 m north of an unnamed third order creekline connected to Eastern Creek, approximately 1.5 km west of the site. The site contains moderate levels of disturbance from historical farming activities and represents a common site type within the area. Alex Avenue PS 02 is considered to be representative of opportunistic background scatter. The site has no direct historical or aesthetic associations, and has low scientific significance. The significance of Alex Avenue PS 02 has been assessed as low.

8 Impact assessment

As previously outlined, the proposed development will consist of a new school to which will have capacity for 1,000 students and 70 staff members. The project involves the following elements:

- Two two-storey Home Base buildings.
- A two-storey admin and staff building.
- A two-storey library.
- A hall and out of school hours care facilities.
- Three learning courtyards and sports court.
- Covered outdoor learning area and walkway.
- Interconnected external area.
- Two storey home base building.

8.1 Predicted physical impacts

The construction of the school buildings, facilities and associated infrastructure associated with the development will impact the majority of the area identified as holding archaeological potential within the study area. If not mitigated the impact may include:

- Vehicle movement within study area with potential compaction of surface soils.
- Earthworks, which will involve the removal of topsoil and subsoil.

Left unmitigated, these activities have potential to completely remove or disturb archaeological deposits and Aboriginal objects. A summary of impacts is provided below in Table 25.

Table 25 Summary of potential archaeological impacts

AHIMS site no.	Site name	Significance	Type of harm	Degree of harm	Consequence of harm
AHIMS # pending	Alex Avenue PS 01	Low	Direct	Complete	Total loss of value
AHIMS # pending	Alex Avenue PS 02	Low	Direct	Complete	Total loss of value

8.2 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 areas containing Alex Avenue PS 01 and Alex Avenue PS02 within the study area, and as such Alex Avenue PS 01 and Alex Avenue PS 02 will be impacted by the proposed SSD project.

Alex Avenue PS 01 and Alex Avenue PS 02 have been assessed as holding low scientific significance. The two sites contained within the study area represent opportunistic background scatter and do not warrant further investigation. Accordingly, no further archaeological works are required within the study area prior to development impacts.

8.3 Long term management of Alex Avenue PS 01 and Alex Avenue PS 02

As part of this assessment, the long term management of the three artefacts recovered during test excavations must be addressed. In consultation with the TSA Management on behalf of SINSW, it has been determined that there are a number of areas within the study area which will not be subject to development or landscaping as part of the proposed works and will be maintained as a natural ground areas in the south-eastern portion of the study area. It is proposed that the artefacts will be reburied on site somewhere within this location.

9 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: Conditions of AHIP C000550

Although SSD projects are not required to comply with Part 6 of the *National Parks and Wildlife Act 1974* (NPW Act), the Office of Environment and Heritage (OEH) advises that conditions of valid AHIPs are followed by SSDs in order to reduce the risk of impacting Aboriginal heritage values.

OEH also advises that the holder of the AHIP should be contacted to confirm the works that are intended on the area covered by the AHIP.

Recommendation 2: No further archaeological works required for Alex Avenue PS 01 and Alex Avenue PS 02

It is recommended that no further archaeological works are required for Alex Avenue PS 01 and Alex Avenue PS 02 prior to development impacts.

Recommendation 3: Preparation and lodgement of AHIMS site cards for Alex Avenue PS 01 and Alex Avenue PS 02

It is recommended that AHIMS site cards are prepared and lodged with AHIMS for newly identified sites Alex Avenue PS 01 and Alex Avenue PS 02, and that the site numbers are included in the final version of this report.

Following development impacts it will be necessary to update these AHIMS records with AHIMS site impact recording forms for Aboriginal sites Alex Avenue PS 01 and Alex Avenue PS 02. This should occur within four months following completion of development impacts or as otherwise stated in SSD approval conditions.

Recommendation 4: Long term care and control of artefacts

In consultation with TSA Management on behalf of SINSW, it has been determined that there are a number of areas within the study area which will not be subject to development or landscaping as part of the proposed works and will be maintained as a natural ground areas in the south-eastern portion of the study area. It is proposed that the artefacts will be reburied on site somewhere within this location.

Recommendation 5: 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:

4. immediately cease all work at that location and not further move or disturb the remains
5. 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
6. not recommence work at that location unless authorised in writing by OEH.

Recommendation 6: Continued consultation with registered Aboriginal stakeholders

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

Recommendation 7: Lodgement of final report

A copy of the final report will be sent to the RAPs, the client, OEH and the AHIMS register for their records.

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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 : 27115 AV

Client Service ID : 365832

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-3356	SCR/UPG2	GDA	56	304901	6269461	Open site	Partially Destroyed	Artefact : 10, Potential Archaeological Deposit (PAD) : -		103710
	Contact T Russell	**Recorders**	Mr.Geordie Oakes,Jo McDonald Cultural Heritage Management see GML,Kelleher Ni					**Permits**	3504,3637,3877,4142	
45-5-3374	Reycroft 1	AGD	56	303417	6267350	Open site	Valid	Artefact : -		100609
	Contact Searle	**Recorders**	Total Earth Care Pty Ltd					**Permits**	3566	
45-5-4095	PAD 1037-6	GDA	56	302155	6269705	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Extent Heritage Pty Ltd - Waterloo,Doctor.Alan Williams					**Permits**		
45-5-4086	Isolated Object 1025-5	GDA	56	302031	6268677	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Extent Heritage Pty Ltd - Waterloo,Doctor.Alan Williams					**Permits**		
45-5-4093	PAD 1035-6	GDA	56	302243	6268470	Open site	Partially Destroyed	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Extent Heritage Pty Ltd - Waterloo,Doctor.Alan Williams,Kelleher Nightingale Cons					**Permits**	3637	
45-5-4646	110 Boundary Rd AS1	GDA	56	303989	6270483	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Mr.Alex Timms					**Permits**	4041	
45-5-4671	Reburied Artefacts of 45-5-4489	GDA	56	302140	6269889	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists,Ms.Tamika Goward,Ms.Tamika Goward					**Permits**	4075	
45-5-4655	Advance Street 1	GDA	56	302902	6269125	Open site	Valid	Artefact : -		103598,103599,103600,103601
	Contact	**Recorders**	Mr.Tyler Beebe					**Permits**	3998	
45-5-4710	Bligh Street Isolated Find 1	GDA	56	302664	6270510	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mr.Josh Symons					**Permits**		
45-5-4711	Bligh Street Isolated Find 3	GDA	56	302572	6270435	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mr.Josh Symons					**Permits**		
45-5-4712	Bligh Street Isolated Find 2	GDA	56	302672	6270513	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mr.Josh Symons					**Permits**		
45-5-4722	Advance Street AFT 2	GDA	56	302982	6269114	Open site	Valid	Artefact : -		103598,103599,103600,103601
	Contact	**Recorders**	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson					**Permits**	3998	
45-5-4723	Schofields Road Detention Basin (SRDB) IF 3	GDA	56	302888	6269179	Open site	Valid	Artefact : -		103598,103599,103600,103601

Report generated by AHIMS Web Service on 22/08/2018 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 302212 - 305120, Northings : 6267062 - 6270836 with a Buffer of 200 meters. Additional Info : Archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 94

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson					**Permits**	3998	
45-5-4724	Schofields Road Detention Basin (SRDB) IF 2	GDA	56	303182	6269203	Open site	Valid	Artefact : -		103598,103599,103600,103601
	Contact	**Recorders**	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson					**Permits**	3998	
45-5-4725	Schofields Road Detention Basin (SRDB) IF 1	GDA	56	303284	6269195	Open site	Valid	Artefact : -		103598,103599,103600,103601
	Contact	**Recorders**	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson					**Permits**	3998	
45-5-0471	Eastern Creek 4 Schofields Aerodrome	GDA	56	302709	6267494	Open site	Valid	Artefact : -	Open Camp Site	1018
	Contact	**Recorders**	Jim Kohen,Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson					**Permits**	4075,4086,4272	
45-5-0544	SA 8 Riverstone	GDA	56	302021	6266922	Open site	Destroyed	Artefact : -	Open Camp Site	1018,100450
	Contact	**Recorders**	Doctor.Jo McDonald,Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderso					**Permits**	2084,2596	
45-5-0497	Eastern Creek 3 Schofields Aerodrome	AGD	56	303000	6266920	Open site	Valid	Artefact : -	Open Camp Site	521,1018
	Contact	**Recorders**	Jim Kohen					**Permits**	4086	
45-5-0498	Eastern Creek 5 Schofields Aerodrome	GDA	56	302479	6268066	Open site	Valid	Artefact : -	Open Camp Site	521,1018,98187
	Contact	**Recorders**	Jim Kohen,Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson					**Permits**	4074,4075,4086	
45-5-0502	Schofields 1 Schofields (Public Road)	AGD	56	302400	6269200	Open site	Valid	Artefact : -	Open Camp Site	521,1018,98187
	Contact	**Recorders**	Jim Kohen					**Permits**		
45-5-0503	Eastern Creek 6 Schofields Aerodrome	AGD	56	303000	6267500	Open site	Valid	Artefact : -	Open Camp Site	521,1018
	Contact	**Recorders**	Jim Kohen					**Permits**	4086	
45-5-3008	PAD12	GDA	56	302055	6267110	Open site	Destroyed	Potential Archaeological Deposit (PAD) : -, Artefact : -		
	Contact	**Recorders**	Doctor.Jo McDonald,Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderso					**Permits**	2084,2596	
45-5-4187	28 Tallawong Road	GDA	56	305061	6269998	Open site	Destroyed	Artefact : 1		103781
	Contact	**Recorders**	GML Heritage Pty Ltd + Context - Surry Hills,Kelleher Nightingale Consulting Pty Lt					**Permits**		
45-5-4202	NWG AS 1	GDA	56	303508	6268857	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Australian Archaeological Survey Consultants,Mr.David Marcus					**Permits**	3646	
45-5-4267	The Ponds PAD1	GDA	56	305102	6268735	Open site	Valid	Potential Archaeological Deposit (PAD) : 1, Artefact : -		
	Contact	**Recorders**	GML Heritage Pty Ltd + Context - Surry Hills,Mr.Josh Madden					**Permits**	3616	
45-5-4266	SF01a	GDA	56	302264	6269873	Open site	Valid	Artefact : 1		

Report generated by AHIMS Web Service on 22/08/2018 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 302212 - 305120, Northings : 6267062 - 6270836 with a Buffer of 200 meters. Additional Info : Archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 94

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Iain Stuart					**Permits**	3696	
45-5-4311	A7 Archaeological Complex	GDA	56	304070	6270906	Open site	Partially Destroyed	Artefact : 1, Potential Archaeological Deposit (PAD) : 1, Modified Tree (Carved or Scarred) : 1		103781
	Contact	**Recorders**	Mr.Geordie Oakes,Mr.Alan Williams					**Permits**	3793,4074	
45-5-4116	Schofields Village AS1	GDA	56	302202	6268541	Open site	Valid	Artefact : 136		
	Contact	**Recorders**	AECOM Australia Pty Ltd (previously HLA-Envirosciences),Mr.Luke Kirkwood					**Permits**	3525	
45-5-4117	Schofields Village AS2	GDA	56	302273	6268430	Open site	Valid	Artefact : 188		
	Contact	**Recorders**	AECOM Australia Pty Ltd (previously HLA-Envirosciences),Mr.Luke Kirkwood					**Permits**	3525	
45-5-4118	Schofields Village AS3	GDA	56	302404	6268458	Open site	Valid	Artefact : 22		
	Contact	**Recorders**	AECOM Australia Pty Ltd (previously HLA-Envirosciences),Mr.Luke Kirkwood					**Permits**	3525	
45-5-4119	Schofields Village AS4	GDA	56	302478	6268554	Open site	Valid	Artefact : 3		
	Contact	**Recorders**	AECOM Australia Pty Ltd (previously HLA-Envirosciences),Mr.Luke Kirkwood					**Permits**	3525	
45-5-4120	Schofields Village AS5	GDA	56	302229	6268331	Open site	Valid	Artefact : 63		
	Contact	**Recorders**	AECOM Australia Pty Ltd (previously HLA-Envirosciences),Mr.Luke Kirkwood					**Permits**		
45-5-4121	Schofields Village AS6	GDA	56	302372	6268163	Open site	Valid	Artefact : 4		
	Contact	**Recorders**	AECOM Australia Pty Ltd (previously HLA-Envirosciences),Mr.Luke Kirkwood					**Permits**		
45-5-4122	Schofields Village AS7	GDA	56	302552	6268270	Open site	Valid	Artefact : 4		
	Contact	**Recorders**	AECOM Australia Pty Ltd (previously HLA-Envirosciences),Mr.Luke Kirkwood					**Permits**	3525	
45-5-4123	Schofields Village AS8	GDA	56	302584	6268143	Open site	Valid	Artefact : 77		
	Contact	**Recorders**	AECOM Australia Pty Ltd (previously HLA-Envirosciences),Mr.Luke Kirkwood					**Permits**	3525	
45-5-4124	Schofields Village AS9	GDA	56	302900	6268362	Open site	Valid	Artefact : 2		
	Contact	**Recorders**	AECOM Australia Pty Ltd (previously HLA-Envirosciences),Mr.Luke Kirkwood					**Permits**		
45-5-4125	SC IA1	GDA	56	302779	6268654	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	AECOM Australia Pty Ltd (previously HLA-Envirosciences),Mr.Luke Kirkwood					**Permits**	3525	
45-5-4272	SB - AS1 - 12	GDA	56	302123	6269471	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Mr.Geordie Oakes,AECOM Australia Pty Ltd (previously HLA-Envirosciences)					**Permits**	3608,3696	
45-5-4108	AA AS 4	GDA	56	305265	6269048	Open site	Partially Destroyed	Artefact : 11		
	Contact	**Recorders**	Ms.Fiona Leslie					**Permits**	3499	
45-5-4152	VR1	GDA	56	302172	6268573	Open site	Destroyed	Artefact : 2		
	Contact	**Recorders**	Kelleher Nightingale Consulting Pty Ltd,Kelleher Nightingale Consulting Pty Ltd,Mi					**Permits**	3637	
45-5-4135	RAA19	GDA	56	303934	6268532	Open site	Valid	Artefact : 1		

Report generated by AHIMS Web Service on 22/08/2018 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 302212 - 305120, Northings : 6267062 - 6270836 with a Buffer of 200 meters. Additional Info : Archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 94

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Doctor.Alan Williams,AECOM Australia Pty Ltd (previously HLA-Envirosciences)					Permits	3606	
45-5-4131	RAA 16	GDA	56	305006	6268242	Open site	Partially Destroyed	Artefact : 14		
	Contact	Recorders	AECOM Australia Pty Ltd (previously HLA-Envirosciences)					Permits	3499	
45-5-4132	RAA 17	GDA	56	305249	6268257	Open site	Partially Destroyed	Artefact : 1		
	Contact	Recorders	AECOM Australia Pty Ltd (previously HLA-Envirosciences)					Permits	3499	
45-5-4625	30AdvSt-IF1	GDA	56	302921	6269238	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Alistair Hobbs					Permits		
45-5-4626	14SchRd_IF1	GDA	56	303403	6268930	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Alistair Hobbs					Permits		
45-5-4627	14SchRd-AS3	GDA	56	303189	6268994	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Alistair Hobbs					Permits		
45-5-4628	14SchRd-AS2	GDA	56	303479	6268920	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Alistair Hobbs					Permits		
45-5-4629	14SchRd-AS1	GDA	56	303125	6268936	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Alistair Hobbs					Permits		
45-5-4565	Hambledon Road PAD + AS	GDA	56	304632	6269132	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Doctor.Tim Owen					Permits		
45-5-4566	Hambledon Road IF	GDA	56	304893	6269163	Open site	Valid	Artefact : -		
	Contact	Recorders	Doctor.Tim Owen					Permits	3877	
45-5-4485	RS_BASIN_E10.3_AS	GDA	56	302888	6270407	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Mr.David Marcus					Permits	3759	
45-5-4614	Schofields 3	GDA	56	302354	6267385	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Mr.Benjamin Anderson,Mr.Ashley O'Sulliva					Permits	4075,4086,4090,4105,4272	
45-5-4615	Schofileds 1	GDA	56	302687	6267773	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Mr.Ashley O'Sullivan					Permits	4075,4086	
45-5-4622	QV1	GDA	56	303126	6267901	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Ashley O'Sullivan					Permits		
45-5-4623	QV2	GDA	56	303112	6267927	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Ashley O'Sullivan					Permits		

Report generated by AHIMS Web Service on 22/08/2018 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 302212 - 305120, Northings : 6267062 - 6270836 with a Buffer of 200 meters. Additional Info : Archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 94

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 27115 AV

Client Service ID : 365832

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-4562	AA-AS-001	GDA	56	303356	6268369	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mr.Lance Syme					**Permits**	3998	
45-5-4563	AA-AS-002	GDA	56	303453	6268684	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mr.Lance Syme					**Permits**	3998	
45-5-4564	AA-AS-003	GDA	56	303837	6269076	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mr.Lance Syme					**Permits**		
45-5-4598	Alex Avenue 5 (AA5)	GDA	56	304999	6268846	Open site	Destroyed	Artefact : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Artefact - Cultural Heritage Management					**Permits**	3972	
45-5-4601	Alex Avenue 1 (AA1)	GDA	56	304790	6269395	Open site	Valid	Artefact : -		103761
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Ms.Alyce Howard					**Permits**		
45-5-4602	Alex Avenue 2 (AA2)	GDA	56	304766	6269389	Open site	Valid	Artefact : -		103761
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Ms.Alyce Howard					**Permits**		
45-5-4603	Alex Avenue 3 (AA3)	GDA	56	304637	6269130	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Ms.Alyce Howard					**Permits**		
45-5-4604	Alex Avenue 4 (AA4)	GDA	56	304680	6269134	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Ms.Alyce Howard					**Permits**		
45-5-4489	Argowan Rd1	GDA	56	302090	6268991	Open site	Destroyed	Artefact : -		
	Contact	**Recorders**	Ms.Tamika Goward					**Permits**	3803	
45-5-5008	Schofields PS	GDA	56	303048	6269868	Open site	Valid	Artefact : 1, Ochre Quarry : 1		
	Contact	**Recorders**	Comber Consultants Pty Limited,Ms.Alandra Tasire					**Permits**	4324	
45-5-5012	Bridge Street AFT 1	GDA	56	302125	6269990	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Kelleher Nightingale Consulting Pty Ltd,Ms.Cristany Milicich					**Permits**		
45-5-5110	BR IF 1 (Boundary Road Isolate Find 1)	GDA	56	303904	6270832	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Miss.Jennifer Norfolk					**Permits**		
45-5-4955	First Ponds 1	GDA	56	304423	6270405	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Eco Logical Australia Pty Ltd - Sydney,Mr.Tyler Beebe					**Permits**	4274	
45-5-4968	Gordon Road Artefact Scatter (GR AS) 01	GDA	56	304583	6269935	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Ms.veronica norman					**Permits**	4311	
45-5-4969	Gordon Road Isolated Find 01 (GR ISO 01)	GDA	56	304539	6270015	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management ,Ms.veronica norman					**Permits**	4311	
45-5-5030	Tallawong Road OC1	GDA	56	304779	6270708	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists,Ms.Tamika Goward					**Permits**		

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-4944	HF OC2	GDA	56	302211	6270088	Open site	Valid	Artefact : -		
Contact		Recorders	Murray Brown,Mr.Paul Irish					Permits		
45-5-4945	HF OC1	GDA	56	302103	6270074	Open site	Valid	Artefact : -		
Contact		Recorders	Murray Brown,Mr.Paul Irish					Permits		
45-5-4466	RAA10	GDA	56	304067	6270609	Open site	Valid	Artefact : -		103781
Contact		Recorders	AECOM Australia Pty Ltd (previously HLA-Envirosciences)					Permits		
45-5-4467	RAA12	GDA	56	304181	6270146	Open site	Valid	Artefact : -		
Contact		Recorders	AECOM Australia Pty Ltd (previously HLA-Envirosciences)					Permits		
45-5-4469	RAA14	GDA	56	305034	6269491	Open site	Valid	Artefact : -		
Contact		Recorders	AECOM Australia Pty Ltd (previously HLA-Envirosciences)					Permits		
45-5-4470	RAA15	GDA	56	304438	6268481	Open site	Valid	Artefact : -		
Contact		Recorders	AECOM Australia Pty Ltd (previously HLA-Envirosciences)					Permits		
45-5-4471	RAA20	GDA	56	304104	6269082	Open site	Valid	Artefact : -		
Contact		Recorders	AECOM Australia Pty Ltd (previously HLA-Envirosciences)					Permits		
45-5-4472	RAA21	GDA	56	303570	6269090	Open site	Valid	Artefact : -		
Contact		Recorders	AECOM Australia Pty Ltd (previously HLA-Envirosciences)					Permits		
45-5-4473	RAA22	GDA	56	304551	6268948	Open site	Valid	Artefact : -		
Contact		Recorders	AECOM Australia Pty Ltd (previously HLA-Envirosciences)					Permits		
45-5-4474	RAA23	GDA	56	304500	6268840	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
Contact		Recorders	AECOM Australia Pty Ltd (previously HLA-Envirosciences)					Permits		
45-5-4476	RV40	GDA	56	303505	6268732	Open site	Valid	Artefact : -		
Contact		Recorders	AECOM Australia Pty Ltd (previously HLA-Envirosciences)					Permits	3998	
45-5-4326	Basin4IF30	GDA	56	303009	6268789	Open site	Valid	Artefact : 1		
Contact		Recorders	Mr.Oliver Brown					Permits	3784	
45-5-4835	GR-01	GDA	56	304317	6270126	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		103781
Contact		Recorders	Niche Environment and Heritage,Niche Environment and Heritage,Mr.Balazs Hanse					Permits	4182	
45-5-4763	RL 8	GDA	56	303306	6270440	Open site	Valid	Artefact : 1		
Contact		Recorders	Darwala-Lia					Permits		
45-5-4899	Tr-As 01	GDA	56	304806	6270636	Open site	Valid	Artefact : -		
Contact		Recorders	Mary Dallas Consulting Archaeologists,Niche Environment and Heritage,Ms.Tamika					Permits	4255	
45-5-4903	SC AS3	GDA	56	302953	6267652	Open site	Valid	Artefact : 3		
Contact		Recorders	Extent Heritage Pty Ltd - Waterloo					Permits	4086	

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 27115 AV

Client Service ID : 365832

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-4928	54 Schofields Road	GDA	56	304490	6269137	Open site	Valid	Artefact : 1, Potential Archaeological Deposit (PAD) : 1		103761
	Contact	**Recorders**	Mr.Dominic Steele					**Permits**	4286	
45-5-4743	209 Railway Terrace IF1	GDA	56	302994	6268672	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Extent Heritage Pty Ltd - Waterloo,Doctor.Tessa Bryant					**Permits**		
45-5-4887	Riverstone Isolated Artefact 6	GDA	56	305223	6270037	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Doctor.Darran Jordan,AECOM Australia Pty Ltd (previously HLA-Envirosciences)					**Permits**	4074	
45-5-4888	Schofields Artefact Scatter 1	GDA	56	302765	6267828	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Doctor.Darran Jordan,AECOM Australia Pty Ltd (previously HLA-Envirosciences)					**Permits**	4074	
45-5-4889	Schofields Artefact Scatter 2	GDA	56	302863	6267851	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Doctor.Darran Jordan,AECOM Australia Pty Ltd (previously HLA-Envirosciences)					**Permits**	4074	
45-5-4890	Schofields Isolated Artefact 1	GDA	56	302687	6267810	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Doctor.Darran Jordan,AECOM Australia Pty Ltd (previously HLA-Envirosciences)					**Permits**	4074	
45-5-4902	SC AS4	GDA	56	303005	6267434	Open site	Valid	Artefact : 3		
	Contact	**Recorders**	Extent Heritage Pty Ltd - Waterloo					**Permits**	4086	

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Appendix 2 Test excavation results

Test Pit No.	Context No.	Start depth (mm)	End depth (mm)	Colour (Munsell Code)	Compaction	Texture	Disturbance	Notes	Inclusions	PH
TP1	1	0	70	10YR 6/3 Pale Brown	Low	Silty sand	Ploughing, horse paddock	N/A	Grass, rootlets (>2%)	6.5
TP1	2	70	160	10YR 5/6 Yellow Brown	Medium	Silty clay	Ploughing, horse paddock	Interface layer between context 1 and 3	Charcoal flecks, clay mottles	6
TP1	3	160	200	10 YR 3/4 Dark Yellowish Brown	High	Clay	Ploughing, horse paddock	Clay content increasing with depth, highly compacted context	High clay content, charcoal (a couple of large charcoal chunks)	6.5
TP2	1	0	170	10YR 5/4 Yellowish Brown	Low	Silty sand	Ploughing	N/A	Grass, rootlets (>5%)	6
TP2	2	170	290	10YR 5/6 Yellowish Brown	Medium	Silty clay	Ploughing, horse paddock	Interface layer between context 1 and 3	Same as TP1, however not large charcoal flecks evident	6
TP2	3	290	350	2.5YR 4/6 Red	High	Clay	Ploughing, horse paddock	Clay content increasing with depth, highly compacted context	Same as TP1, with very high clay content at base of pit	6
TP3	1	0	165	10YR 4/4 Dark Yellowish Brown	Low	Silty sand	Ploughing, horse paddock	N/A	Grass, rootlets (>5%)	6.5
TP3	2	165	240	10YR 4/4 Dark Yellowish Brown	Medium	Silty clay	Ploughing, slight insect burrowing	N/A	Charcoal flecks (3%), with increasing clay mottles with depth	6
TP3	3	240	300	2.5YR 4/8 Red	High	Clay	Ploughing, horse paddock	Highly compacted sterile clay layer	Clay	6
TP4	1	0	140	7.5YR 4/4 Brown	Medium	Silty clay	Ploughing, horse paddock	N/A	Grass, rootlets (5%) and clay mottles increasing with depth	6.5
TP4	2	140	200	2.5YR 4/8 Red	High	Clay	Roolets (>1%)	N/A	Highly compacted clay at base of pit	6
TP5	1	0	150	10YR 5/3 Brown	High	Silty sand	Ploughing, horse paddock	very rocky fill layer	Rock, clay mottles, gravel	6.5
TP5	2	150	300	10YR 5/4 Yellowish Brown	Medium	Silty clay	Ploughing, horse paddock	Interface layer between context 1 and 3	Clay mottles increasing with depth, small charcoal flecks	6
TP5	3	300	320	5YR 5/6 Yellowish Red	High	Clay	N/A	Highly compacted clay layer at base of pit	Clay mottles	6
TP6	1	0	150	10YR 5/2 Greyish Brown	Low	Silty sand	Ploughing, horse paddock, geotech activity	Test pit placed over prior geotech hole	Rootlets and grass cover (>2%)	6.5
TP6	2	150	350	7.5YR 3/4 Dark Brown	Medium	Silty clay	Roolets (>1%), ploughing	Interface layer between context 1 and 3	Clay mottles increasing with depth, stone/rock	6
TP6	3	350	500	2.5YR 4/8 Red	High	Clay	Geotech disturbance, ploughing	Highly compacted sterile clay layer at base of pit	N/A	6
TP7	1	0	100	7.5YR 4/4 Brown	Low	Silty sand	Ploughing, horse paddock, grass	Gravely layer	Grass, rootlets (>2%)	8
TP7	2	100	200	2.5YR 4/8 Red	High	Clay	Insect burrowing (ants)	N/A	Clay mottles increasing with depth to highly compacted clay	7
TP8	1	0	110	7.5YR 5/4 Brown	Medium	Silty clay	Ploughing, horse paddock	Fill layer due to ploughing. Not the same make up as previous context 1s	Clay nodules, rocks, rootlets (>1%)	8.5
TP8	2	110	260	7.5YR 4/4 Brown	Medium	Silty sand	N/A	Context 2 is the same as TP3,4 and 5 context 1	Rootlets (>1%), charcoal flecks, small clay nodules towards bottom of context	8.5

Test Pit No.	Context No.	Start depth (mm)	End depth (mm)	Colour (Munsell Code)	Compaction	Texture	Disturbance	Notes	Inclusions	PH
TP8	3	240	280	2.5YR 4/8 Red	High	Clay	N/A	Highly compacted red clay at base of pit	N/A	7.5
TP9	1	0	50	7.5YR 4/2 Brown	Low	Silty sand	Ploughing, horse paddock	N/A	Grass, rootlets (>2%)	6
TP9	2	50	170	10YR 4/3 Brown	Medium	Silty clay	N/A	N/A	Charcoal flecks (5%) and clay mottles increasing with depth	6
TP9	3	170	200	2.5YR 4/8 Red	High	Clay	N/A	Highly compacted red clay at base	N/A	6
TP10	1	0	170	10YR 4/4 Dark Yellowish Brown	Low	Silty sand	Ploughing, rootlets (2%), grass	N/A	Small charcoal flecks and clay nodules towards end of context	6.5
TP10	2	170	240	7.5YR 3/4 Dark Brown	Medium	Silty clay	N/A	Interface layer between context 1 and 3	Charcoal flecks and clay nodules/mottles increasing with depth	6
TP10	3	240	270	2.5YR 4/8 Red	High	Clay	N/A	N/A	N/A	6
TP11	1	0	90	7.5YR 3/4 Dark Brown	Low	Silty clay	Ploughing, old horse paddock	N/A	Grass, rootlets (>1%)	6
TP11	2	90	330	7.5YR 3/3 Dark Brown	Medium	Silty clay	N/A	N/A	N/A	6.5
TP11	3	330	350	2.5YR 4/8 Red	High	Clay	N/A	N/A	N/A	6
TP12	1	0	130	10YR 3/4 Dark Yellowish Brown	Low	Silty sand	Ploughing, old horse paddock	N/A	Grass, rootlets (3%)	6
TP12	2	130	230	2.5YR 4/8 Red	Medium	Silty clay	N/A	N/A	Red clay mottles increasing with depth	6
TP12	3	230	250	2.5YR 4/8 Red	High	Clay	N/A	N/A	N/A	6
TP13	1	0	210	7.5YR 5/4 Brown	Low	Silty loam	N/A	N/A	Rootlets in top 80mm (5%)	6
TP13	2	210	320	5YR 3/2 Dark Reddish Brown	High	Sandy clay	N/A	N/A	Charcoal flecks (<10mm, 5%)	6
TP13	3	320	380	2.5YR 4/6 Red	High	Clay	N/A	Mixed charcoal in base of pit, likely burnt out plant root	N/A	6
TP14	1	0	140	7.5YR 5/2 Brown	Medium	Silt	N/A	N/A	Rootlets (>3%)	6
TP14	2	140	220	7.5YR 4/3 Brown	Medium	Clayey silt	N/A	N/A	N/A	6
TP14	3	220	300	2.5YR 4/6 Red	High	Clay	N/A	N/A	N/A	6
TP15	1	0	120	7.5YR 4/3 Brown	Medium	Silty clay	Ploughing, old horse paddock	N/A	Stone, gravel, rootlets	6
TP15	2	120	370	7.5 YR 3/4 Dark Brown	Medium	Clayey silt	N/A	N/A	Rootlets, charcoal flecks	6
TP15	3	370	550	7.5YR 4/6 Strong Brown	Medium	Sandy silt	N/A	N/A	Charcoal flecks, with white mottling throughout context	6
TP15	4	550	690	10YR 6/4 Light Yellowish Brown	High	Sandy silt	N/A	N/A	Charcoal flecks, with orange mottles and manganese nodules throughout context	6
TP15	5	690	720	7.5YR 5/4 Brown	Medium	Silty sand	N/A	Sandy silt lense between context 4 and 6	N/A	6
TP15	6	720	900	2.5YR 4/8 Red	High	Clay	N/A	N/A	N/A	6
TP16	1	0	80	7.5YR 3/3 Dark Brown	Low	Clayey silt	Ploughing	N/A	Rootlets (5%)	6

Test Pit No.	Context No.	Start depth (mm)	End depth (mm)	Colour (Munsell Code)	Compaction	Texture	Disturbance	Notes	Inclusions	PH
TP16	2	80	190	10YR 4/3 Brown	Medium	Loamy silt	Rootlets	Higher compaction than context 1	Ironstone fragments	6
TP16	3	190	300	2.5YR 4/8 Red	High	Clay	N/A	Clay content increases with depth	Ironstone fragments	6
TP17	1	0	210	10YR 2/2 Very Dark Brown	Low	Silty clay	Ploughing, old horse paddock	N/A	Roolets (10%)	6
TP17	2	100	230	10YR 4/2 Greyish Brown	Medium	Silty sand	N/A	N/A	Charcoal flecks and clay mottles	6
TP17	3	230	290	10YR 4/3 Brown	High	Clay	N/A	Yellow grey clay at base of pit, as opposed to red clay seen throughout the rest of the site	N/A	6
TP18	1	0	90	7.5YR 5/3 Brown	Low	Loamy silt	Ploughing, horse paddock	N/A	Rootlets (5%), orange clay flecks	6
TP18	2	90	320	7.5YR 5/3 Brown	High	Sandy silt	N/A	N/A	Managnese nodules, orange clay flecks and charcoal flecks throughout context	6
TP18	3	280	340	2.5YR 4/8 Red	High	Clay	N/A	N/A	Charcoal flecks, rootlets (2%)	6
TP19	1	0	60	7.5YR 4/3 Brown	Low	Clayey silt	Ploughing, horse paddock	N/A	Rootlets (>3%)	6
TP19	2	80	170	7.5YR 4/4 Brown	Low	Clayey silt	N/A	Higher compaction than context 1	Rootlets, charcoal flecks and ironstone throughout context, with large charcoal pieces pressed into interface between context 2 and 3	6
TP19	3	160	200	2.5YR 4/8 Red	High	Clay	N/A	Some pale yellow mottling present throughout base of pit	Large charcoal pieces pressed into the interface of context 2 and 3 on eastern side	6
TP20	1	0	260	7.5YR 5/4 Brown	High	Silty clay	Rootlets	N/A	Charcoal, rootlets, red and orange clay nodules	7
TP20	2	260	320	2.5YR 5/6 Red	High	Sandy clay	Rootlets	N/A	Light brown silty clay patches, rootlets	6
TP20	3	320	350	2.5YR 4/6 Red	High	Clay	N/A	N/A	Some lighter yellow clay patches throughout	5.5
TP21	1	0	240	7.5YR 3/4 Dark Brown	Low	Silty loam	Ploughing, old horse paddock	N/A	Grass, rootlets, very small clay nodules throughout	6
TP21	2	240	290	5YR 4/2 Dark Reddish Grey	High	Loamy silt	Rootlets	Lense in north western corner of test pit	Red and orange clay nodules, rootlets	6
TP21	3	260	320	2.5YR 4/8 Red	High	Clay	Rootlets	N/A	Rootlets	6
TP22	1	0	100	7.5YR 5/3 Brown	Medium	Sandy silt	N/A	N/A	Rootlets (5%)	6
TP22	2	100	210	5YR 6/4 Light Reddish Brown	High	Clayey silt	N/A	N/A	Charcoal flecks (<1%)	6
TP22	3	210	250	2.5YR 4/6 Red	High	Clay	N/A	N/A	N/A	6
TP23	1	0	200	10YR 6/3 Pale Brown	High	Silty clay	Rootlets	Ironstone present in 2 sections of the test pit. Very large <100mm	Rootlets, charcoal and ironstone	6
TP23	2	200	250	2.5YR 4/6 Red	High	Sandy clay	Rootlets	N/A	Rootlets	6
TP23	3	250	300	2.5YR 4/8 Red	High	Clay	N/A	N/A	Lighter yellow clay mixed throughout context	6

Test Pit No.	Context No.	Start depth (mm)	End depth (mm)	Colour (Munsell Code)	Compaction	Texture	Disturbance	Notes	Inclusions	PH
TP24	1	0	170	7.5YR 6/1 Grey	High	Silt	N/A	N/A	Rootlets (5%)	5
TP24	2	170	280	5YR 4/6 Yellowish Red	High	Clay	N/A	N/A	N/A	6
TP25	1	0	140	10YR 3/2 Very Dark Greyish Brown	Medium	Clay	Ploughing, old horse paddock	N/A	Rootlets	6
TP25	2	140	260	2.5YR 4/8 Red	High	Clay	N/A	N/A	N/A	6
TP26	1	0	60	10YR 4/3 Brown	Low	Silty sand	Ploughing	N/A	Grass, rootlets (2%)	5.5
TP26	2	60	290	7.5YR 5/2 Brown	High	Sandy silt	N/A	Highly compacted sandy silt throughout context	Gravel, charcoal flecks	6
TP26	3	290	340	2.5YR 4/8 Red	High	Clay	N/A	N/A	N/A	6
TP27	1	0	80	7.5YR 4/2 Brown	Medium	Sandy silt	Ploughing, horse paddock	N/A	Rootlets	6
TP27	2	90	330	7.5YR 4/3 Brown	High	Silty sand	N/A	N/A	Manganese nodules, charcoal flecks, clay flecks and rootlets	6
TP27	3	310	380	2.5YR 4/8 Red	High	Clay	N/A	N/A	Charcoal flecks	6
TP28	1	0	60	7.5YR 4/2 Brown	Low	Loamy silt	Ploughing, horse paddock	N/A	Rootlets	6
TP28	2	60	220	7.5YR 5/3 Brown	High	Sandy silt	N/A	N/A	Rootlets, manganese nodules	6
TP28	3	200	380	7.5YR 6/3 Light Brown	High	Silty sand	N/A	Higher compaction than context 2	Manganese nodules	6
TP28	4	380	420	2.5YR 4/8 Red	High	Clay	N/A	Light yellow mottling throughout base of test pit	N/A	6
TP29	1	0	80	7.5YR 2.5/3 Very Dark Brown	Low	Loamy silt	Ploughing	N/A	Grass and rootlets (3%)	6
TP29	2	80	240	7.5YR 3/3 Dark Brown	Medium	Sandy silt	N/A	N/A	Charcoal flecks, with clay mottles increasing with depth	6
TP29	3	240	250	2.5YR 4/8 Red	High	Clay	N/A	N/A	N/A	6
TP30	1	0	100	10YR 2/2 Very Dark Brown	Low	Loamy silt	Ploughing	N/A	Grass and rootlets	6.5
TP30	2	100	240	7.5YR 4/6 Strong Brown	Medium	Loamy silt	N/A	N/A	Charcoal flecks and clay mottles throughout context	6
TP30	3	240	310	7.5YR 4/6 Strong Brown	High	Loamy silt	N/A	N/A	Charcoal flecks and clay content increasing with depth	6
TP30	4	290	340	2.5YR 4/8 Red	High	Clay	N/A	N/A	N/A	6
TP31	1	0	90	7.5YR 4/4 Brown	Low	Loamy silt	Ploughing, old horse paddock	N/A	Grass, rootlets	6
TP31	2	90	300	7.5YR 5/4 Brown	Medium	Silty sand	N/A	N/A	Charcoal flecks, small clay mottles	6
TP31	3	150	330	10YR 4/6 Dark Yellowish Brown	Medium	Loamy silt	N/A	N/A	Charcoal flecks, manganese nodules, with clay mottles increasing with depth	6.5
TP31	4	340	360	2.5YR 4/8 Red	High	Clay	N/A	N/A	Charcoal flecks	6

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TP 1 18/02/2019 ←
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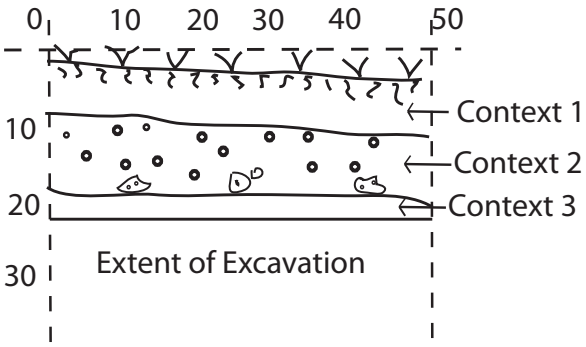

Key

V - Grass
S - Rootlets
- Charcoal
- Clay Nodules

29496/27715 Alex Avenue
TP 2 18/02/2019 ↑
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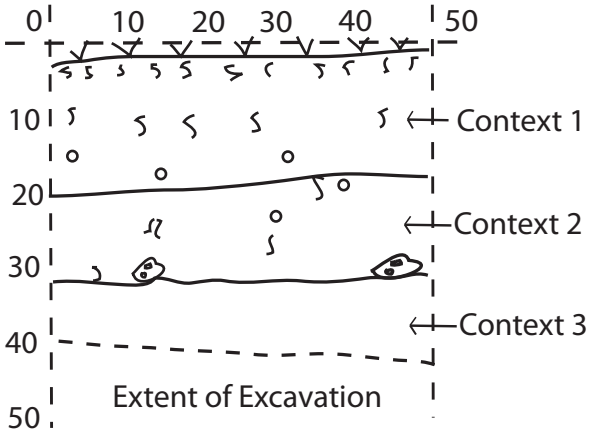

Key

V - Grass
S - Rootlets
- Charcoal
- Clay Nodules

29496/27715 Alex Avenue
TP 3 18/02/2019 ↑
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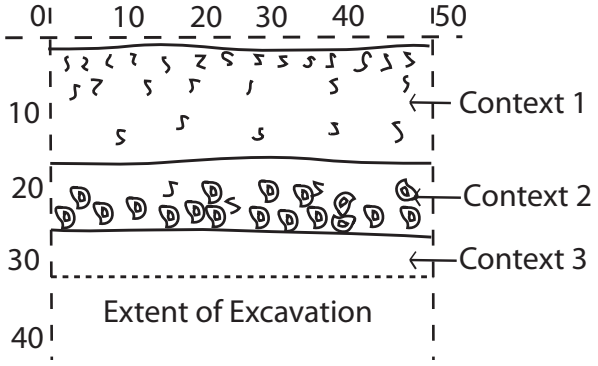

Key

V - Grass
S - Rootlets
- Clay Nodules

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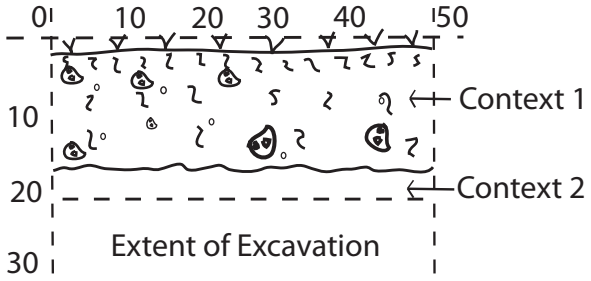

Key

V - Grass
S - Rootlets
- Charcoal
- Clay Nodules

29496/27715 Alex Avenue
TP 5 19/02/2019 N
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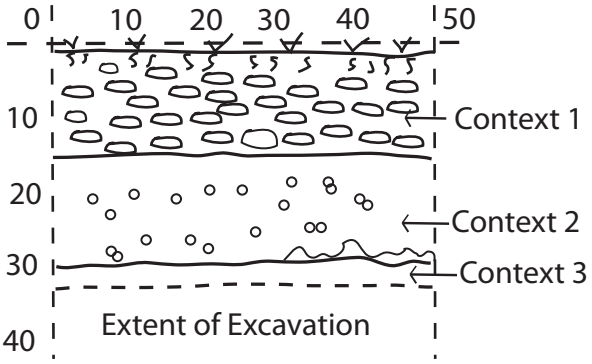

Key

V - Grass
S - Rootlets
- Rocks/Gravel
- Charcoal
- Clay

29496/27715 Alex Avenue
TP 6 19/02/2019 N
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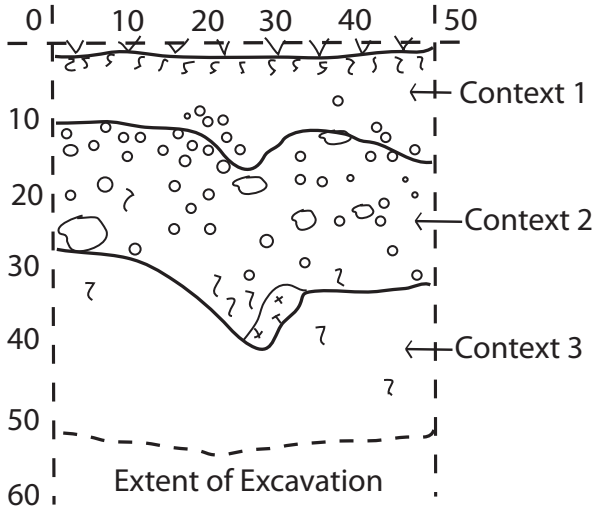

Key

V - Grass
S - Rootlets
- Rock
- Clay Nodules
- Clay Mottles

29496/27715 Alex Avenue
TP 7 19/02/2019
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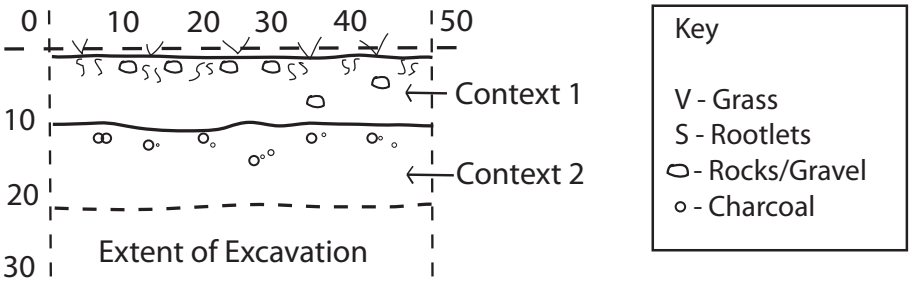

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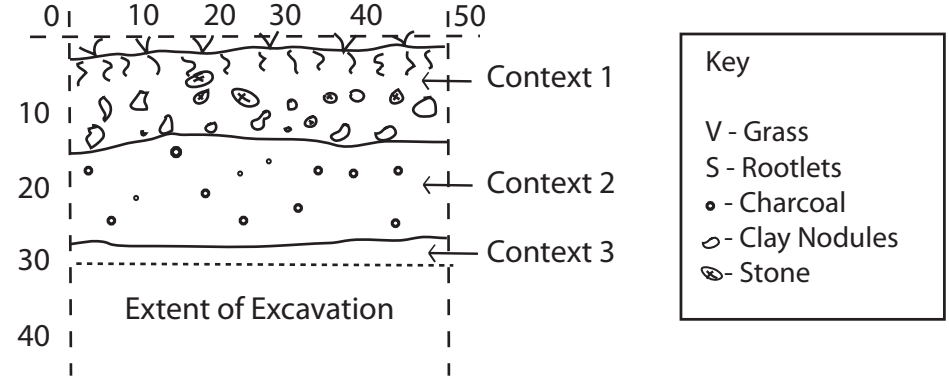

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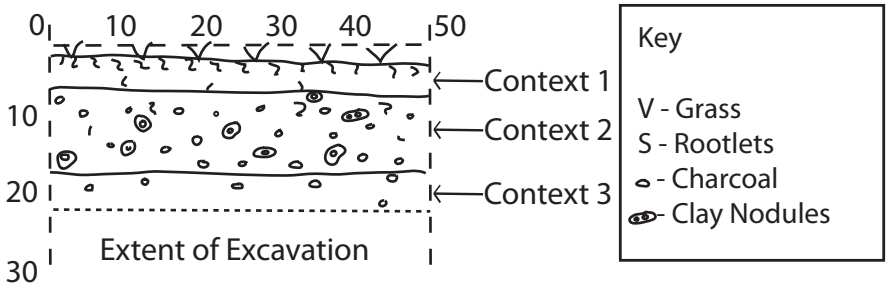

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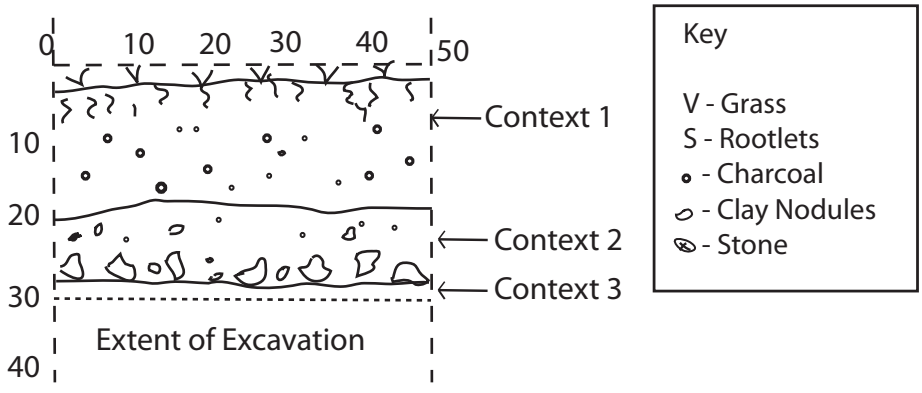

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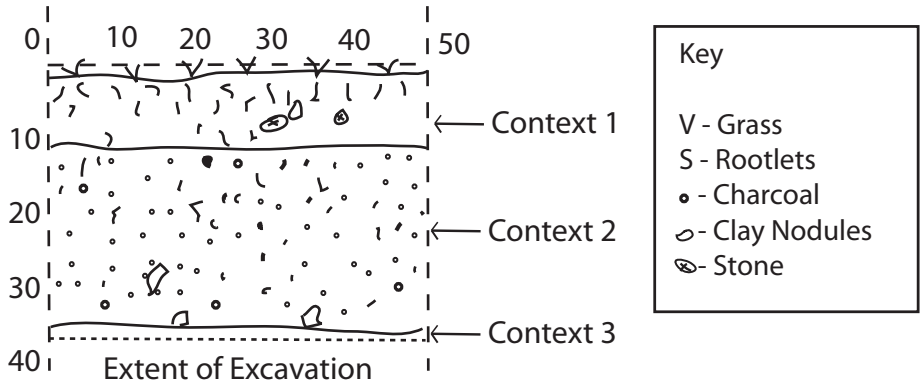

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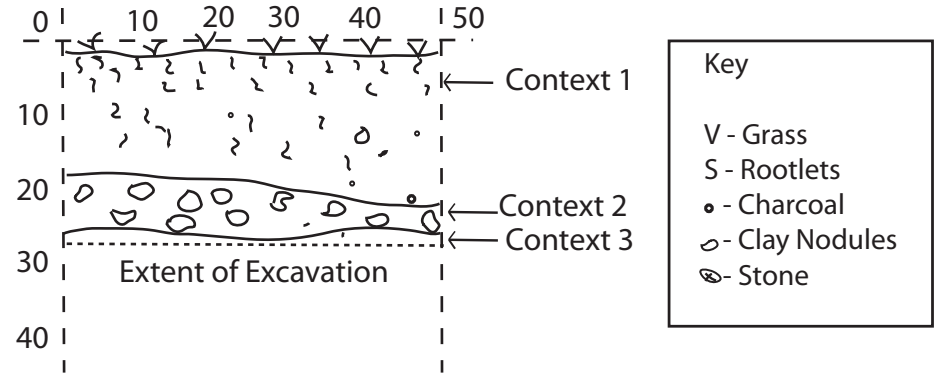

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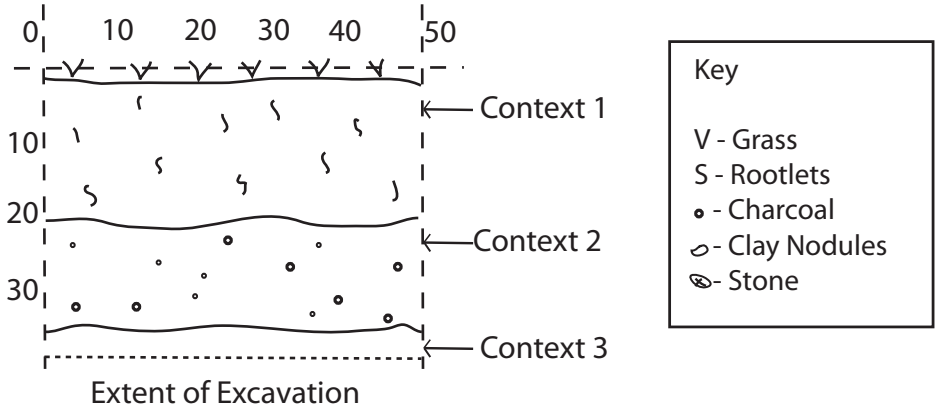

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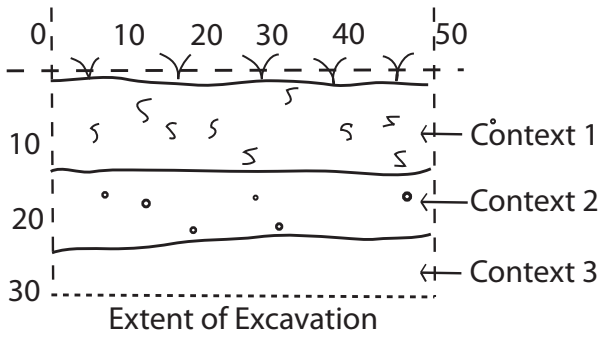
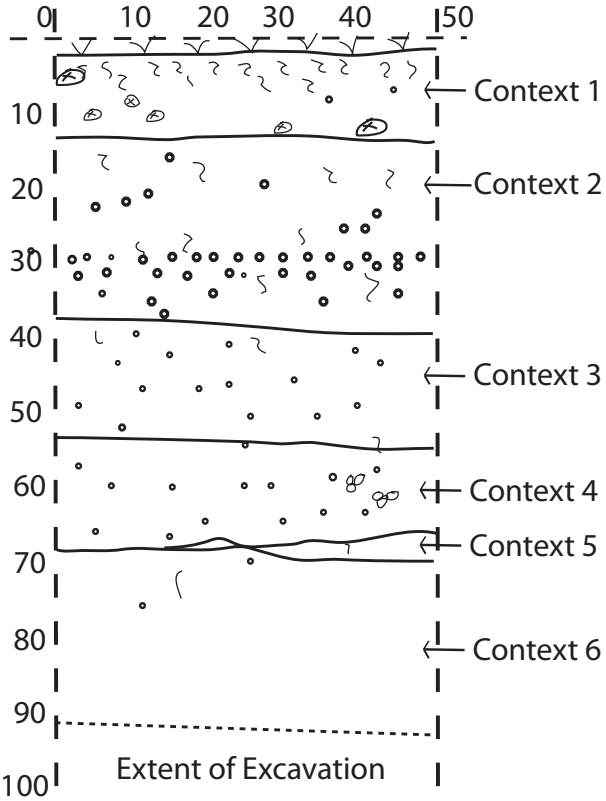


Key

V - Grass
S - Rootlets
∘ - Charcoal

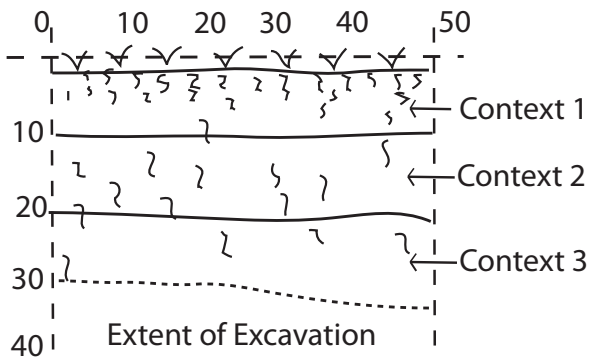
29496/27715 Alex Avenue
TP 15 22/02/2019 ↑
Scale 1:10 CLA N



Key

V - Grass
S - Rootlets
∘ - Charcoal
- Stone
- Manganese Nodules

29496/27715 Alex Avenue
TP 16 25/02/2019 ↑
Scale 1:10 CLA N



Key

V - Grass
S - Rootlets

29496/27715 Alex Avenue
TP 17 22/02/2019
Scale 1:10 CLA
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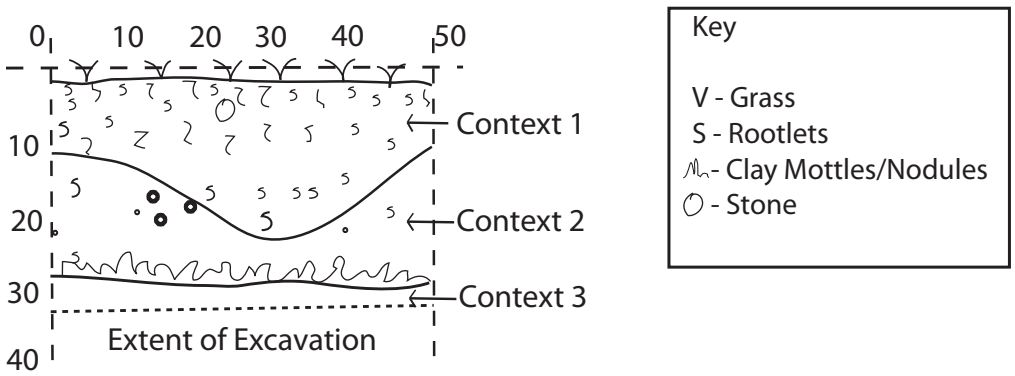

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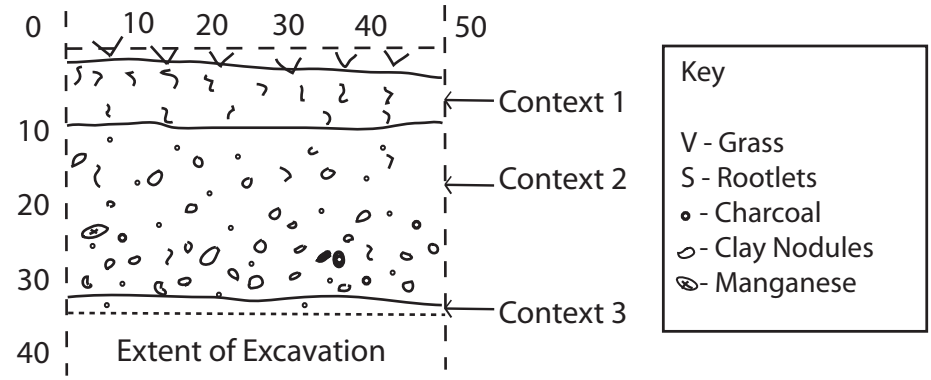

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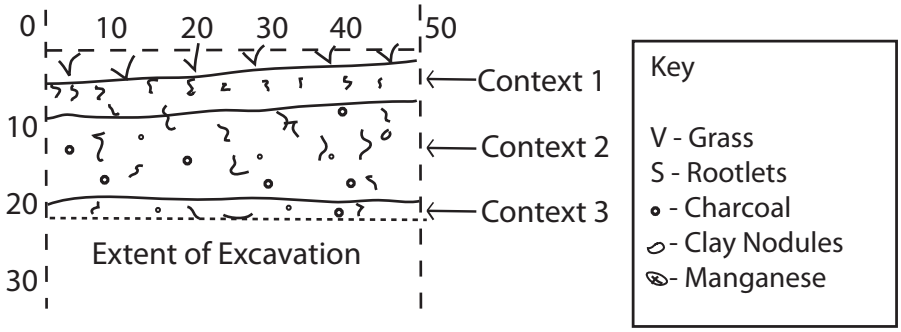

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TP 20 21/02/2019
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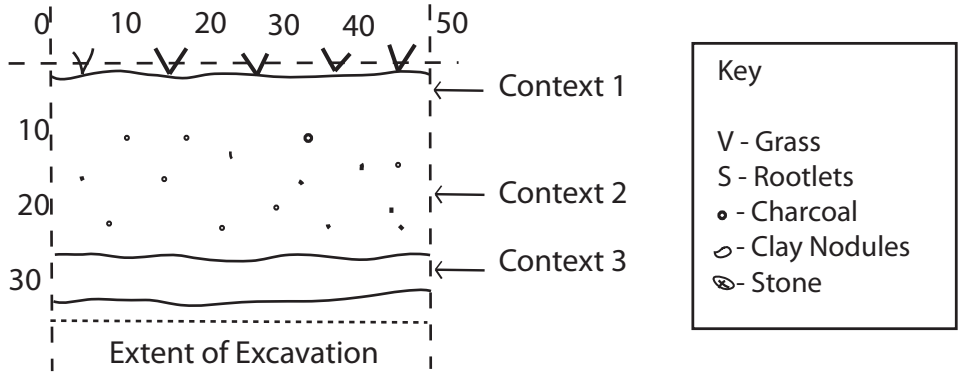

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TP 21 20/02/2019
Scale 1:10 CLA
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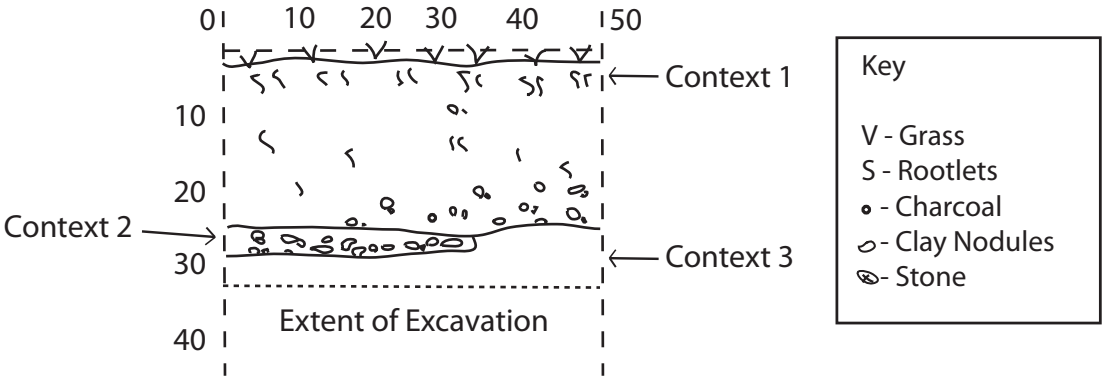

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TP 22 21/02/2019
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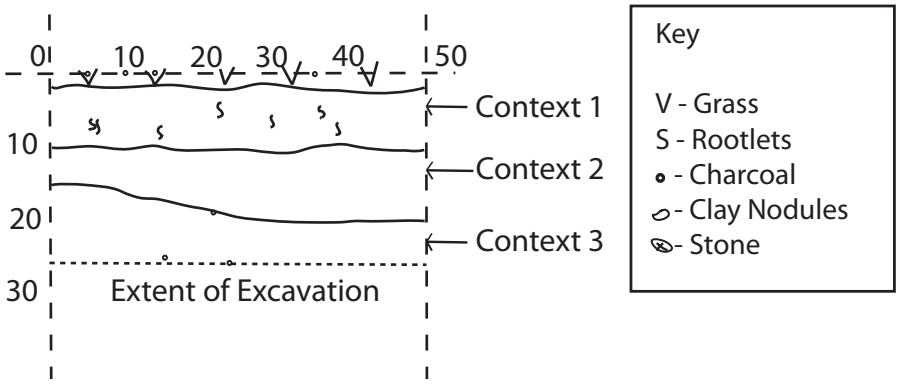

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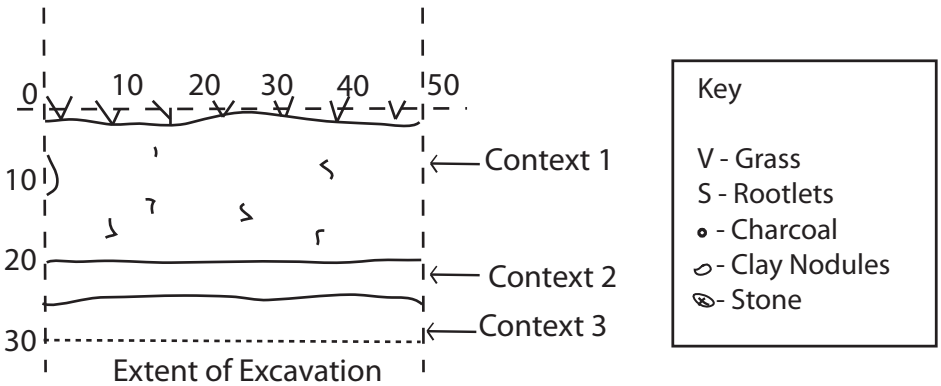

29496/27715 Alex Avenue
TP 24 21/02/2019
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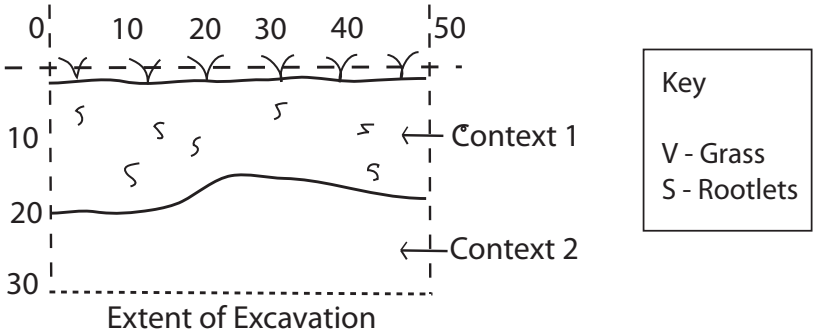
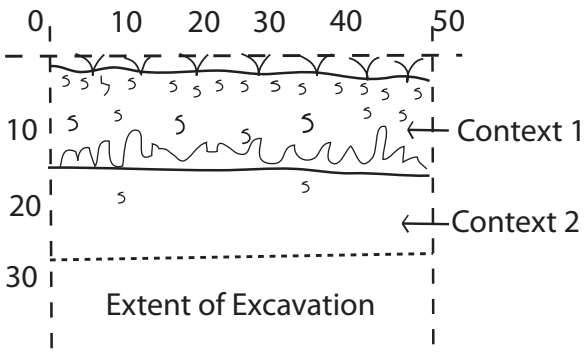


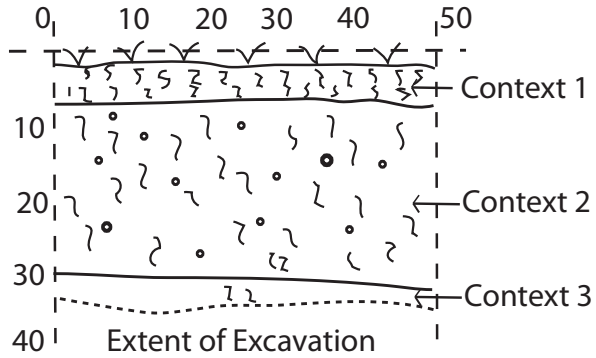
29496/27715 Alex Avenue
TP 25 22/02/2019
Scale 1:10 CLA
N



Key

V - Grass
S - Rootlets
- Clay Mottles

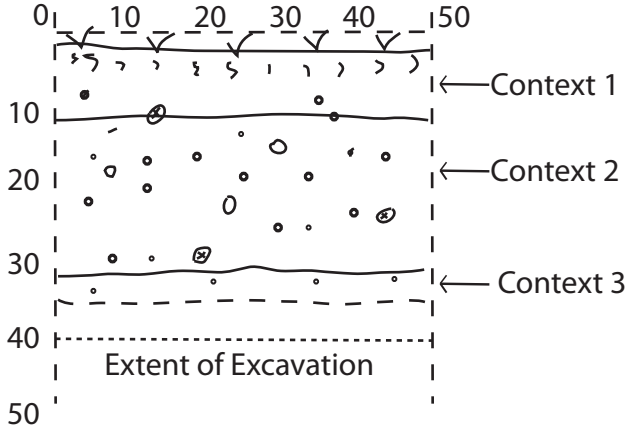
29496/27715 Alex Avenue
TP 26 22/02/2019
Scale 1:10 CLA
N



Key

V - Grass
S - Rootlets
- Charcoal

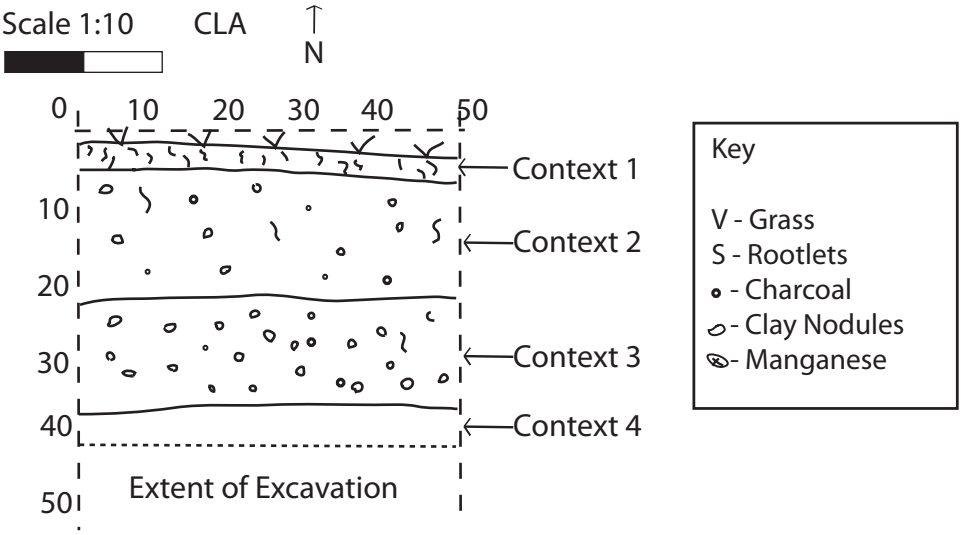
29496/27715 Alex Avenue
TP 27 25/02/2019
Scale 1:10 CLA
N



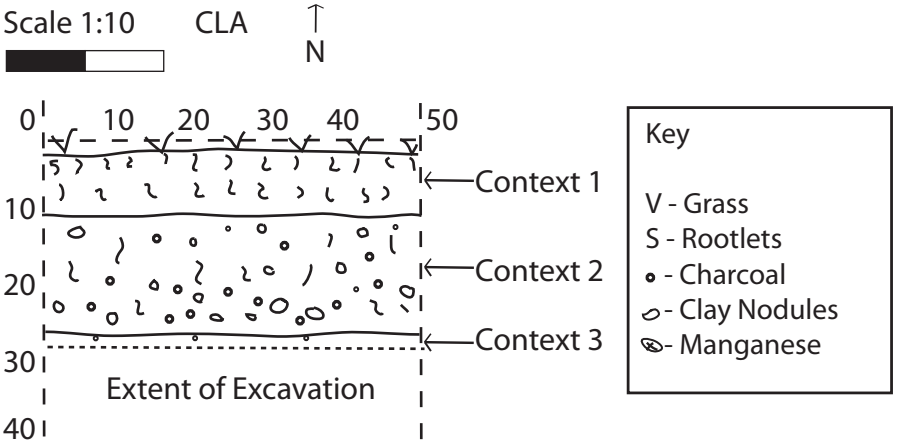
Key

V - Grass
S - Rootlets
- Charcoal
- Clay Nodules
- Manganese

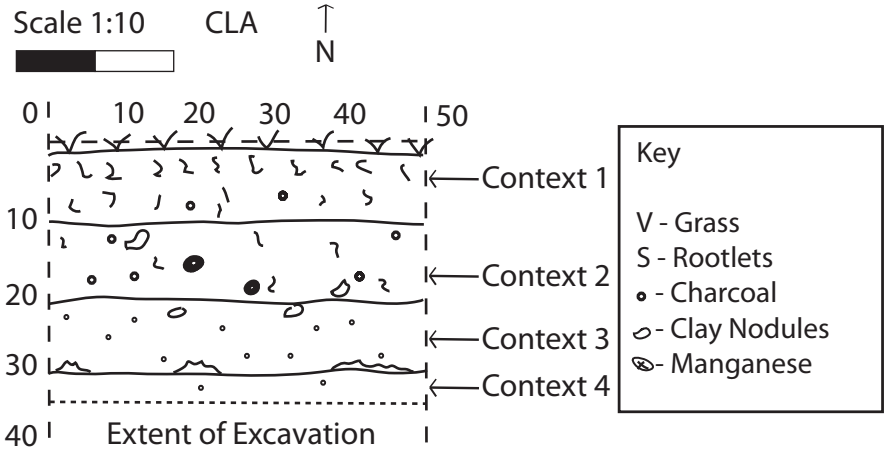
29496/27715 Alex Avenue
TP 28 25/02/2019
Scale 1:10 CLA



29496/27715 Alex Avenue
TP 29 26/02/2019
Scale 1:10 CLA

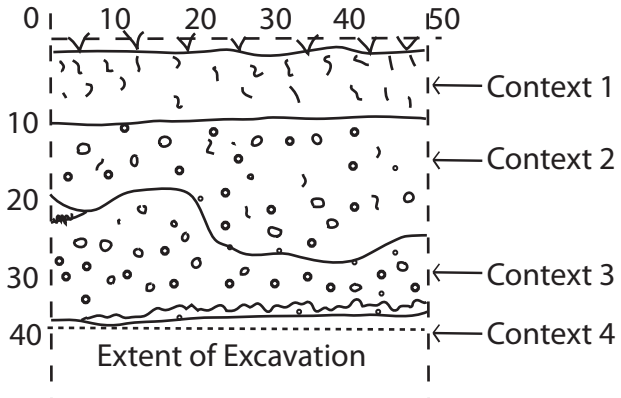


29496/27715 Alex Avenue
TP 30 26/02/2019
Scale 1:10 CLA



29496/27715 Alex Avenue
TP 31 26/02/2019
Scale 1:10 CLA

N



Key

V - Grass
S - Rootlets
- Charcoal
- Clay Nodules
- Manganese

Appendix 3 Artefact analysis

ID No.	Pit N.	Spit N.	Type	Raw material	Colour	Cortex (%)	Platform type	Platform width (mm)	Platform depth (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars
1	27	2	Complete flake	Silcrete	Brown with red vein	30	Flaked	4.61	3.11	Feather			20.52	8.78	4.33	6
2	12	2	Medial fragment	Silcrete	Red	0							30.54	13.77	9.53	5
3	11	3	Distal fragment	Chert	Grey brown	20				Hinge	Distal	Dorsal surface	8.27	14.56	4.45	3