

AUSTRAL ARCHAEOLOGY PTY LTD

ABN: 55 629 860 975

Info@australarch.com.au

www.australarchaeology.com.au



AUSTRAL
ARCHAEOLOGY

NEPEAN GARDENS, WALLACIA, NSW

ABORIGINAL ARCHAEOLOGICAL REPORT

DRAFT REPORT

Catholic Cemeteries Board

6 November 2020

Document Set ID: 9494657

Version: 1, Version Date: 02/03/2021

DOCUMENT INFORMATION

Project:	Nepean Gardens, Wallacia, NSW
Services required:	Aboriginal Archaeological Report
Client:	Catholic Cemeteries Board
Prepared by:	William Andrews & Miles Robson
Project number:	2044

DOCUMENT HISTORY AND APPROVAL STATUS

Version No.	Version Type	Issue Date	Authored by	Approved by	Date Approved
1	Draft	4/11/2020	MR	DM	4/11/2020
2					

DISTRIBUTION OF COPIES

Version No.	Quantity	Issue date	Issued to
1	1	6/11/2020	Catholic Cemeteries Board
2			

Copyright and Moral Rights

No part of this document may be reproduced or distributed in any form or by any means without prior permission from a representative of Austral Archaeology Pty Ltd. Austral Archaeology Pty Ltd also reserves the right to use documents and materials produced for this project for future presentations or publications, if required.

In the preparation of this report historical sources and other reference materials are acknowledged in text citations and in a separate section at the end of the report. Reasonable effort has been made to acknowledge and obtain permission from the relevant copyright owners.

EXECUTIVE SUMMARY

This Aboriginal Archaeological Report (AAR) has been prepared by Austral Archaeology (Austral) according to the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (CoP) (Department of Environment, Climate Change and Water 2010a). As well as being an appendix to the main Aboriginal Cultural Heritage Assessment (ACHA) report, this document is additionally required to be 'a stand-alone technical report' (Department of Environment, Climate Change and Water 2010b). Therefore, this AAR by necessity includes a duplication of information contained in the main ACHA report.

This report details the Aboriginal Archaeological Report of development at Wallacia Memorial Park, Wallacia, New South Wales (NSW) and consists of the entirety of Lot 1, DP1254545, Lot 2, DP1254545 as well as Lot 3 and 4 DP18701.

The location of the study area is shown in Figure 1.1, Figure 1.2 and Figure 1.3 and is situated within the Penrith City Council Local Government Area (LGA). The boundaries of the property also fall within the area overseen by the Deerubbin Local Aboriginal Land Council (DLALC). The study area is located approximately 13 kilometres south of Penrith and 50 kilometres west of Sydney. The study area is bounded by Park Road and various residential lots to the south, rural properties to the north, and residential properties to the east.

Austral has previously undertaken an Aboriginal Cultural Heritage Due Diligence Assessment (ACHDDA) for the study area (Austral Archaeology Pty Ltd 2019). The report found no Aboriginal Heritage Information Management System (AHIMS) listed sites within the study area, which is attributed to the lack of prior surveys within the study area rather than a lack of Aboriginal material. The study also identified multiple streams and creeks which pass through the study area that would have made the area conducive to Aboriginal settlement. The assessment recommended a walking survey to ground truth the findings of the assessment and disturbance present within the study area along with further investigation in the form of an ACHA.

The results of the Aboriginal archaeological survey presented in this report examine the likely nature and extent of the archaeological resource and inform the potential impacts to Aboriginal cultural heritage within the proposed area of development.

SUMMARY OF RESULTS

A total of five artefacts were identified during the archaeological survey undertaken as part of this assessment. Two of these artefacts, a brown chert flake (Figure 5.22) and a red chert flake with cortex (Figure 5.23) were found on the track leading from the clubhouse eastwards to Jerrys Creek. These have been designated 'Wallacia Golf Course AS1'. Two additional flakes of banded chert (Figure 5.24 and Figure 5.24) were identified on the eastern side of Jerrys Creek, near the break of slope from the hillslope to the alluvial flat in the northern part of the site. These two have been designated 'Wallacia Golf Course AS2'. A single artefact, consisting of small silcrete flake, (Figure 5.27) was also found on an area of raised ground overlooking a drainage gully in the northern part of the site in an area of erosion below a green. It has been designated 'Wallacia Golf Course IF1'. The survey also confirmed the presence of areas of PAD within the study area relating to the hillslopes present either side of Jerrys Creek and along the northern boundary of the study area. These results came amid important levels of disturbance of varying degrees of impact, found within the use and maintenance of the golf course, and the construction of services and associated infrastructure. It was concluded that a program of archaeological testing is recommended in order to fully determine the nature and extent of cultural heritage present within the study area.

RECOMMENDATIONS

The following recommendations have been developed after considering the archaeological context, environmental information, consultation with the local Aboriginal community, the findings of the excavation results and the predicted impact of the proposed development on archaeological resources. It is recommended that:

- 1) Archaeological test excavations are to be undertaken to determine the nature and extent of the Aboriginal archaeological resource present within the study area in accordance with the CoP (DECCW 2010a). As the study area currently presents land access issues, it is recommended that the requirement for test excavations be included as a condition of consent associated with the Development Application being lodged with Penrith City Council.
- 2) The results of the test excavation are to be appended to this assessment as an addendum report.
- 3) As Aboriginal cultural material has been identified within the study area, an application must be made for Aboriginal Heritage Impact Permit (AHIP) prior to construction impacts occurring.
- 4) One copy of the final report should be lodged with the Registrar of the AHIMS database and provided to all Registered Aboriginal Stakeholders.

CONTENTS

EXECUTIVE SUMMARY	iii
CONTENTS	v
1 INTRODUCTION.....	1
1.1 INTRODUCTION	1
1.2 PROJECT DESCRIPTION.....	5
1.3 PREDICTED IMPACT ON THE POTENTIAL ARCHAEOLOGICAL RESOURCE.....	5
1.4 ASSESSMENT OBJECTIVES.....	5
1.5 FEDERAL AND STATE LEGISLATION	6
1.6 SECTION SUMMARY.....	7
1.7 PROJECT TEAM AND QUALIFICATIONS	7
1.8 ACKNOWLEDGEMENTS	8
1.9 ABBREVIATIONS	9
2 ARCHAEOLOGICAL CONTEXT	10
2.1 REGIONAL ABORIGINAL ARCHAEOLOGICAL CONTEXT	10
2.2 HERITAGE DATABASE SEARCH RESULTS.....	16
2.3 PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS.....	19
3 LANDSCAPE CONTEXT.....	23
3.1 GEOLOGICAL CONTEXT AND SOIL LANDSCAPE	23
3.1.1 LUDDENHAM (LU) SOIL LANDSCAPE	24
3.2 LANDFORMS.....	24
3.3 HYDROLOGY.....	29
3.4 CLIMATE.....	29
3.5 FLORA AND FAUNA	31
3.6 PAST LAND USE PRACTICES.....	32
3.7 POTENTIAL LAND USE IMPACTS ON THE ARCHAEOLOGICAL RESOURCE	40
4 PREDICTIVE STATEMENT.....	41
4.1 ABORIGINAL PREDICTIVE MODELLING	41
5 ABORIGINAL ARCHAEOLOGICAL SURVEY.....	44
5.1 SURVEY METHODOLOGY.....	44
5.2 SURVEY RESULTS.....	44
Landform	60
Survey unit area (m²).....	60
Visibility (%)	60
Exposure (%).....	60
Effective Coverage area (m²).....	60
Effective Coverage (%)	60
Landform area (m²).....	60
Area effectively surveyed (m²)	60
% of landform effectively surveyed	60
Number of sites	60
Number of artefacts or features	60
6 IMPACT ASSESSMENT.....	61
6.1 ASSESSING HARM.....	61
6.1.1 ECOLOGICALLY SUSTAINABLE DEVELOPMENT.....	61

6.1.2	TYPES OF HARM	62
6.2	<i>PROPOSED WORKS</i>	62
6.3	<i>PREDICTED IMPACT ON THE POTENTIAL ARCHAEOLOGICAL RESOURCE</i>	62
7	AVOIDING AND MINIMISING HARM	65
7.1	<i>CUMULATIVE IMPACTS AND OPTIONS TO AVOID HARM</i>	65
7.2	<i>MANAGEMENT AND MITIGATION STRATEGIES</i>	65
8	RECOMMENDATIONS	66
	REFERENCES	67
	APPENDICES	70
	<i>APPENDIX A: AHIMS SEARCH RESULTS</i>	70
	<i>APPENDIX B: GLOSSARY OF TERMS USED IN ABORIGINAL CULTURAL HERITAGE ASSESSMENTS AND ARCHAEOLOGICAL REPORTS</i>	73

FIGURES

Figure 1.1	Topographic map showing study area and surrounding suburbs.....	2
Figure 1.2	Detailed Aerial of the Study Area.....	3
Figure 1.3	Surrounding Cadastral Boundaries.....	4
Figure 2.1	Foraging Model (Foley 1981).....	13
Figure 2.2	AHIMS Sites within two kilometres of the Study Area	18
Figure 3.1	Geological Landscape Associated with the Study Area	24
Figure 3.2	Soil Landscapes Associated with the Study Area	26
Figure 3.3	Detailed topography of the study area.....	27
Figure 3.4	Landforms evident within the study area	28
Figure 3.5	Hydrology associated with the study area	30
Figure 3.6	1955 Historic Aerial.....	32
Figure 3.7	1961 Historic Aerial.....	33
Figure 3.8	1965 Historic Aerial.....	33
Figure 3.9	1970 Historic Aerial.....	34
Figure 3.10	1975 Historic Aerial.....	34
Figure 3.11	1978 Historic Aerial.....	35
Figure 3.12	1983 Historic Aerial.....	35
Figure 3.13	1986 Historic Aerial.....	36
Figure 3.14	1991 Historic Aerial.....	36
Figure 3.15	1994 Historic Aerial.....	37
Figure 3.16	1998 Historic Aerial.....	37
Figure 3.17	2002 Historic Aerial.....	38
Figure 3.18	2005 Historic Aerial.....	38
Figure 3.19	2009 Historic Aerial.....	39
Figure 3.20	2015 Historic Aerial.....	39
Figure 5.1	North-west facing view showing green, with bunker and surrounding landscaping (1m scale).....	45
Figure 5.2	East facing view showing green and associated landscaping in background (1m scale).....	45
Figure 5.3	South-east facing view showing landscaping on ridgeline (1m scale)	46
Figure 5.4	North-east facing view showing manhole cover (1m scale).	46
Figure 5.5	North facing view showing constructed pathways (1m scale).	47
Figure 5.6	East facing view showing repeated erosion on path and within gully (1m scale).	47
Figure 5.7	North facing view showing widespread sheet erosion on hill slope (1m scale).....	48
Figure 5.8	West facing view showing clubhouse (1m scale).	48
Figure 5.9	South facing view showing carpark adjacent to clubhouse (1m scale).	49
Figure 5.10	North-east facing view showing gentle slope towards Jerrys Creek (1m scale).	50
Figure 5.11	South facing view showing west to east slope of hillslope (1m scale).	50
Figure 5.12	North-east facing view showing slope down towards Jerrys Creek (1m scale).....	51
Figure 5.13	South facing view showing alluvial flats adjacent to Jerrys Creek (1m scale).....	51
Figure 5.14	East facing view looking upslope on gentle hillslope (1m scale).	52
Figure 5.15	East facing view looking upslope along southern boundary of site (1m scale).	52
Figure 5.16	East facing view showing gullies along northern study area boundary (1m scale).....	53
Figure 5.17	West facing view showing gullies and undulating landscape along northern boundary (1m scale).	53
Figure 5.18	East facing view showing vehicle track and footpath (1m scale.).....	54
Figure 5.19	South facing view showing area of erosion on fairway (1m scale).	55
Figure 5.20	Typical soil profile within exposure (1m scale).	55
Figure 5.21	Second example of soil profile within exposure (1m scale).	56
Figure 5.22	Artefact 1 from Wallacia Golf Course AS1.....	57
Figure 5.23	Artefact 2 from Wallacia Golf Course AS1.....	57
Figure 5.24	Artefact 1 from Wallacia Golf Course AS2.....	58
Figure 5.25	Artefact 2 from Wallacia Golf Course AS2.....	58
Figure 5.26	West facing view showing location of Wallacia Golf Course AS2 (1m scale).	59
Figure 5.27	East facing view showing location of Wallacia Golf Course IF1.....	59
Figure 6.1	Site Plan associated with the Study Area (plan provided by the proponent).....	64

TABLES

Table 1.1	Federal Acts	6
Table 1.2	State Acts.....	6
Table 1.3	State and Local Planning Instruments	7
Table 1.4	Aboriginal Community Consultation Guidelines.....	7
Table 2.1	Summary of sites recorded within approximately 2 kilometres of the study area.	16
Table 2.2	Summary of archaeological consultant reports from the region	19
Table 3.1	Summary of past land uses within the study area	40
Table 5.1	Survey Coverage	60
Table 5.1	Landform Summary	60
Table 7.1	Definition of types of harm	62
Table 7.2	Predicted impact to identified sites within the study area	63

1 INTRODUCTION

1.1 INTRODUCTION

Austral Archaeology (Austral) has been commissioned by the Catholic Cemeteries Board to undertake an Aboriginal Archaeological Report (AAR), as part of an Aboriginal Cultural Heritage Assessment (ACHA) in advance of the proposed works to be undertaken at Wallacia Golf Course, Wallacia, New South Wales (NSW) [study area]. The aforesaid works relate to the conversion of parts of the study area into a cemetery, chapel, crematorium, and an administration building. The construction of these buildings will require large-scale earthworks that are likely to disturb or destroy any cultural heritage that is present within their footprints. The nature of the site as a cemetery will also require deep earthworks, for excavation of graves and associated with the installation of infrastructure such as electrical cables, roadways, sewerage, and water pipes.

The location of the study area is shown in Figure 1.1, Figure 1.2 and Figure 1.3. The study area is located within the Penrith City Council Local Government Area (LGA) and consists of the entirety of Lot 1, DP1254545, Lot 2, DP1254545 as well as Lot 3 and 4 DP18701. The study area falls within the boundaries of the Deerubbin Local Aboriginal Land Council (DLALC) and covers an area of approximately 444,300 metres² in size, located directly east of Wallacia town centre.

Austral has previously undertaken an Aboriginal Cultural Heritage Due Diligence Assessment (ACHDDA) for the study area (Austral Archaeology Pty Ltd 2019). The report found no Aboriginal Heritage Information Management System (AHIMS) listed sites within the study area, which was attributed to the lack of prior surveys of the study area rather than a lack of Aboriginal material. The study also identified multiple streams and creeks which pass through the study area that would have made the area conducive to Aboriginal settlement. The assessment recommended a walking survey to ground truth the findings of the assessment and disturbance present within the study area along with further investigation in the form of an ACHA.

The purpose of this assessment is to document the results of the Aboriginal archaeological survey across the study area, to re-examine the archaeological significance of the study area, and to act as support for a Development Application being lodged with Penrith City Council.

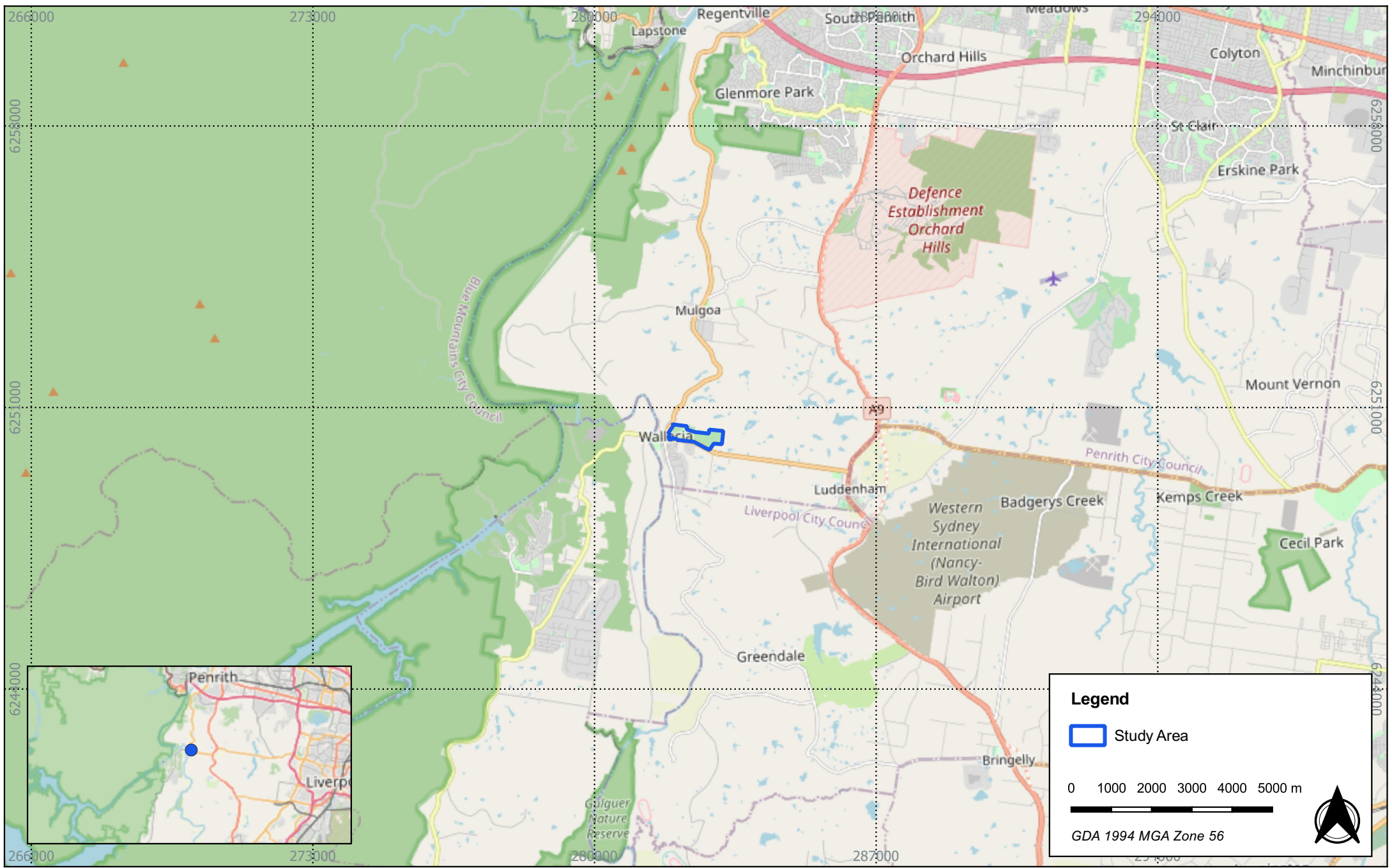


Figure 1.1 Topographic map showing the Study Area and surrounding suburbs

Nepean Gardens, Wallacia, NSW





Figure 1.2 Detailed aerial of the study area

Nepean Gardens, Wallacia, NSW



A U S T R A L
ARCHAEOLOGY

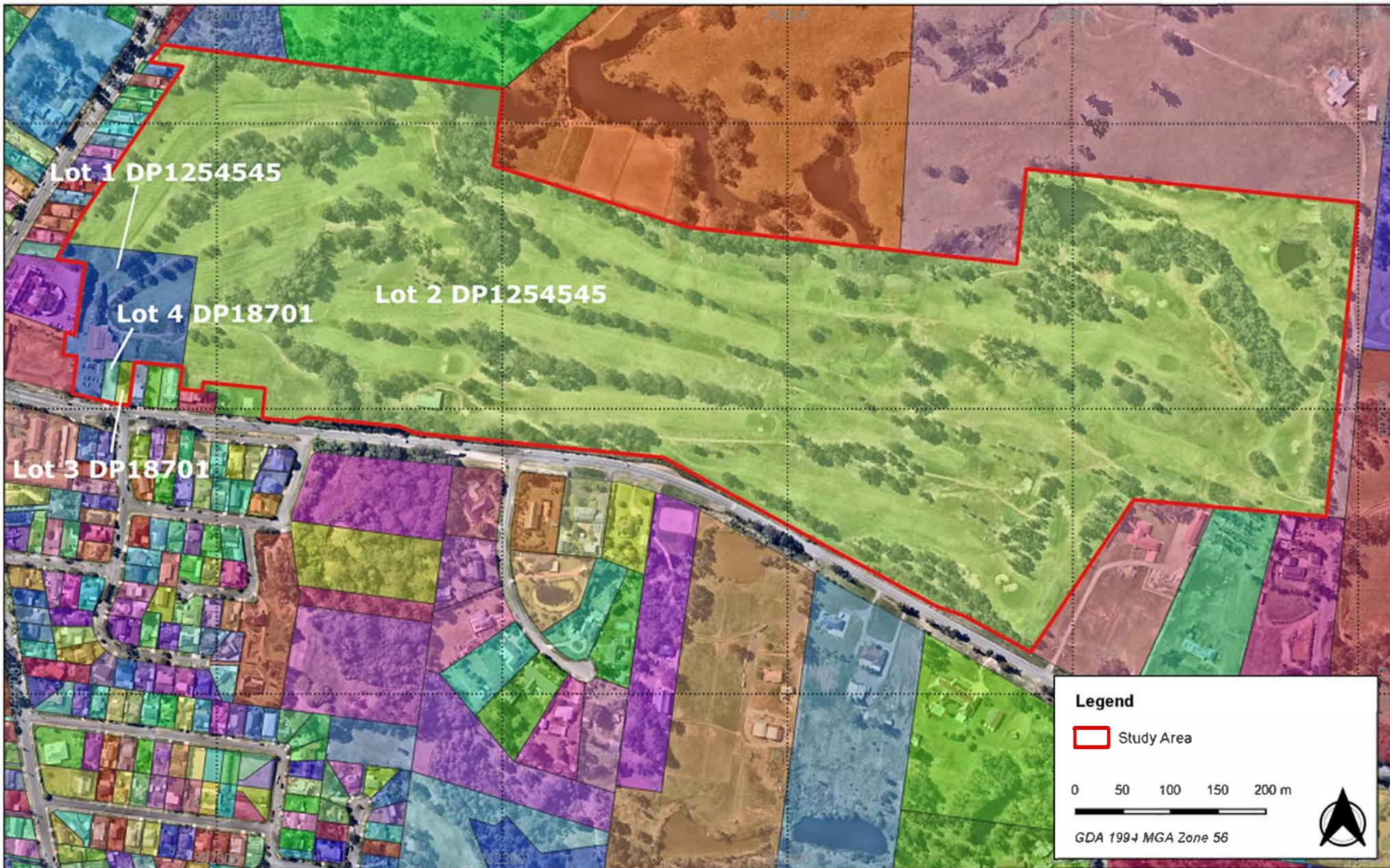


Figure 1.3 Cadastral boundaries associated with the study area
 Nepean Gardens, Wallacia, NSW



1.2 PROJECT DESCRIPTION

The proposed works within the study area relate to different works which are to occur in the eastern and western parts of the study area. The eastern area is to be converted from a golf course into a cemetery, which will include 27,000 burial plots, a chapel, administration building, internal roads, parking areas and amended access from Park Road. The western half of the study area will be converted into a 9-hole golf course, with a new pool, gym, putting and bowling greens, and alterations and additions to the golf clubhouse.

Other general works to undertaken within the study area include tree removal and landscaping, fencing, civil and storm-water works and new road intersections along Park Road.

It is understood that the construction works will involve:

- Large scale groundworks including extensive earth work, subsurface excavation and levelling.
- Construction of roadways, pathways, buildings related to the funerary services
- Installation of associated services including stormwater, sewerage and electrical services.
- Associated landscaping works and tree removal.

1.3 PREDICTED IMPACT ON THE POTENTIAL ARCHAEOLOGICAL RESOURCE

The proposed works have the potential to disturb or destroy any Aboriginal cultural heritage which may be present within the study area. There are areas of high potential identified by the previous ACHDDA report which are likely to be affected by the proposed development. It is noted that the proposed works relating to the conversion to a cemetery are to be staged, with works beginning in the eastern half of the study area and moving to the west as the cemetery fills.

The construction of buildings and infrastructure within the study area is also likely to disturb or destroy any existing Aboriginal cultural heritage within the footprint of the designs.

1.4 ASSESSMENT OBJECTIVES

The scope of this AAR is based on the legal requirements, guidelines and policies of Heritage NSW of the Department of Premier and Cabinet, formerly the Office of Environment and Heritage (OEH) and the Department of Environment, Climate Change and Water (DECCW). The guiding documents for this assessment are the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (DECCW 2011) [the Guide to Reporting] and the *Code of Practice for Archaeological Investigation of Aboriginal objects in NSW* (DECCW 2010a) [the CoP].

The scope of works includes the following:

- Undertake a literary review of available data, including previous studies/investigations from around the study area;
- Undertake necessary consultation with relevant Government agencies and key local Aboriginal stakeholders;
- Undertake a walking survey to ground truth the findings of previous reports;
- Document the requirement to undertake test excavations; and
- Provide adequate documentation to support the Development Application being lodged with Penrith City Council.

1.5 FEDERAL AND STATE LEGISLATION

Aboriginal archaeological and cultural heritage assessments in NSW are carried out under the auspices of a range of State and Federal acts, regulations and guidelines. The acts and regulations allow for the management and protection of Aboriginal places and objects, and the guidelines set out best practice for community consultation in accordance with the requirements of the acts.

Table 1.1 to Table 1.4 detail the Australian acts and guidelines which have been identified as being applicable or with the potential to be triggered with regards to the proposed development.

Table 1.1 Federal Acts

Federal Acts:	Applicability and implications
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	This Act has not been triggered, and so does not apply. <ul style="list-style-type: none"> No sites listed on the National Heritage List (NHL) are present or in close proximity to the study area. No sites listed on the Commonwealth Heritage List (CHL) are present or in close proximity to the study area.
<i>Aboriginal and Torres Strait Islander Heritage Protection Amendment Act 1987</i>	Applies. <ul style="list-style-type: none"> This Act provides blanket protection for Aboriginal heritage in circumstances where such protection is not available at the state level. This Act may also override state and territory provisions.

Table 1.2 State Acts

State Acts:	Applicability and implications
<i>National Parks and Wildlife Act 1974 (NP&W Act)</i>	Applies. <ul style="list-style-type: none"> Section 86 – Prohibits both knowingly and unknowingly causing harm or desecration to any Aboriginal object or place without either an AHIP or implementing another suitable defence from the Act. Section 87 – Allows for activities carried out under an AHIP or following due diligence to be a defence against harm of an Aboriginal object. Section 89A – Requires that Heritage NSW must be notified of any Aboriginal objects discovered, within a reasonable time. Section 90 – Requires an application for an AHIP in the case of destruction of a site through development or relocation.
<i>National Parks and Wildlife Regulations 2009 (NP&W Regulation)</i>	Applies. <ul style="list-style-type: none"> Section 80A – States minimum standards of due diligence to have been carried out Section 80C – Requires Aboriginal community consultation process to be undertaken before applying for an AHIP. Section 80D – Requires production of a cultural heritage assessment report to accompany AHIP applications.
<i>Environmental Planning and Assessment Act 1979 (EP&A Act)</i>	Applies. <ul style="list-style-type: none"> This project is being assessed under Part 5 of the EP&A Act. Sections 86, 87, 89A and 90 of the NP&W Act will apply.
<i>NSW Heritage Act 1977</i>	This Act has not been triggered and so does not apply. <ul style="list-style-type: none"> No Aboriginal sites listed on the State Heritage Register (SHR) are present or in close proximity to the study area.

Table 1.3 State and Local Planning Instruments

Planning Instruments	Applicability and implications
Local Environmental Plans (LEP)	The following LEP is applicable: <ul style="list-style-type: none"> • <i>Penrith Local Environmental Plan 2010</i>
Development Control Plans (DCP)	The following DCP is applicable: <ul style="list-style-type: none"> • <i>Penrith Development Control Plan 2014</i>

Table 1.4 Aboriginal Community Consultation Guidelines

Guidelines	Applicability and implications
<i>Aboriginal cultural heritage consultation requirements for proponents 2010.</i>	The development is to be conducted in accordance with Part 5 of the EPA Act. <ul style="list-style-type: none"> • As the project is to be assessed under Part 6 of the NP&W Act, approvals under Section 90 of the NP&W Act 1974 as amended 2010 will be required, S89A of the Act will apply, and the Part 4 Guidelines will apply.

1.6 SECTION SUMMARY

Aboriginal places and objects, both known and unknown, are protected in NSW by State and Federal legislation. The present assessment is being conducted in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (Department of Environment, Climate Change and Water 2010b) [the Consultation Requirements], the Guide to Reporting, under Section 80 of the NP&W Regulations and Part 6 of the NP&W Act in respect to the identification of Aboriginal stakeholders. As the work is not classified as a State significant project, the procedures under Part 5 of the EP&A Act do not apply.

Searches of the Australian Heritage Places Inventory (AHPI), the Register of the National Estate (RNE), the National Heritage List and the State Heritage Inventory (SHI) identified no recorded sites within the study area.

At the State level, the works are to be assessed under the NP&W Act and the EP&A Act. The relevant sections of the NP&W Act are Section 86, Section 87, Section 89A and Section 90. The Penrith LEP, produced in accordance with the EP&A Act, makes provision for the protection of Aboriginal heritage, archaeological sites and potential archaeological sites. Still, no places or objects within the study area are recorded in the LEP.

1.7 PROJECT TEAM AND QUALIFICATIONS

This AAR was prepared by William Andrews (Graduate Archaeologist, Austral) and Miles Robson (Senior Archaeologist, Austral) with project management provided by David Marcus (Director, Austral). The site survey was performed by David Marcus and William Andrews. All mapping in the report was prepared by William Andrews and Miles Robson. This report was reviewed by David Marcus for quality assurance purposes.

DAVID MARCUS (B.A. (HONS.) ARCHAEOLOGY, MA. ARCHAEOLOGY)

David is a Director of Austral with significant experience in both Aboriginal and historical cultural heritage projects. David started his career in archaeology in 2000 and has worked in all roles from field assistant through to project manager. He commenced work for Austral Archaeology in 2010 and has been responsible for all aspects of the day-to-day running of Austral Archaeology. David also has high level skills in both physical and digital mapping and integration of digital data into GIS.

WILLIAM ANDREWS (B. ENG. (HONS) SURVEYING)

William is an Archaeologist based out Austral's Sydney office. William has a degree in Engineering (Surveying) and he chose to transition his career path towards archaeology, having studied archaeology first. Prior to his career change, William had worked as a land surveyor which has given him the skills to specialise in spatial data collection techniques which are of significant benefit to Austral's projects and clients. This includes site surveys, photogrammetry, laser scanning, GIS and in-field documentation methods.

MILES ROBSON (B.A (HONS) ARCHAEOLOGY)

Miles is a Senior Archaeologist who has worked with Austral on various projects since 2013, before being taken on as a full-time employee. He specialises in undertaking fieldwork and has a wide range of experience and skills in both Aboriginal and historical archaeology, working on projects in New South Wales, Tasmania and South Australia. Miles is also skilled in GIS mapping, report preparation and undertaking historical research.

1.8 ACKNOWLEDGEMENTS

Austral Archaeology would like to acknowledge the participation of the following people who contributed to the preparation of the report:

- David De Angelis Catholic Cemeteries + Crematoria

1.9 ABBREVIATIONS

The following are common abbreviations that are used within this report:

AAR	Aboriginal Archaeological Report
ACHDDA	Aboriginal Cultural Heritage Due Diligence Assessment
ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
AHIP	Australian Heritage Places Inventory
Austral	Austral Archaeology Pty Lt
BP	Before Present
Burra Charter	Burra Charter: Australia ICOMOS Charter for Places of Cultural Significance 2013
CBD	Central Business District
CHL	Commonwealth Heritage List
Consultation Requirement	Aboriginal Cultural Heritage Consultation Requirements for Proponents
CoP	The Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW
DCP	Development Control Plan
DECCW	Department of Environment Climate Change and Water
DLALC	Deerubin Local Aboriginal Land Council
DPC	Department of Premier and Cabinet
DPIE	Department of Planning, Industry and Environment
EPA Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environmental Protection and Biodiversity Act 1999
EPI	Environmental Planning Instrument
Heritage Act	NSW Heritage Act 1977
ICOMOS	International Council on Monuments and Sites
IHO	Interim Heritage Order
LEP	Local Environmental Plan
LGA	Local Government Area
NHL	National Heritage List
NPW Act	National Parks and Wildlife Act 1974
NSW	New South Wales
OEH	Office of Environment and Heritage
Penrith DCP	Penrith Development Control Plan 2014
Penrith LEP	Penrith Local Environmental Plan 2010
The Proponent	Catholic Cemeteries + Crematoria
RNE	Register of the National Estate
SHI	State Heritage Inventory
SHR	State Heritage Register
Study Area	Lot 1 DP1254545 and Lot 2 DP1254545, Park Road, Wallacia, NSW

2 ARCHAEOLOGICAL CONTEXT

2.1 REGIONAL ABORIGINAL ARCHAEOLOGICAL CONTEXT

Archaeological investigations on the Cumberland Plains and along the floodplains of the Nepean River have been conducted in direct response to the spread of urban development. The limited ethnographic accounts of early settlers and explorers were once considered the primary source for archaeological enquiry. However, with the recent spread of urban development within the Cumberland Plain environs, archaeological investigations have undergone a corresponding increase.

The major studies which have contributed to our understanding of the Cumberland Plains, and those with direct relevance to the study area through their proximity, are outlined below. Reference is made to the main trends garnered from these investigations which serve to provide a broad framework in which to base the current study.

Aboriginal occupation of the Cumberland Plain and Nepean River valley extends back well into the Pleistocene, around 10,000 years Before Present (BP). Currently the oldest accepted date for an archaeological site in the Sydney region is a date of about 14,700 years BP which was obtained from Shaws Creek Rockshelter K2, located to the north of Penrith and not far from the present study area (Attenbrow 2002, p.20). Relatively early dates were obtained by McDonald. et al. (1996) for artefact-bearing deposits at open site RS1 (45-5-982) at Mulgoa Creek, Regentville, but the reliability of these is uncertain (McDonald. et al. 1996, pp.61–62), while Austral Archaeology have also recorded similar dates within an aeolian sand body associated with the Hawkesbury River at Windsor (Austral Archaeology 2011).

POPULATION AND CONTACT HISTORY

Aboriginal people formed part of a dynamic culture which encouraged movement throughout the landscape in order to assist in the ceremonial and functional practicalities of daily life (Helms 1895, p.389, Niche Environment and Heritage 2010, p.17). As such, defined borders for tribal groups need to be recognised as an artificial constraint designed by anthropologists (Organ 1990, p.xliii).

With these constraints in place, it is possible to characterise the Aboriginal history of the study area. The present study area is thought to lie near the boundary of two major Aboriginal language groups, with Darug (alternatively spelt Dharug or variations of – see Attenbrow 2002, Table 3.3) speakers occupying the region to the north and east of the Mulgoa valley while the Gundungarra speakers were located to the south and west (Kohen 2009, p.3). Anthropologist and linguist RH Mathews stated that:

The *Dhar-rook* dialect, very closely resembling the *Gundungarra*, was spoken at Campbelltown, Liverpool, Camden, Penrith, and possibly as far east as Sydney, where it merged into the *Thurrawal* (Mathews & Everitt 1900, p.265).

According to Kohen 'the band that lived in the [Mulgoa] valley at the time of contact were Dharug, and were known from the early part of the 19th century as the Mulgoa Tribe' (Kohen 1982, p.3). '*Mulgoa*', '*mulgowy*' or '*mulgaway*' meaning 'black swan' is also believed to be the Dharug name for the area (Kohen 1982, p.4), while an alternative origin for the name is also suggested based on the word *Mulgowrie*, meaning 'a place for water' in a local dialect (*Nepean Times*, 18 May 1939; Reed 2010, p.59).

The pre-contact Aboriginal population numbers for the study area are not known and, due to epidemics often preceding the arrival of European settlers into a region (Attenbrow 2002, p.21), it is unlikely that the early European explorers were able to successfully grasp the traditional population size. However, in the early days of the Sydney Cove settlement, Governor Phillip estimated that about 1,500 Aboriginal people lived in the Sydney district. More recent estimates of the contact period population of the greater Sydney region place the number between 5,000 and 8,000, although other estimates are much lower (Kohen 1995, p.1, Turbet 2001, pp.25–26). For the western Cumberland Plain, Kohen has estimated a pre-contact population of 500 to 1000 people, or a minimum overall density of about 0.5 persons per square kilometre (Attenbrow 2002, p.17, Kohen 2009, p.4).

The Aboriginal population of the Sydney district declined dramatically following European settlement even before European explorers reached Mulgoa, as many Aboriginal people had been killed by the smallpox epidemic which spread through the area in 1789. The epidemic is thought to have caused the deaths of at least half of the Aboriginal population of the Sydney district, while some accounts testify that 90% of the population were decimated (Attenbrow 2002, p.21, Kohen 1995, p.2).

MATERIAL CULTURE

The material culture of the Aboriginal people of the Mulgoa region at the time of European contact was diverse, and utilised materials derived from a variety of plants, birds and animals as well as stone. Below is only a short summary of the types of material known to have been used by the Aboriginal people across the Cumberland Plain.

Spears in the Cumberland Plain were usually made of a grasstree spike (for the shaft) with a hardwood point, or alternatively with a hardwood shaft and barbs made of stone, bone, shell or wood (Turbet 2001, p.40). Thin and straight spear-throwers, or *woomera*, were made from wattle and other hardwoods (Turbet 2001, p.40). Fishing spears were usually tipped with four hardwood prongs with bone points (Attenbrow 2002, p.117, Turbet 2001, p.42), while fish were also caught by means of shell or bird talon fish hooks attached to twine (Attenbrow 2002, p.117, Turbet 2001, p.45).

Bark of various types were used for making such diverse items as wrappings for new-born babies, shelters (*gunyahs*), canoes, paddles, shields, water carriers (*coolamon*) and torches (Attenbrow 2002, Table 10.1). Resin from the grasstree was also used as an adhesive for tool and weapon making (Attenbrow 2002, p.116, Turbet 2001, p.45).

Various kinds of clubs and throwing sticks were made from hardwoods, as were other useful items such as digging sticks. The word '*boomerang*' is believed to be from the Darug language and the returning variety originated from the Sydney basin. In conjunction with larger, two-handed throwing sticks, it complemented the range of hunting tools available for taking down larger prey (Turbet 2001, pp.37–45, Attenbrow 2002, p.112).

Stone artefacts are often the only physical indication of Aboriginal use of an area. The knapping of stone artefacts can indicate one of two things, the knapping of stone to create tools and the discard of these tools once they have been used, or sometimes both. The knapping of stone creates a large amount of stone debris in very little time. Large knapping events tend to occur in proximity to sources of permanent water (Jo McDonald Cultural Heritage Management Pty Ltd 2000). This is probably because the availability and resources made these good places to camp for short periods of time. Small scale knapping events can occur anywhere in the landscape and are associated with the manufacture or maintenance of stone tools as a direct result of a specific need. This implies that locations of sites away from water courses will be more diffuse.

Stone was commonly used for tools and, apart from discarded shell in coastal middens, is the most common material found in archaeological sites of the Sydney region. Stone or stone tools were used for axe heads, spear barbs and as woodworking tools, amongst other things.

Aboriginal people made good use of local stone raw materials sourced from the known quarries on the Cumberland Plain and from the Hawkesbury-Nepean River gravels. Knowledge of source locations for raw materials such as silcrete, basalt, quartz, tuff and chert is of great importance in determining movements, trade and exchange patterns of the people who inhabited the area (Attenbrow 2002). There is evidence, in the form of stone artefacts and axes from inland sources (possibly the Nepean River gravels) for trade between the inland Darug people with the coastal people (Smith 1989, p.20).

Archaeological investigation has resulted in the recognition of changes in the types of stone tools used by Aboriginal people in the Sydney region through time. A sequence of changes in stone tool types in eastern New South Wales was first noticed by archaeologist FD McCarthy who named it the 'Eastern Regional Sequence' (McCarthy 1976, pp.96–98). McCarthy identified the '*Capertian*,' '*Bondaian*' and '*Eloueran*' phases of the sequence which together appear to span the last 15,000 years in the Sydney region.

McCarthy's sequence was argued against, and Stockton & Holland (1974, pp.53–56) modified McCarthy's theory by proposing four phases of the Eastern Regional Sequence instead. After Capertian, they described the Early Bondaian and Middle Bondaian phases, where Bondi points and other small tools become apparent in assemblages in Eastern New South Wales. Late Bondaian of Stockton & Holland's sequence referred to McCarthy's Eloueran phase. Stockton & Holland's terminology proved more useful to archaeologists and are used throughout the Sydney region today (Attenbrow 2002, p.156).

Broadly speaking, the earliest, Capertian period assemblages typically contain tools which are larger in size than later assemblages, although smaller tools, such as thumbnail scrapers and dentated saws can also be present.

In the late Holocene (from approximately 5,000 years ago), backed artefacts such as Bondi points, Elouera and geometric microliths appear in archaeological assemblages in the Sydney region and these tools are characteristically much smaller than those of earlier phases. McCarthy (1976) used these formal tools to define this period as Bondaian while for Stockton & Holland (1974:53-56) the appearance of these tools marked the Early Bondaian and Middle Bondaian phases. Edge ground implements also started appearing in regional assemblages for the first time at about 4,500 to 4,000 years ago.

From about 1,600 year ago, Bondi points and geometric microliths began to drop out of use in the coastal parts of the Sydney region, although Elouera continued to be used. This is known as the Late Bondaian phase. On the Cumberland Plain, however, dated archaeological sites suggest that all of these backed artefact types continued to be used 'until at least 650-500 years ago, although probably not [as late as the time of] British colonisation' (Attenbrow 2002, p.156). In coastal areas, and possibly throughout the Sydney Basin, both the use of quartz and of the bipolar flaking technique increased through time, although this tendency is less marked on the western Cumberland Plain (Attenbrow 2002, pp.153–159).

FOOD

A wide range of land mammals were hunted for food, including kangaroos, possums, wombats and echidnas as well as native rats and mice (Attenbrow 2002, p.70). Birds, such as the mutton bird and brush turkey, were eaten and it is recorded that eggs were a favourite food (Attenbrow 2002, pp.75–76).

Attenbrow has noted that 'Sydney vegetation communities include over 200 species that have edible parts, such as seeds, fruits, tubers/roots/rhizomes, leaves, flowers and nectar (Attenbrow 2002, p.76). Several other plants have medicinal functions, many of which have only recently been discovered by science, although these were traditionally known to the Aboriginal people.

Observations from the earliest European settlers describe Aboriginal people in the Sydney region roasting fern-roots, eating small fruits the size of a cherry as well as a type of nut and the root of 'a species of the orchid' amongst other types of plant food, and it was noted that their diet consisted of 'a few berries, the yam and fern-root, the flowers of the different Banksia, and at times some honey' (Collins 1804:361). At other times, the Aboriginal people living in woods would 'make a paste formed of the fern-root and the ant bruised together; in the season, they also add the eggs of this insect' (Collins 1804:362).

However, as Attenbrow notes, the settlers' lack of knowledge of the local plant species make actual identification of the various plants being discussed difficult, beyond vague terminology which compared plants to those which were known to the settlers' (Attenbrow 2002, pp.76–79). Of the numerous species which are known to have been used by Aboriginal people in the past, the '*murrnong*', or yam daisy (*Microseris lanceolata*), was the most important staple food and it was the destruction of these plants that contributed to an increased strain on the food resources available to Aboriginal people in the early 19th century (Kohen 1995, p.4). Other important species to the Darug people included the '*burrawang*' (*Macrozamia communis*), whose seeds had to be treated before being turned into flour, and the native yam (*Dioscorea transversa*) (Kohen 2009, p.5).

In summary, the Cumberland Plains and Nepean River provided a wide variety of plants and animals which were used by the local Aboriginal populations for artefact manufacture, medicinal purposes, ceremonial items and food.

EARLY ARCHAEOLOGICAL MODELS

Many of the earliest archaeological models were either developed for the entirety of the southern New South Wales coastline, stretching from Sydney down to Batemans Bay, or concentrated on the Sydney region (Navin 1987, p.29). These settlement models focussed on seasonal mobility, with exploitation of inland resources in winter and coastal resources for the remainder of the year (i.e. Poiner 1976).

Foley (1981) developed a general site distribution model for forager settlement patterns. The general principles described by Foley have been considered useful indicators of sites location across the Australian landscape and has been used as the basis for many later settlement models.

The model splits hunter gatherer sites into two main categories; 'residential base camps' and 'activities areas' (Foley 1981). People reside in one general location or locations, probably in proximity to a good source of permanent water with shelter from the elements, and travel throughout the local landscape to gather resources at known locations. The right hand side of Figure 2.1 shows how this settlement pattern would look in terms of artefact discard. The majority of artefacts are deposited in proximity to the residential base camp, fewer at the various resource locations and a general low, random scatter amount throughout the rest of the landscape, mainly on travelling routes between activity areas and the base camp. The model, however, does not take into account the use of more than one base camp in an area, or changing preferences of camping areas over time; nor does it account for the movement of resources over time.

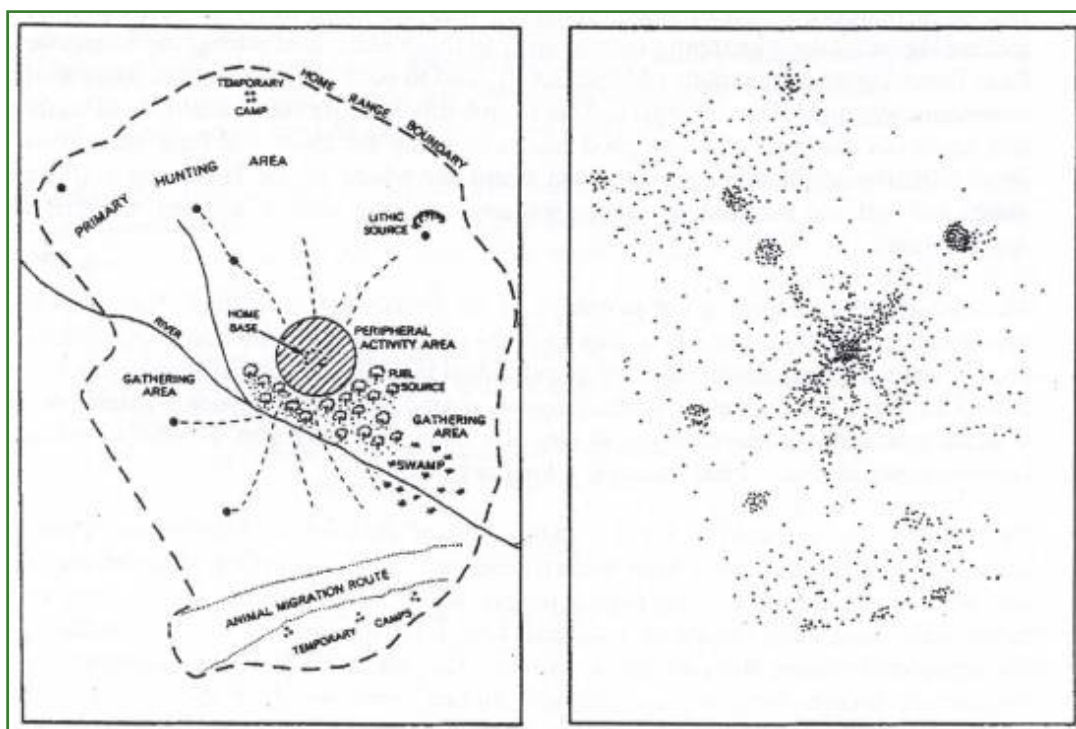


Figure 2.1 Foraging Model (Foley 1981).

Another early model was developed by Kohen in his 1986 study of the Cumberland Plain, where he created a general model of site occurrence, chronology and function for the region. The chronological component of his model posits that the Aboriginal occupation of the Cumberland Plain primarily occurred during the mid to late Holocene (approximately 4,500 BP) and was related to an increase in Aboriginal population in the area and the introduction of a new stone tool technology, the 'small tool tradition'. Prior to the mid Holocene, Kohen argues that Aboriginal occupation of the area was concentrated on and around the Nepean River and the coast (James Leslie Kohen 1986).

Similarly, Smith's (1989) work represented the first stage of a National Parks and Wildlife Service (NPWS) Planning Study for the Cumberland Plain. At the time, Smith calculated that less than 0.5% of the Cumberland Plain had been surveyed and/or studied systematically and that only 17 sites had been excavated. A number of surveys were conducted as part of Smith's investigation and, in the 1,600 metre² area which she surveyed in the Rickaby's Creek and Londonderry area, four sites and one isolated find were located. A predictive site location model was developed by Smith for the southern Cumberland Plain based the results of her study. This included the theory that sites would be most commonly found along permanent creeks and around swamp margins, which was later expanded upon. Creek flats and banks were considered to be focal topographical features for site location (Smith 1989, p.2).

LATER WORK

Despite a surge in the amount of archaeological assessments undertaken in the Mulgoa valley in the late 1980s and early 1990s, little current research has been undertaken to create predictive models which focus specifically on Jerry's Creek. Instead, it is necessary to focus on archaeological models which have been created for the wider Cumberland Plain.

One of the key archaeological models for the Cumberland Plain was created by McDonald (1997) and was used in her initial assessment of the ADI site at St Marys to undertake a more detailed analysis of site types and their distribution over the wider region. McDonald's investigation identified artefact scatters (also known as open camp sites) to be the dominant site type (composing 89% of all sites) followed by isolated finds and scarred trees (totalling 2.1% of all recorded features). Her analysis was also able to highlight the disproportionate relationship between the lack of artefacts on the ground surface compared to their sub-surface presence.

This investigation revealed the fact that virtually none of the sites which had been excavated on the Cumberland Plain could have been characterised on the basis of surface evidence alone. In addition, McDonald noted that open sites were found in all landscape units and that the high proportion of sites located on creek banks reflected variables such as surface visibility and taphonomy rather than being indicative of cultural artefact distribution across the landscape (McDonald 1997a, p.36).

As a corollary to these findings it was deemed that existing predictive models had relied heavily on surface evidence and were inadequate for usage in the Cumberland Plains (McDonald. et al. 1996). It was further assumed that sub-surface results would provide the necessary data on which a model could be based that could predict site location and/or site variability. After extensive salvage and test excavations carried out for the Rouse Hill Test Excavation Programme (McDonald & Rich 1993, McDonald. et al. 1996) and the Rouse Hill (Stage 2) Infrastructure Project (McDonald. 1999) several important characteristics relating to the Cumberland Plain were noted:

- *Most areas - even those with sparse or no surface manifestations – contain sub-surface archaeological deposits.*
- *Where open sites are found in aggrading and stable landscapes, some are intact and have the potential for internal structural integrity. Sites in alluvium possess potential for stratification.*
- *While ploughing occurs in many areas, this only affects top 30 centimetres of the deposit, and ploughed knapping floors have been located which are still relatively intact.*
- *Contrary to earlier models for open sites, many sites contain extremely high artefact densities, with variability appearing to depend on the range of activity areas and site types present.*
- *The complexity of the archaeological record is far greater than was previously identified on the basis of surface recording and limited test excavations. Intact knapping floors, backed blade manufacturing sites, heat treatment locations, a number of apparently specialised tool types, and generalised camp sites can all exist within the Plains.*
- *Two Early Bondaian dates (between 5,000 and 3,000 BP) provide a context for some backed blade manufacture.*

- *Gross site patterning is identifiable on the basis of environmental factors: sites on permanent water are more complex (i.e. they represent foci for larger groups or are used repeatedly by smaller groups over a long period of time) than sites on ephemeral or temporary water lines (McDonald. et al. 1996, p.115).*

McDonald was also able to argue that environmental factors were integral to developing a predictive model for the Cumberland Plain. As a consequence, she has successfully used stream order models to develop a predictive model for the Cumberland Plain. Stream order modelling as a predictive tool could be utilised to anticipate the potential for Aboriginal camp site locations in the landscape based on the order of water permanence.

According to McDonald, the range of lithic activities and the complexity of the resulting stone assemblage observed at a location of permanent water differ depending on stream order. Overall, artefact scatters in the vicinity of a higher order ranking stream reflect a greater range of activities (e.g. tool use, manufacture and maintenance, food processing and quarrying) than those located on lower order streams. Temporary or casual occupations of a site, reflected by an isolated knapping floor or tool discard, are more likely to occur on smaller, more temporary water courses (McDonald 1997a, pp.134–135).

It is therefore possible, McDonald concluded, that Strahler stream order modelling could be utilised to make general predictions about the location and nature of Aboriginal sites on the Cumberland Plain. Water permanence (i.e. stream order), landscape unit (i.e. hill top, creek flat) as well as the proximity to artefact raw materials can result in variations in the density and complexity of an Aboriginal archaeological feature (McDonald 1997a, Jo McDonald Cultural Heritage Management Pty Ltd 2000, p.19). Site location and duration of occupation predictions therefore relate to stream order in the following ways:

- *In the headwaters of upper tributaries (1st order creeks) archaeological evidence will be sparse and represent little more than a background scatter;*
- *In the middle reaches of minor tributaries (2nd order creeks) archaeological evidence will be sparse but indicate focussed activity (e.g. one-off camp locations, single episode knapping floors);*
- *In the lower reaches of tributary creeks (3rd order creeks) will be archaeological evidence for more frequent occupation. This will include repeated occupation by small groups, knapping floors (perhaps used and re-used), and evidence of more concentrated activities;*
- *On major creek lines and rivers (4th order creeks) archaeological evidence will indicate more permanent or repeated occupation. Sites will be complex, with a range of lithic activities represented, 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;*
- *Ridge top 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 (Jo McDonald Cultural Heritage Management Pty Ltd 2000, p.19).*

This model was refined by White and McDonald (2010), based on the results of the subsurface testing at the Rouse Hill development on the northern Cumberland Plains. The predictive model identified four main factors which the authors decided determined artefact density and distribution. These were:

- 1) *Stream order, with higher order streams tending to have higher artefact densities and more continuous distributions than lower order streams;*
- 2) *Landform, with higher densities occurring on terraces and lower slopes, and with sparse discontinuous scatters on upper slopes;*
- 3) *Aspect on lower slopes associated with larger streams, with higher artefact densities occurring on landscapes facing north and north-east; and*

- 4) *Distance from water, with higher artefact densities occurring 51 to 100 metres from 4th order streams, and within 50 metres of 2nd order streams (White & McDonald 2010, p.36).*

In agreement with Niche (2010, p.24), despite the relative distances from the data source, it is held that these results are directly transferable to other parts of the Cumberland Plains.

One final predictive model was recently prepared by Kayandel Archaeological Services (2017) for North Silverdale, which is located approximately 4 kilometres south-west of the study area. Their predictive model states that:

- *Both low density surface and subsurface artefacts may occur across the entire Subject area;*
- *Subsurface archaeological deposits may be present in areas where no visible surface archaeological remains are evident;*
- *The size, density and significance of sites will vary, although it is anticipated that any sites will be considerably less complex and less dense at distances greater than 250m from major water sources (3rd/4th order streams) such as Warragamba River or the Nepean River, or along ridges and elevated positions overlooking water courses;*
- *Habitation sites will have associated open production and hunting/gathering sites, which will be present in close proximity, along the length of the flat behind the escarpment;*
- *No lithic raw material outcrops have been identified in the Subject Area. As such, any archaeological material present within the Subject Area may provide additional understanding to raw material selection in the Silverdale region;*
- *As past land use disturbance increases in intensity, the ability for Aboriginal objects to provide spatial and chronological information about past Aboriginal land use will decrease; and,*
- *Potential Archaeological Deposits may be located in portions of the Subject Area with minimal previous land disturbance (Kayandel Archaeological Services 2017, p.38)*

2.2 HERITAGE DATABASE SEARCH RESULTS

A search of the AHIMS database was undertaken on 22 July 2020 (AHIMS client number 522062). The results from the AHIMS search identified no Aboriginal sites within the study area, and 26 Aboriginal sites within a 2 kilometre radius of the study area (Table 2.1). There are no Aboriginal places declared in or near the study area.

It should be noted that unless otherwise stated, the spatial integrity and data quality of sites located outside of the study area have not been checked for accuracy or contents and are presented directly as recorded in the AHIMS database.

Table 2.1 Summary of sites recorded within approximately 2 kilometres of the study area.

Feature Type	Total	%
Art (Pigment or Engraved)	1	3.85
Artefact	21	80.77
Artefact, Art (Pigment or Engraved)	1	3.85
Grinding Groove	1	3.85
Modified Tree (Carved or Scarred)	2	7.69
TOTAL	26	100%

Table 2.1 shows that there are three different site types represented by the search results: stone artefacts (isolated or scatter), culturally modified trees, and rock shelters with deposits. The spatial distribution of these sites is shown in Figure 2.2.

The vast majority of the registered sites identified in the AHIMS database search are stone artefacts (both isolated finds and open artefact scatters). This site type represents 21 reported sites, or 81% of the overall site type frequency in the localised search. In comparison, the remaining 19% are made up of single occurrences of an art site, an art site with an artefact, a grinding groove, and two modified trees.

The distribution of the sites shows a clear spatial differentiation which relates to geological and historical land use aspects of the landscape, with the rock shelter identified close to the Nepean River while the culturally modified trees are found in an area of old-growth vegetation adjacent to a road corridor on the western bank of the Nepean River. All recorded artefact sites are, as expected, within 100 metres of a recognised watercourse. While sites RC 12 (#45-5-2500) and RC 13 (#45-5-2499) are associated with the adjacent Mulgoa Creek catchment along with all sites to the east of these sites, the closest four artefact scatters to the study area are associated with either 1st or 3rd order tributaries of Jerry's Creek or, in the case of site JC3 (#45-5-2351), the 4th order portion of the creek immediately after it has passed through the current study area.

OTHER HERITAGE REGISTER SEARCH RESULTS

Searches of the AHPI, the RNE and the SHI were undertaken and did not identify any recorded Aboriginal Objects or Places in or around the development area. No Aboriginal objects or places are listed as significant in the Penrith LEP.

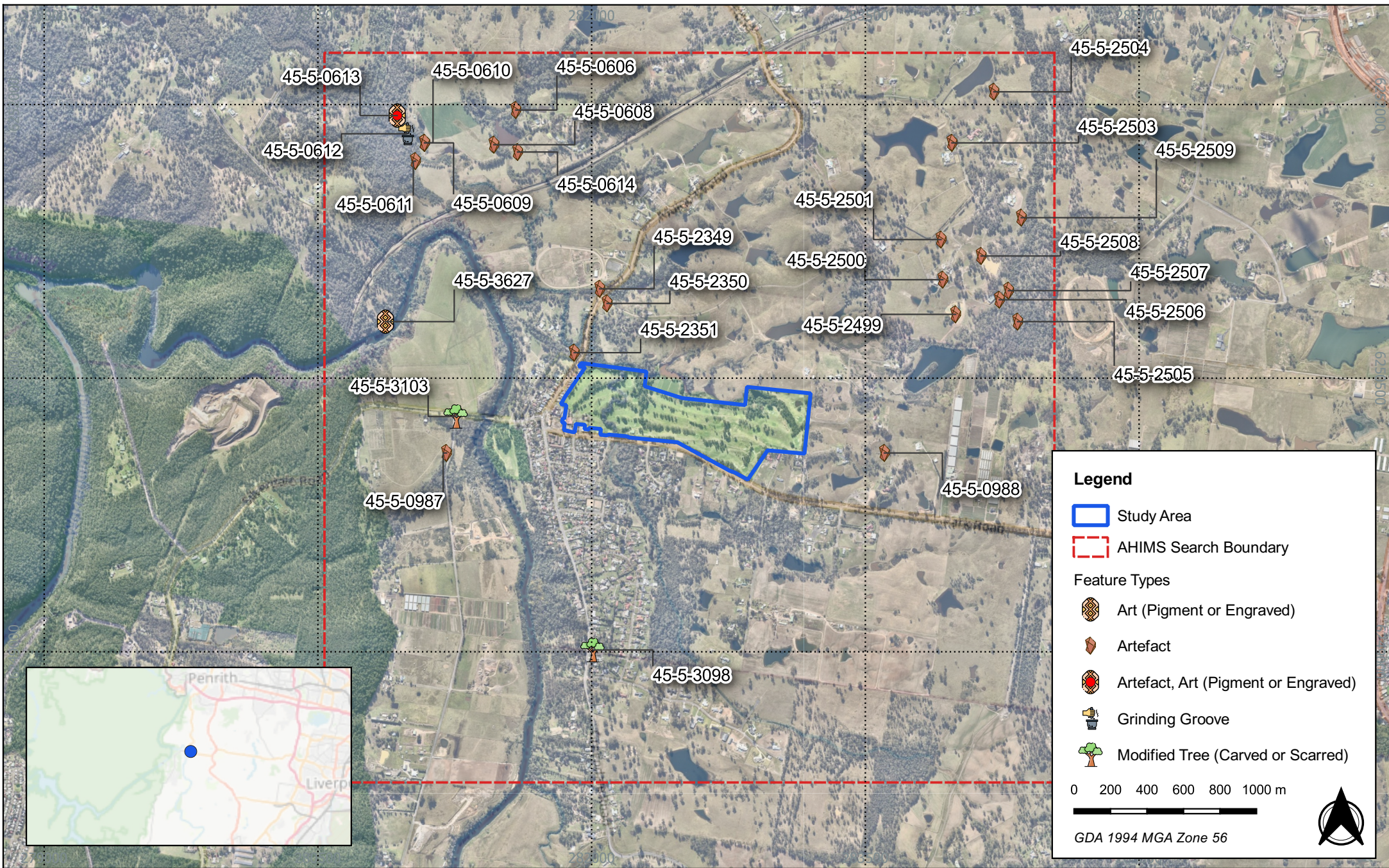


Figure 2.2 AHIMS Sites within two kilometres of the study area

Nepean Gardens, Wallacia, NSW



A U S T R A L
ARCHAEOLOGY

2.3 PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

Although European observers recorded various aspects of the lifestyles of Aboriginal people in Western NSW, from the beginning of European settlement of the area in the 19th century, it was not until the 20th century that archaeological investigations of Aboriginal archaeological sites were undertaken. Since then, archaeological sites have been frequently recorded across the region, and hundreds have been excavated. Most commonly, these contain open scatters of archaeological material such as stone artefacts, ovens, scarred trees ashy deposits or shell middens.

ARCHAEOLOGICAL INVESTIGATIONS IN THE LOCAL REGION

Much of the archaeological work in the local area has been undertaken as a result of development-driven archaeological studies or surveys. Table 2.2 below outlines the details and results of relevant, key archaeological consultant's reports from the region.

Table 2.2 Summary of archaeological consultant reports from the region

Reference	Study Area Location/Description	Results	Site distribution
Brayshaw 1981	Lot 28, Mulgoa district, City of Penrith	Single broken basalt edge ground axe recorded.	N/A
Dallas 1981	South Penrith development site	20 surface artefact scatters and 7 isolated artefacts recorded.	Irregular, but sites recorded 'either in hilltop or elevated situations or in close proximity to creeks' (Dallas 1981:22).
Brayshaw 1982	Lot 1, Bradley Street, Mulgoa (75ha)	One open artefact scatter and one isolated artefact recorded.	Sites located along Main Creek (tributary of Mulgoa Creek). Not clear whether site distribution was a 'function of Aboriginal land use or other phenomena such as ground visibility and erosional process' (Brayshaw 1982:5).
Kohen 1982	Mulgoa Valley contact-period desktop study (with limited surface survey).	Artefacts recorded in two locations, one of these contained 19 th century glass and ceramic which may be associated with stone artefacts.	According to Kohen 'these two small sites are certainly not significant in themselves, but considering the limited nature of the survey, it appears that many more sites would be found in any detailed investigation [of the Mulgoa valley]' (Kohen 1982:7).
Greer & Brayshaw 1983	Lot 1, DP541090, Mulgoa (1.5km x 0.5km)	One open artefact scatter and one isolated artefact recorded.	Artefacts located on hilltop, hill slope and creek bank.
Brayshaw 1983	Site 7770, Bradley Street, Mulgoa (19ha).	No sites or artefacts recorded.	'In view of the irregular distribution of archaeological sites in this part of the Cumberland Plain, the absence of sites from an area the size of the proposed quarry is not surprising, although it could not have been predicted' (Brayshaw 1983:6).
Kohen 1986	'Winbourne,' Mulgoa, approx 1.2 x 0.5km	Stone artefacts recorded at 9 locations (8 open sites and one rockshelter), one axe grinding groove location recorded.	Open site artefacts generally located within 50 metres of creek lines, with one exception located near the crest of a low hill. Rockshelter site located in sandstone gorge. Grinding grooves found in sandstone outcrops adjacent to creekline.

Reference	Study Area Location/Description	Results	Site distribution
McDonald 1987	Subsurface testing of site 45-5-0411, previously recorded by Greer and Brayshaw (1983) at Mulgoa	Sub-surface investigation 'revealed that there was no intact, archaeological deposit at the site' (McDonald 1987:7).	Site consists of a sparse surface scatter located on a hill slope above a minor tributary.
Kohen 1988	'Fairlight Park' Mulgoa, approx 270ha	Stone artefacts recorded at five locations (including three isolated finds). One scarred tree and one axe grinding groove location recorded.	Five of the sites appear to be located within approximately 100 metres of creek lines, while two of the isolated artefacts are up to about 500 or 600 metres from a creekline (Kohen 1988:Figure 2). Kohen noted that 'the most unexpected result was the lack of evidence for the use of rockshelters in the sandstone gullies adjacent to the Nepean River... This may be partly explained by the lack of suitable shelters in the upper reaches of the gullies' (Kohen 1988:23).
HLA-Envirosciences Pty Limited 1995	Fransworth Avenue, Warragamba to The Northern Road, Luddenham	10 sites identified on Farnsworth Avenue near Megarity's Creek, including an artefact scatter and one stone axe.	The artefact scatter was found on the corner of Park Road and Montelimar Place, which is directly across the road from the study area. A stone axe was also found on the southern side of Park Road. Evidence suggesting that Aboriginal people were definitely in the immediate vicinity of the study area.
Barton & McDonald 1995	Jerry's Creek Bridge, near Wallacia	Three low density stone artefact scatters recorded on eroded or exposed ground.	Barton and McDonald noted that the 'information needed to categorise the nature of this artefact scatter is dependent upon sub-surface testing' (Barton and McDonald 1995:15).
McDonald 1997b	Proposed Telstra Base Station at Regentville, small area of 12 x 7m west of Mulgoa Creek	No sites recorded within study area, but one open site recorded nearby.	According to McDonald 'the position of the site – i.e. in a saddle high above and some distance from permanent water is unusual in the local context – although slightly less so when taking into account similar types of environments slightly further afield' (McDonald 1997c:10).
Brayshaw 1999	Warragamba Dam Spillway additional spoil emplacement area, western side of Nepean River, approximately 3ha.	In common with an earlier survey of the spoil emplacement areas, no Aboriginal artefacts or sites were recorded.	'The survey indicates that there is unlikely to have been intensive use of the landscape within the boundaries of the study area' (Brayshaw 1999:6).

Reference	Study Area Location/Description	Results	Site distribution
Austral Archaeology Pty Ltd 2007	The study area lies just north of Mulgoa town. The study area is made up of two lots (Lot 1 DP 996994 & Lot 1 DP 1035490).	Five surface artefact scatters and two isolated artefacts were recorded.	Sites located in the northern lot close to the confluence of Littlefields Creek and Mulgoa Creek were considered to be more significant. Sites located in southern lot were less significant due to their dispersed nature and their location further away from the confluence of Littlefields and Mulgoa Creeks.
AMBS 2009	Relocation of sites located at Theresa Park, Sharpes and Wallacia weirs.	Relocation of three artefact scatters.	Located along the access tracks to Theresa Park Weir (lower slope), Sharpes Weir (floodplain) and Wallacia Weir (ridge).
Austral Archaeology Pty Ltd 2010	St Thomas' Church, Mulgoa	Pedestrian survey identified five artefact scatter containing 40 artefacts and two isolated artefacts.	All artefacts were identified from lower slopes within 100 metres of Littlefields Creek. Test excavations were recommended to further define the artefact scatter.
Austral Archaeology Pty Ltd 2013	Eastern Fernhill Mulgoa Precinct, Estate,	A total of 95 artefacts and 28 non-artefactual stone fragments recovered from 90 test pits.	The site contained a 'widespread but unevenly dispersed and extremely low density deposit of Aboriginal cultural heritage, interspersed with occasional higher density clusters' (Austral Archaeology 2013:95). Three specific areas of high artefact concentrations were identified located on low ridges overlooking a 2 nd order creek.
Australian Museum Consulting 2014	Crown Lands – Badgerys Creek and Luddenham	Pedestrian survey identified 23 Aboriginal cultural heritage sites. The survey had time constraints and the area was not fully surveyed.	Sites were in areas moderate and high archaeological potential. With the majority of sites being associated with minor and secondary creek tributaries.
Kayandel Archaeological Services 2017	Silverdale Road, North Silverdale	A pedestrian survey identified two isolated artefacts; one made from silcrete and one from white quartz.	The silcrete fragment was identified in an area of high modern disturbance and was considered unlikely to be <i>in situ</i> , while archaeological testing was recommended at the location of the second artefact (Kayandel 2017:64).

PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS IN THE STUDY AREA

The study area has been subject to only one previous Aboriginal archaeological assessment, which was undertaken by Austral Archaeology in 2019. Austral prepared ACHDDA for the study area (Austral Archaeology Pty Ltd 2019). The report found no listed sites within the study area, which was attributed to the lack of prior investigations of the study area rather than a lack of Aboriginal material. The study also identified multiple streams and creeks which pass through the study area that would have made the area conducive to Aboriginal settlement. The assessment recommended a walking survey to ground truth the findings of the assessment and disturbance present within the study area along with further investigation in the form of an ACHA.

3 LANDSCAPE CONTEXT

The natural environment of an area influences not only the availability of local resources, such as food or raw materials for artefacts, but also determines the likely presence and/or absence of various archaeological site types which may be encountered during a field investigation.

Resource distribution and availability is strongly influenced by the environment. The location of different site-types (such as rock-shelters, middens, open camp-sites, axe grinding grooves, engravings etc) are strongly influenced by the nature of soils, the composition of vegetation cover and the climatic characteristics of a region, along with a range of other associated characteristics that are specific to different land systems and bedrock geology. In turn this affects resource availability of fresh, drinking water, plant and animal foods, raw materials for stone tools, wood and vegetable fibre used for tool production and maintenance.

Therefore, examining the environmental context of an area is essential in accurately assessing potential past Aboriginal land-use practices and/or predicting site types and distribution patterns within any given landscape, cultural or not. The information that is outlined below is applicable for the assessment of site potential of the current study area.

3.1 GEOLOGICAL CONTEXT AND SOIL LANDSCAPE

GEOLOGICAL CONTEXT

The study area lies at the border of two different physiographic regions, with the Cumberland Lowlands (or Plains) in the east and the Blue Mountains Plateau in the west. The Cumberland Plains physiographic unit comprises low lying and gently undulating plains and low hills on Wianamatta Group shales and sandstones, with predominantly north-flowing water courses. The Blue Mountains Plateau consists of deeply incised Hawkesbury sandstone overlying Narrabeen sandstone, with occasional outcrops of the Narrabeen group on valley floors and rare volcanic intrusions. Wianamatta group shales and sandstones can occur as a thin capping on the eastern fringes of the plateau (Bannerman & Hazelton 2011, p.2).

The geology evident within the study area is made up of two geological units, this can be seen in Figure 3.1.

The first is **Q_a: Alluvium**, which is associated with Jerry's Creek that runs from south to north through the study area. This is described as unconsolidated grey to brown to beige, humic micaceous silty clay, with quartz, lithic silt, fine- to medium-grained quartz-rich to quartz-lithic sand, and sporadic lenses of polymictic pebble to cobble gravel (Colquhoun et al. 2019).

The rest of the study area is made up of **Twib: Bringelly Shale**. This is described as a mixture of shale, carbonaceous claystone, laminite, and lithic sandstone with rare pockets of coal (Colquhoun et al. 2019).

As can be seen above, the study area does not contain the necessary geology for stone tools to be quarried from within the site. As such any material found is likely to have been imported from another area and created or discarded within the study area.

SOIL LANDSCAPE

The study area itself lies on land associated with the Luddenham (**lu**) soil profile. The soil landscapes are summarised below and shown on Figure 3.2.

3.1.1 LUDDENHAM (LU) SOIL LANDSCAPE

The Luddenham (**lu**) soil landscape is an erosional landscape characterised by rolling to steep hills with relief of between 50 to 80 metres and slopes of between 5% and 20%, but generally averaging between 10% to 15%. Ridges are narrow and convex, often between 20 to 300 metres in width, with hillcrests which morph into moderately inclined slopes with narrow, concave drainage lines. The underlying geology is the Wianamatta group of Ashfield shale and Bringelly shale, but with fine to medium grained lithic sandstone from the Minchinbury sandstone type. Gully and rill erosion is common throughout the soil landscape, with sheet erosion occurring where topsoil removal has occurred (Bannerman & Hazelton 2011, pp.63–64).

The Luddenham soils consist of the following soils (from Bannerman & Hazelton 1990:63-64):

- *A loose dark brown loam (lu1) which occurs as a topsoil. A few small, shale fragments occur and roots are common in the top 100 millimetres, while charcoal fragments are rare.*
- *A brown, clay loam (lu2) with frequent shale rock fragments, charcoal fragments and roots.*
- *A strongly pedal clay (lu3) which varies in colour from brownish black to dark reddish brown. Shale rock fragments are common while roots are rare and charcoal fragments are absent.*
- *A mottled bright brown plastic clay (lu4) which occurs as a deep subsoil. Shale rock fragments and gravels are common, while roots are rare.*
- *An apedal brown sandy clay (lu5) with up to 10% inclusions of small, well-weathered shale fragments. All other inclusions are absent.*

The occurrences and relationships between these soils vary considerably, dependant on location. On crests, 100 millimetres of lu1 can overlie up to 400 millimetres of lu5, which lies directly on bedrock or, more rarely, lu4. Dependant on erosion, lu1 can be absent entirely. On the upper slopes, lu1 can be identified as a topsoil overlying lu2, lu3 and lu4, while on lower slopes eroded soils can form a greyish brown loam overlying lu5 and bedrock. In other examples, known sequences of the Luddenham soils can be lu2, lu5, lu3 and lu4 (Bannerman & Hazelton 2011, pp.63–64).

3.2 LANDFORMS

As can be seen in Figure 3.3, the study area exhibits a large range of elevation changes. The area around Jerry's Creek, which runs from the south to the north of the study area, is largely flat due to the area being alluvial flood zone. The area to the west of Jerry's creek sits on a hill slope with the slope increasing as one gets closer to the alluvial zone. Much the same can be said of the area immediately to the east of the alluvial zone. However, the slope evident on this side of the creek is much steeper. As such, the likelihood of Aboriginal cultural heritage existing close to the creek is unlikely to be high, as people were unlikely to have camped here knowing the risk of flood, or most of the evidence of any past short term settlement has been removed by flood waters.

To the east of the previous zone, the land reaches a height of about 48 metres AHD and begins to flatten onto a very gentle slope, with some minor undulations. This area is both dry and reasonably flat in some areas and is a suitable place for longer term settlements.

To the north of the gently sloping area the land slopes back down to the creek located along the north of study area. The slope is quite steep in some areas, and thus is quite unlikely to have been a place that was conducive to any settlement and would be more likely to have been a resource collection zone.

The very eastern section of the study area is mostly undulating hill slopes, however along the eastern boundary there exists multiple hill crests that could be conducive to settlement. These spots have a good view over the surrounding area and are dry and flat enough to establish a camp site.

The landforms described above are shown in Figure 3.4.

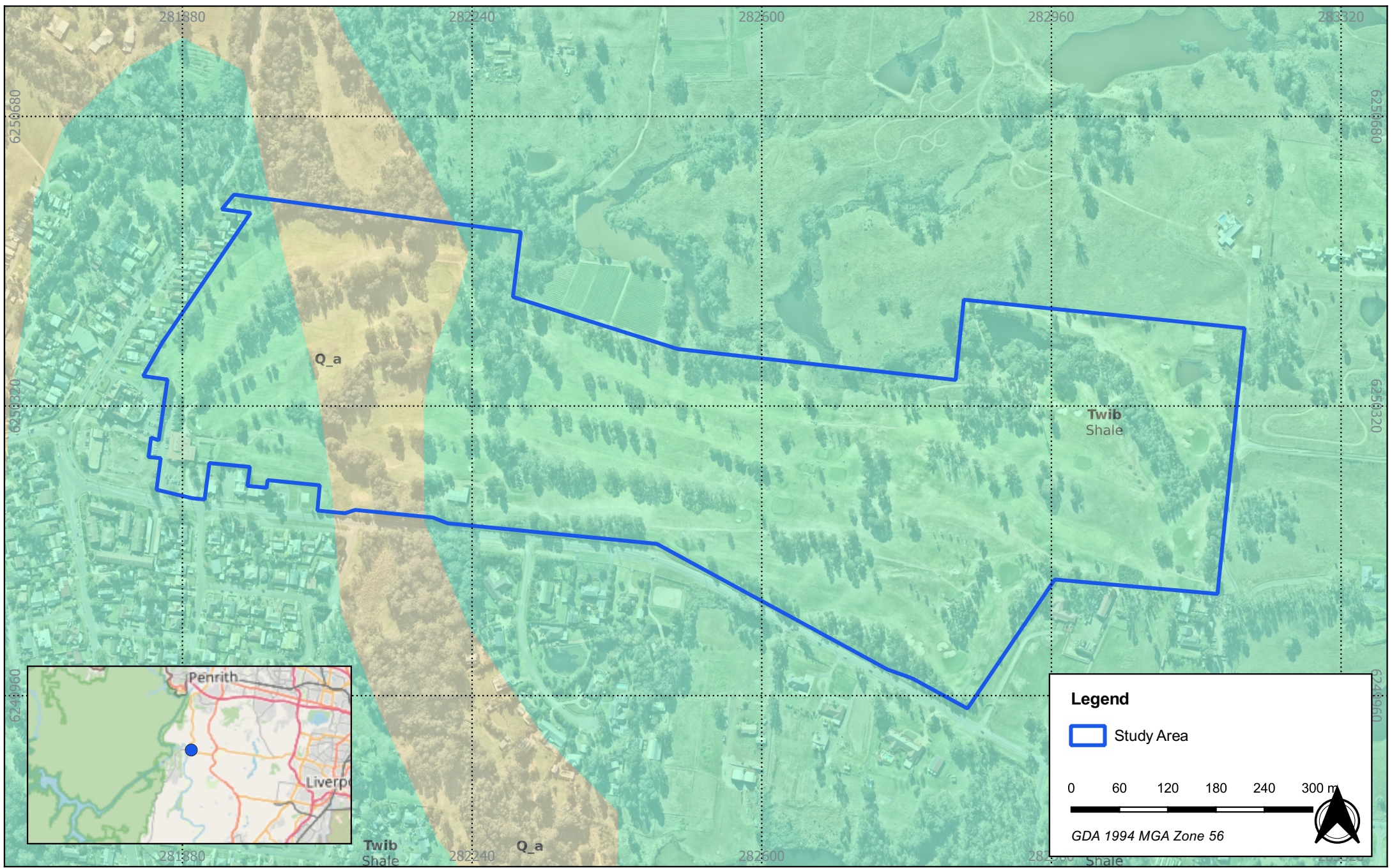


Figure 3.1 Geological landscapes associated with the study area

Nepean Gardens, Wallacia, NSW



A U S T R A L
ARCHAEOLOGY

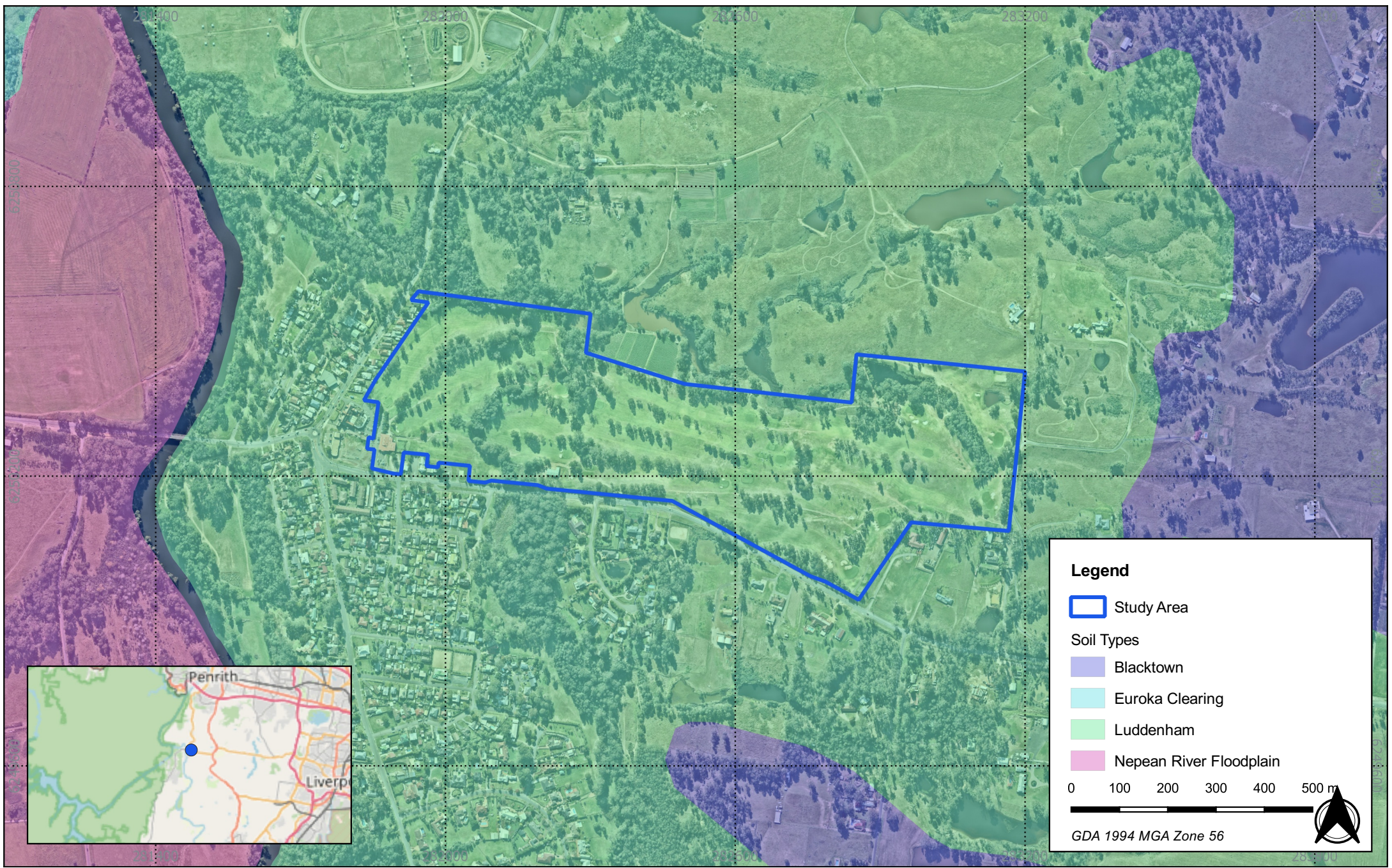


Figure 3.2 Soil Landscapes associated with the study area

Nepean Gardens, Wallacia, NSW

Source: OSM, Nearmap, Soil and Land Resources

Document ID: 49367

Version: 1, Version Date: 02/03/2021

Drawn by: WA Date: 2020-07-29



A U S T R A L
ARCHAEOLOGY

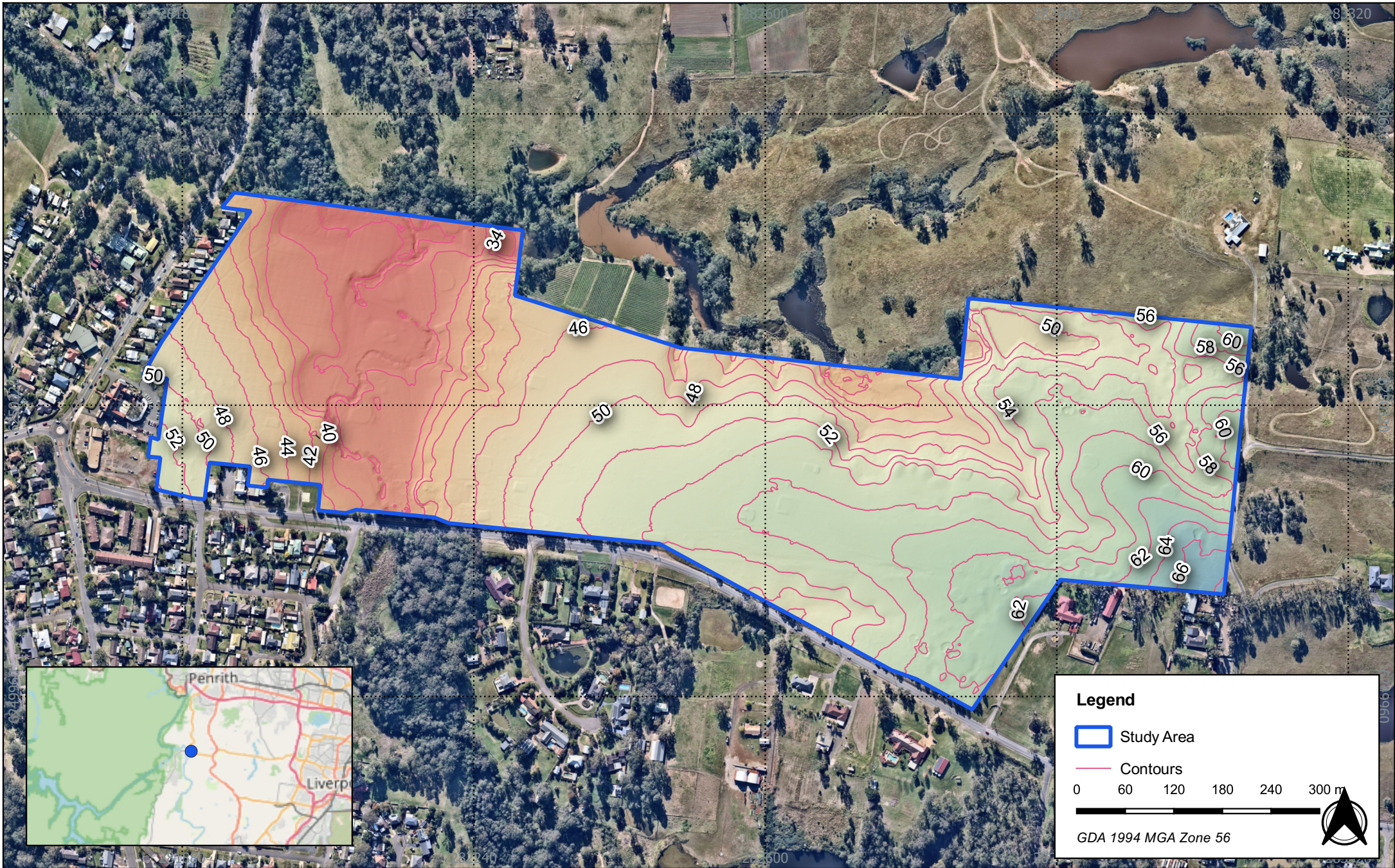


Figure 3.3 Detailed topography of the study area

Nepean Gardens, Wallacia, NSW



A U S T R A L
ARCHAEOLOGY

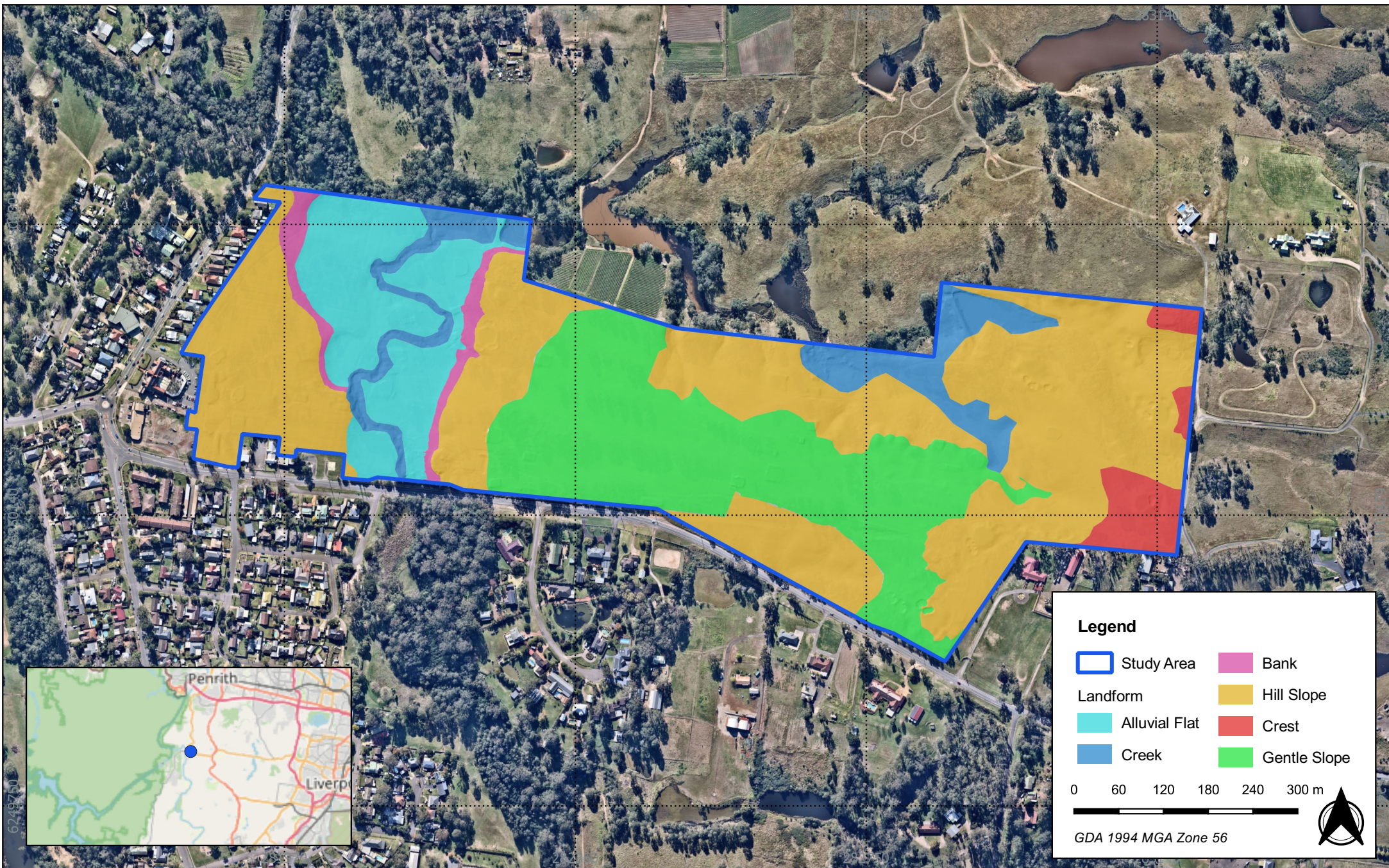


Figure 3.4 Landforms evident within the study area

Nepean Gardens, Wallacia, NSW



A U S T R A L
ARCHAEOLOGY

3.3 HYDROLOGY

The study area is located in the watershed of Jerry's Creek, which forms part of the Nepean-Hawkesbury River catchment along with the adjacent watersheds of Mulgoa Creek to the north-east and Duncan's Creek to the south (Figure 3.5).

The major watercourse in the vicinity of the study area is the Nepean River which flows approximately 400 metres west of the western boundary of the study area. While the Nepean River generally forms a deep, heavily forested gorge in the region, the river was fordable at Wallacia. The headwaters of the Nepean River rise near the town of Robertson on the western slopes of the Illawarra Escarpment, about 100 kilometres south of Sydney. The Nepean River flows northwards past Wallacia before turning westwards to join the Warragamba River and resuming its northwards flow to join the Grose River near Penrith, marking the point where the river changes its name to the Hawkesbury River. As the Hawkesbury River, it flows roughly north-east before it enters the sea approximately 50 kilometres north of Sydney at Broken Bay. The total length of the Nepean-Hawkesbury River from source to sea is about 265 kilometres.

Jerry's Creek is the major creekline in the local watershed and it passes through the western part of the study area as a 4th order stream. However, the creekline has been at least partially modified, as the creek enters an underground drain in order to pass below a fairway. The headwaters of Jerry's Creek lie predominantly to the south of the study area and the creek runs northwards before joining the Nepean River north of Wallacia. In the north-eastern corner of the study area is a lake which is formed through the damming of a 3rd order creek whose two 2nd order tributaries flow westwards through the north-eastern part of the study area. An unnamed 1st order drainage gully is also present in the northern part of the study area, flowing north-westwards to join the dammed creekline which then continues to flow westwards, re-entering the study area as a 4th order stream in the north-western corner before joining Jerry's Creek and flowing northwards out of the study area (Figure 3.5).

For the discussion on stream order relevance for archaeological site patterning, please refer to Section 2.1. One point to consider is that while stream order modelling focuses on predicting the likely year-round permanence of a water source, the Cumberland Lowlands physiographic region contains a dense pattern of drainage channels (Bannerman & Hazelton 2011, p.2). This means that while a 1st or 2nd order streams would normally be considered semi-perennial and 3rd and 4th order streams would be a permanent water source, several creeks in the vicinity of the study area are considered semi-perennial but are rated as 3rd or 4th order streams.

3.4 CLIMATE

The climate of Wallacia is temperate with cool winters and warm to hot summers (Bannerman & Hazelton 2011, pp.3–4). Average temperatures at the Badgerys Creek weather station, located approximately 10 kilometres to the east of the study area, are highest in January and can range from a daytime mean of 30.0°C to an overnight mean of 17.1°C. July is the coolest month with average daily temperatures of 17.4°C and mean overnight temperatures of 4.1°C (BOM 2017). The area lies within the rain shadow of the higher coastal plateaux that captures the prevailing south-east winds, thus the annual rainfall is considerably lower than Sydney to the east and the Blue Mountains to the west (Bannerman & Hazelton 1990, p. 3-4). The mean annual rainfall for Badgerys Creek is about 683 millimetres per year, mainly in summer, with rain occurring on an average of 68.6 days per year (BOM 2017).

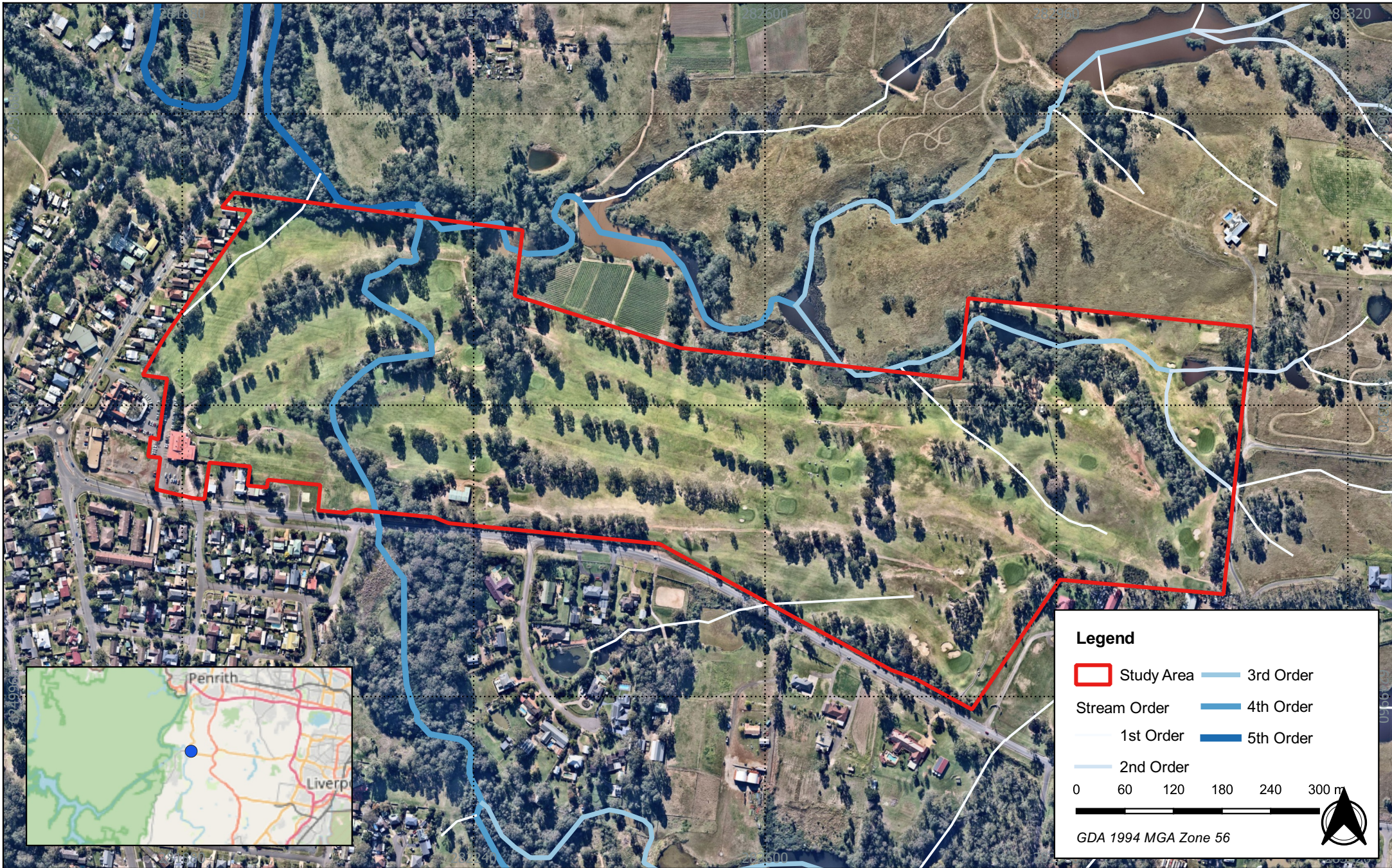


Figure 3.5 Hydrology associated with the study area

Nepean Gardens, Wallacia, NSW



AUSTRAL
ARCHAEOLOGY

3.5 FLORA AND FAUNA

Prior to the removal of the natural vegetation, the ecological diversity of the area would have provided a wide range of resources for Aboriginal people. Aboriginal people frequenting the study area would have exploited resources from the nearby Nepean River as well those within the smaller drainage lines such as Jerry's Creek.

The dominant native vegetation community in the region surrounding the study area is characterised as an 'Alluvial Woodland' (NSW National Parks and Wildlife Service 2002, Map 4). This forest community is predominantly found on watercourses draining through soils which derive from Wianamatta shale (National Parks and Wildlife Service 2002, p.41). Larger trees present within this vegetation community include cabbage gum (*Eucalyptus amplifolia*) and forest red gum (*E. Tereticornis*), with occasional occurrences of rough-barked apple (*Angophora floribunda*). Smaller trees can include Parramatta green wattle (*Acacia parramattensis* subsp. *parramattensis*), swamp she-oak (*Casuarina glauca*), and flax-leaved paperbark (*Melaleuca linariifolia*). A dense ground cover could include grasses such as Australian basket grass (*Oplismenus aemulus*), weeping grass (*Microlaena stipoides* var. *Stipoides*), bordered panic (*Entolasia marginate*) and forest hedgehog grass (*Echinopogon ovatus*), or herb species such as forest nightshade (*Solanum prinophyllum*), whiteroot (*Pratia purpurascens*) and *Commelina cyanea*. Although not as common, shrubs such as blackthorn (*Bursaria spinosa*) could also be present (NSW National Parks and Wildlife Service 2002).

Additional species present within the Nepean Gorge also include blackbutt (*E. deanei*), river oaks (*Casuarina cunninghamiana*) and red cedar (*Toona australis*) (Benson & Howell 1990, p.84).

The study area has been predominantly cleared of vegetation, although copses of trees are present along the course of Jerry's Creek, in the vicinity of the dam in the north-east corner of the study area and adjacent to various fairways throughout the golf course. However, the majority of the vegetation within the study area, excluding the trees lining Jerry's Creek, were planted in the latter part of the 20th century and are not shown on an aerial photograph dating from 1955.

The study area and its nearby surroundings would have provided habitats for the usual variety of macropods found in the Cumberland Plain, while the rivers and creeks would provide access to addition faunal resources such as fish species, a range of water birds and a variety of lizards. The Atlas of NSW Wildlife identifies 232 native species having been recorded within 10 kilometres of the study area. This is broken down into 34 mammals, 157 birds and 41 reptiles, amphibians and insects (OEH 2017). A large number of these species would have been hunted by Aboriginal people, including macropods such as the eastern grey kangaroo (*Macropus giganteus*), possums such as the common ringtail possum (*Pseudocheirus peregrines*), and myriad other species of bats, birds, and snakes (Attenbrow 2002, pp.70–76).

3.6 PAST LAND USE PRACTICES

The early settlement and economy of the Cumberland Plain relied heavily on farming and agriculture. Following the large-scale clearance of native vegetation, the Wallacia region and surrounds gained a reputation for producing abundant crops of wheat and other cereals.

The study area formed part of John Blaxland's grant in 1813, and the land within the study area was primarily used for agricultural purposes. The land continued to be utilised for farming practices, including animal grazing, until the early 20th century.

In 1932, the study area functioned as a golf course following the establishment of the Wallacia Golf Course. The study area continues to be used as a golf course until the present day.

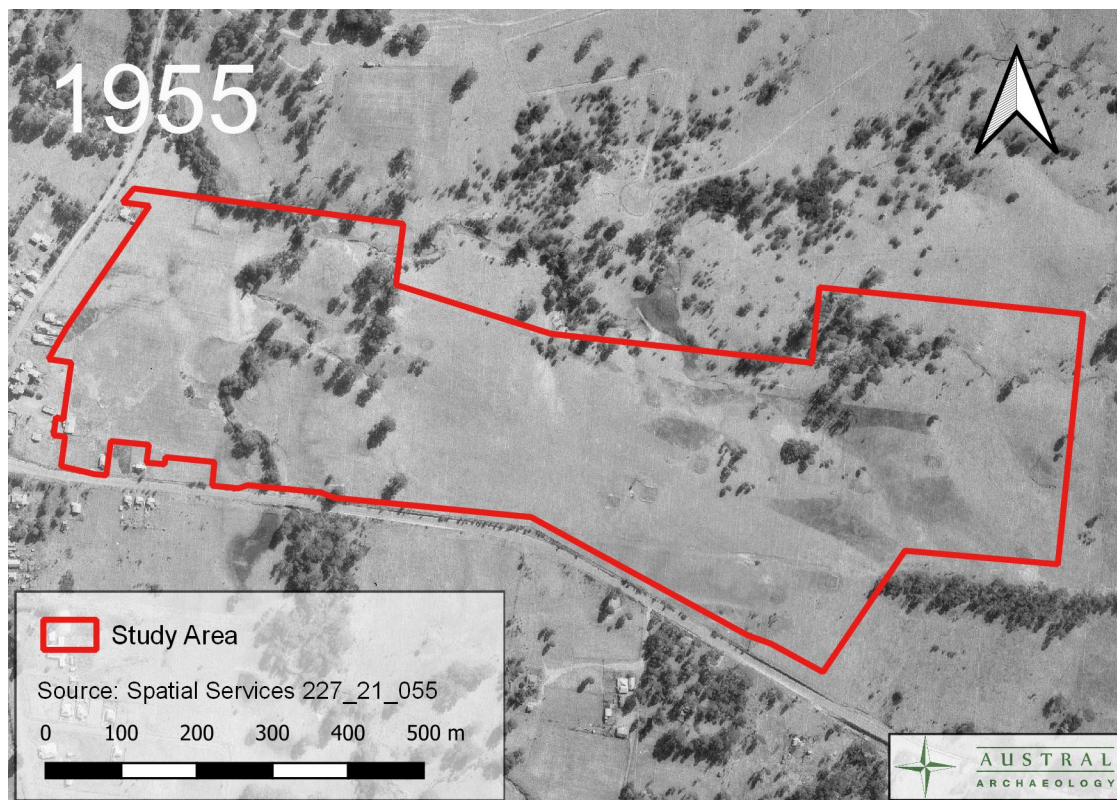


Figure 3.6 1955 Historic Aerial

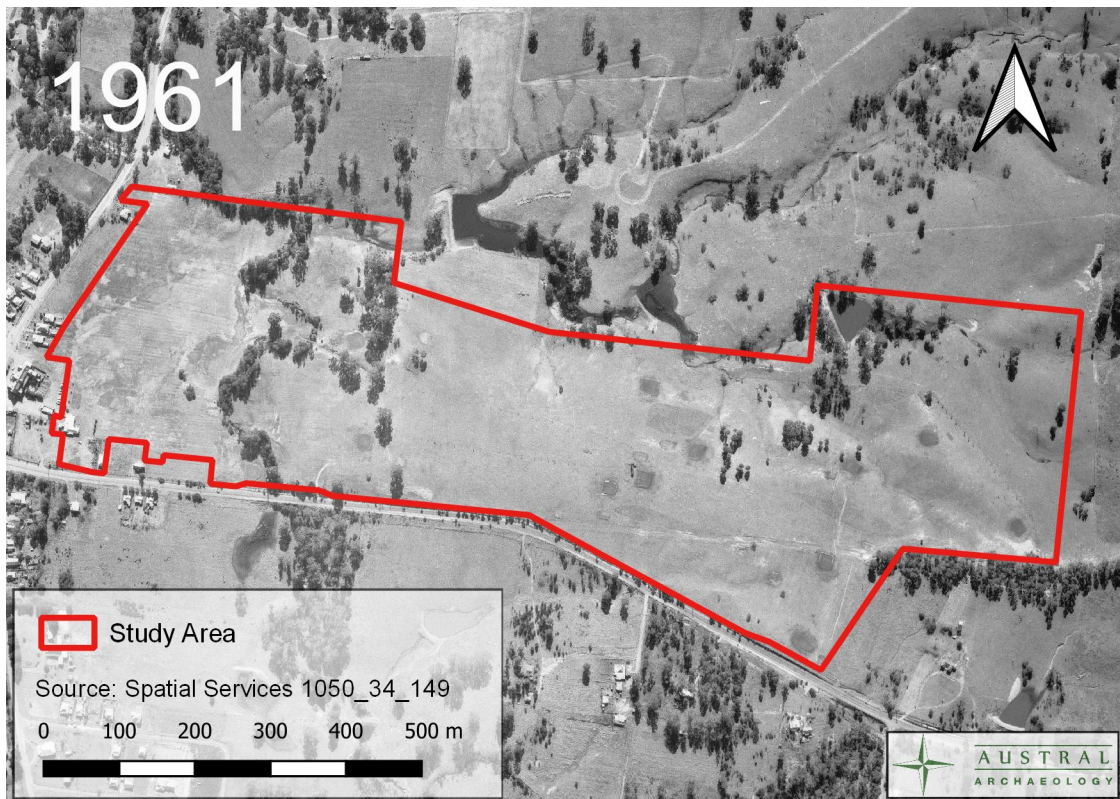


Figure 3.7 1961 Historic Aerial

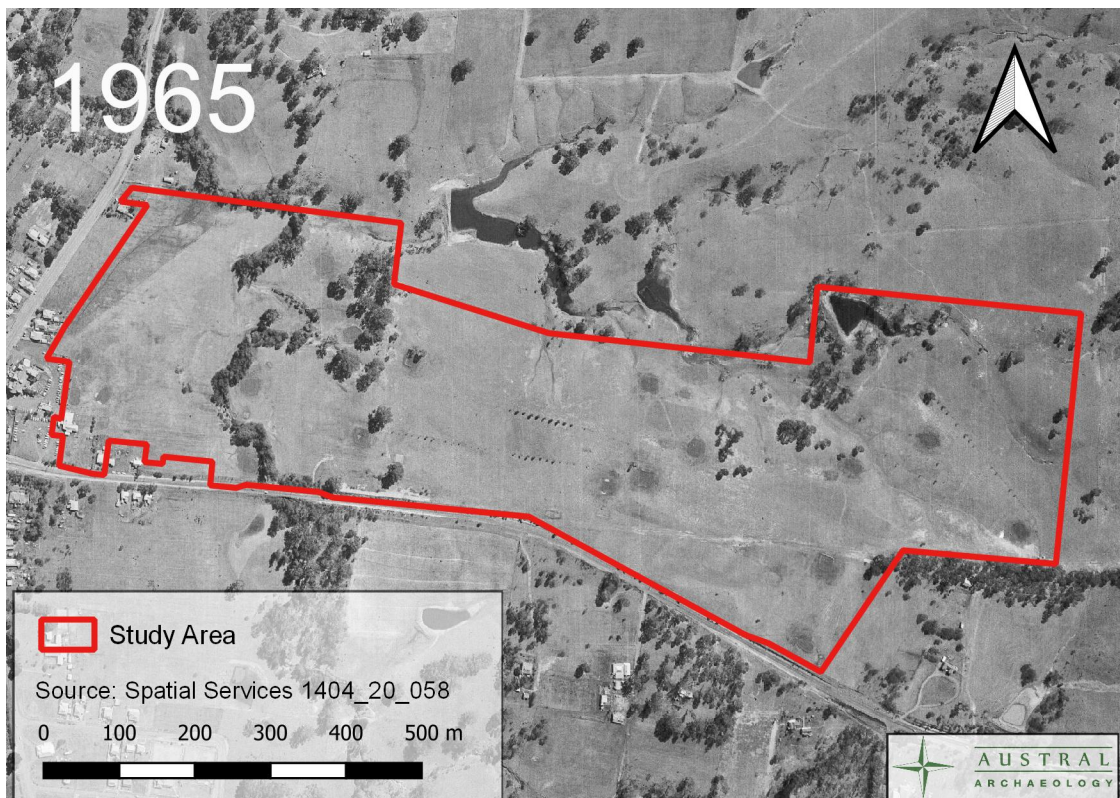


Figure 3.8 1965 Historic Aerial

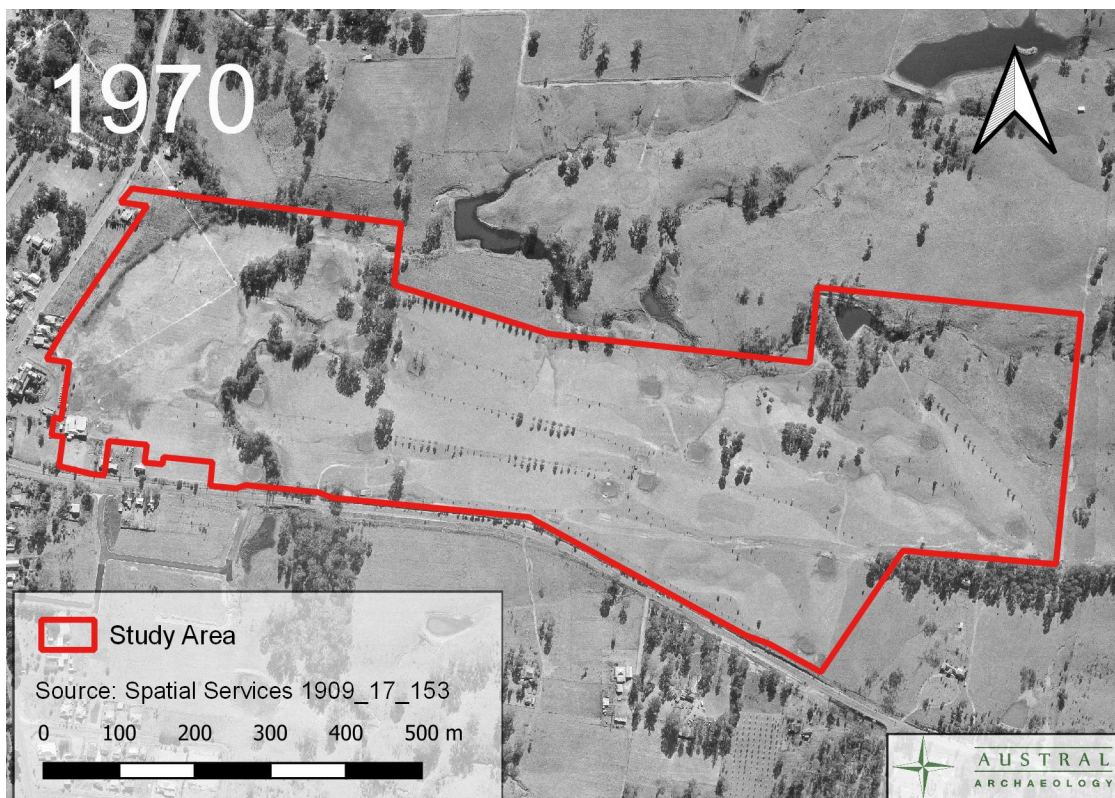


Figure 3.9 1970 Historic Aerial

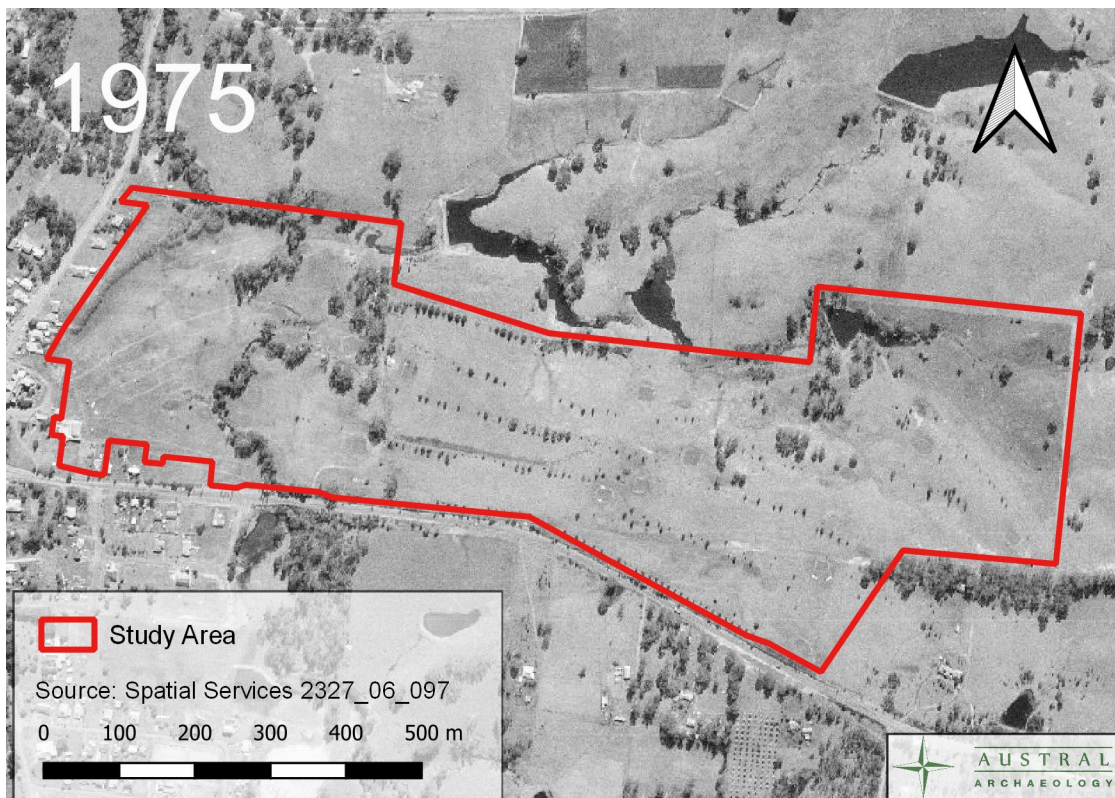


Figure 3.10 1975 Historic Aerial



Figure 3.11 1978 Historic Aerial

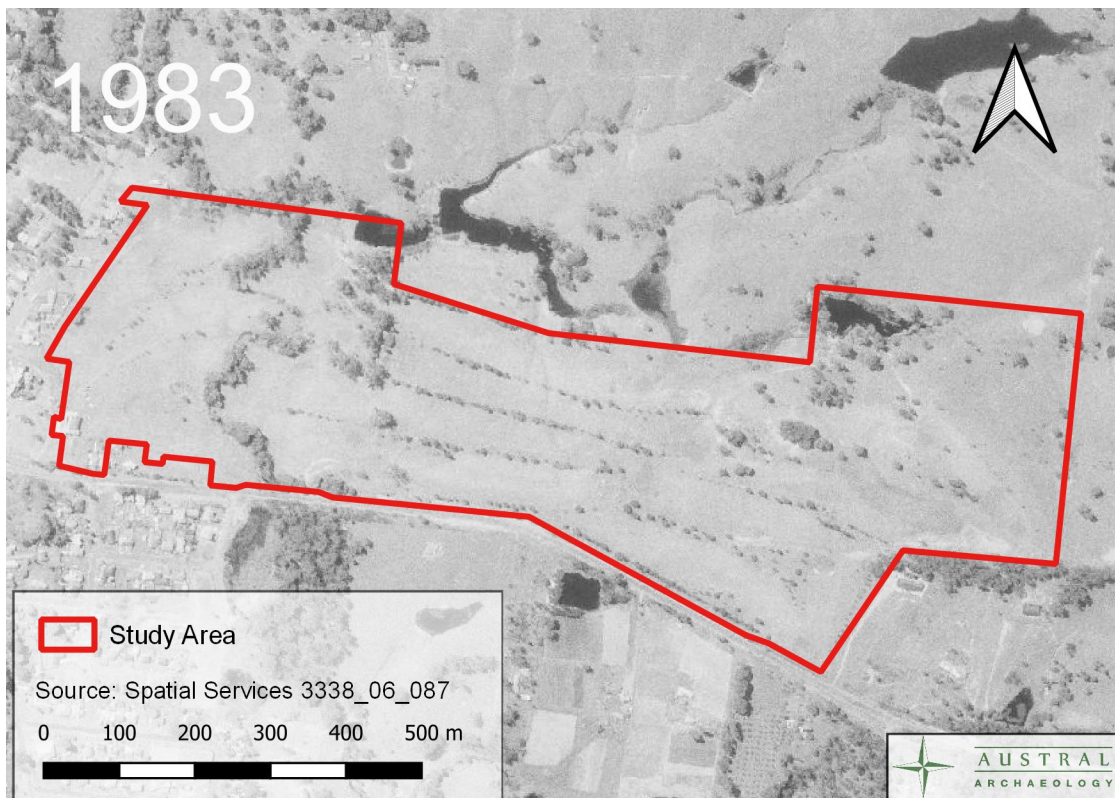


Figure 3.12 1983 Historic Aerial



Figure 3.13 1986 Historic Aerial



Figure 3.14 1991 Historic Aerial



Figure 3.15 1994 Historic Aerial



Figure 3.16 1998 Historic Aerial



Figure 3.17 2002 Historic Aerial

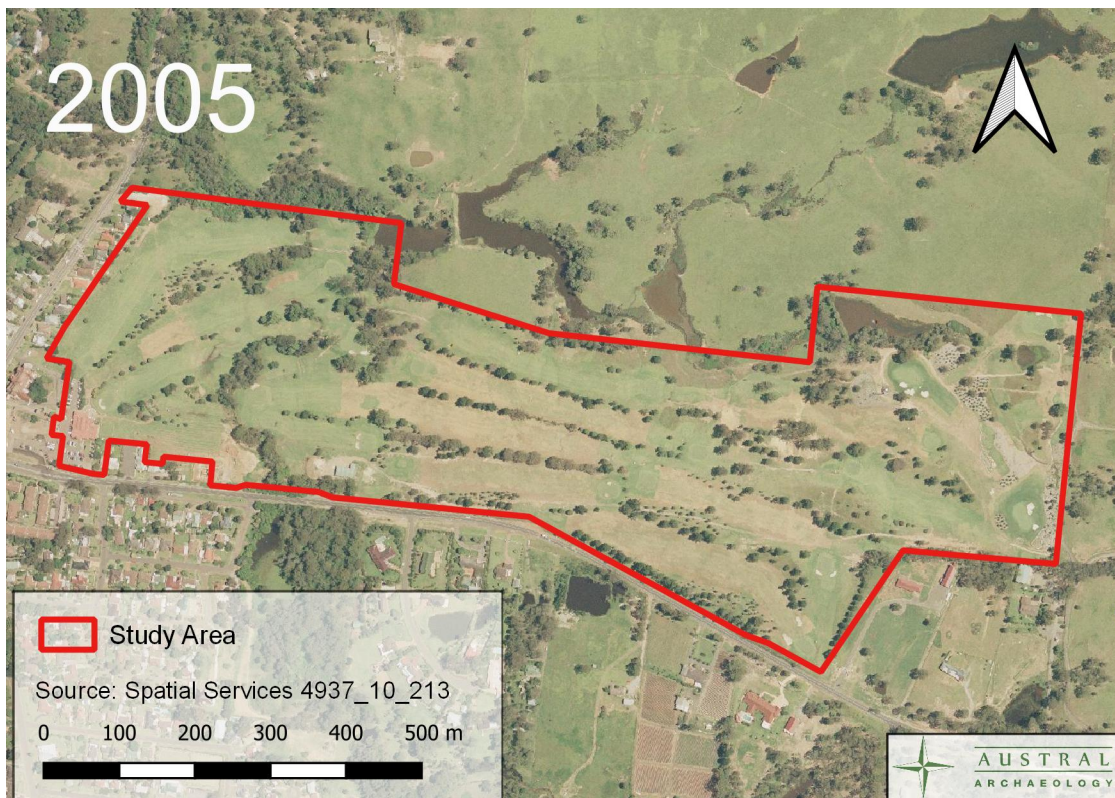


Figure 3.18 2005 Historic Aerial



Figure 3.19 2009 Historic Aerial



Figure 3.20 2015 Historic Aerial

3.7 POTENTIAL LAND USE IMPACTS ON THE ARCHAEOLOGICAL RESOURCE

The main impacts on the subject land relate to the past use of the study area.

Land clearance would have resulted in soil disturbance and as a result, the archaeological resource is likely to have been affected to some degree by this activity. However, this is likely to have resulted in localised artefact displacement rather than widespread destruction of Aboriginal cultural heritage.

Later occupation within the study area would have impacted the existing landscape in a number of ways, resulting in artefact displacement and destruction. These activities include substantial clearing of the study area, construction of numerous buildings including homesteads, associated outbuildings and sheds, as well as major landscaping works for the construction of the golf course.

The past land uses of the subject land and their potential impact on archaeological resources are summarised in Table 3.1 below.

Table 3.1 Summary of past land uses within the study area

Past land uses	Potential impacts on archaeological resources
Historical vegetation clearance	The potential loss of scarred trees from the subject land as well as substantial erosion.
Construction of buildings	Significant ground disturbances within the footprint of the building, leaving to the potential disturbance distribution or destruction of artefacts and other subsurface Aboriginal cultural heritage.
Landscaping works for the construction of the golf course	Major clearing and manipulation of the ground surface leading to the potential disturbance and dispersal of ground artefact scatters.

4 PREDICTIVE STATEMENT

In general, an archaeological predictive statement on any study area draws on surrounding environmental data, previous archaeological research and predicative models for Aboriginal occupation. Another essential aspect to predicting the archaeological integrity of a site and something that must be considered is previous land uses and the degree of disturbance across the study area. These are addressed in the following sections.

4.1 ABORIGINAL PREDICTIVE MODELLING

The moderate climate of the Cumberland Plain and its location within the wider Nepean River catchment is likely to have been conducive to Aboriginal occupation in the past. The study area lies within a resource base associated primarily with the Jerry's Creek watercourse, itself a tributary of the Nepean River. Habitats associated with the river would have supported a wide range of animals, fish, birds and mammals.

Due to the environmental setting, the Nepean River landscape would have been subject to a variety of human activities. This primarily would have been due to the presence of permanent water sources, followed by the sheltered camping locations and good resources availability in the immediate area. Activities would have included camping, hunting, gathering, cooking, ceremonies, and other cultural activities associated with semi-permanent settlement sites in the region. Some of these activities, mainly stone tool knapping, are seen in the archaeological record.

In predicting site types within the study area, one would expect to find surface isolated artefacts and scatters on the ground surface of sensitive landforms, scarred trees in areas of remnant native vegetation, and grinding grooves on sandstone rock surfaces and platforms where available. Locations of likely site recordings predictably may occur in areas of high ground visibility such as around dams, the base of trees, tracks and around the disturbances of the building constructions. Surface sites will probably not be visible in the vast majority of the site as it is currently a combination of grassed spaces and areas covered with leaf litter.

If stone tools are recorded they are likely to conform to other known sites in the region. This means that tools are likely to be from a late Holocene occupation with stone technologies attributed to the Bondaian phase of the Eastern Regional Sequence. If stone tools are present on site they will predictably be made from chert, silcrete, or quartz sourced from local quarries. These sites may be the results of activities attributed to people of the Darug language or, less certainly, to the Gundungurra language groups.

In summary, the main trends broadly seen across the Cumberland Plain are that:

- Archaeological sites have the potential to occur on most landforms.
- Site frequency and density are dependent on their location in the landscape.
- There is a constant, or background, presence of low density surface open artefact scatters and isolated finds.
- There is a paucity of scarred trees due to land clearance.
- Aboriginal scarred trees may still be present in areas where remnant old growth vegetation exists, however these are relatively rare on the Cumberland Plain.
- Artefact scatters are commonly located in close proximity to permanent water sources along creek banks, alluvial flats and low slopes, largely concentrated within the first 100 metres of the creekline. More complex sites are usually located close to water sources with major confluences being key locations for occupation sites. Subsurface testing across the Cumberland Plain has established that archaeological material is also present beyond the immediate creek surrounds in decreasing artefact densities.
- Fewer sites occur on ridge tops and crests.
- Subsurface archaeological deposits often exist in areas where no visible surface archaeological remains are evident.

- The dominant raw material used in artefact manufacture is silcrete and fine grained siliceous material with smaller quantities of chert, quartz and volcanic stone seen.
- Artefact assemblages usually comprise a small proportion of formal tool types with the majority of assemblages dominated by flakes and Angular fragment.
- While surface artefact scatters may indicate the presence of subsurface archaeological deposits, surface artefact distribution and density may not accurately reflect those of subsurface archaeological deposits.
- PADs are most likely to occur along valley floors and low slopes in well-drained areas.
- Aboriginal occupation along the Nepean River is focussed around rock shelters.

As a result of these statements, it is reasoned that undisturbed areas within the Cumberland Plains are considered archaeologically and culturally sensitive, with frequent Aboriginal sites in the vicinity.

The general studies of the Cumberland Plains and the Nepean River region, the specific investigations surrounding the study area and the search of the AHIMS database have helped to predict what site types can be expected to occur within the study area. Specifically, the analyses undertaken by McDonald and White (2010) at Rouse Hill in relation to artefact distribution and density have assisted in further modifying these predictions. Based on the results of McDonald and White with regards to site density in relation to stream orders, the following predictive model is offered for the study area:

- Higher artefact densities are likely to occur within a zone of 51 to 100 metres from a 4th order stream, within 25 to 50 metres of a 2nd order stream, with a negligible number of artefacts found in association with a 1st order creek;
- McDonald and White did not have sufficient data to determine the likely distance of higher artefact densities from a 3rd order stream. However, by extrapolating the results from 2nd and 4th order creeks, an assumed zone of between 25 to 75 metres has been applied to 3rd order creeks; and
- Higher densities of artefacts occur on terraces and lower slopes, especially those facing north or north-east, with sparse, discontinuous scatters on upper slopes. As such, the remainder of the site may contain the standard disparate remnants which are common across the landscape.

In summary, the following statements outline the likelihood for various types of Aboriginal cultural material being present in the study area:

- Surface open camp sites or isolated finds of flaked or ground stone are likely to be present in areas associated with higher order streams and creeklines such as Jerry's Creek.
- PADs are likely to be present, but their identification is dependent on the correct recognition of an area with an absence of historical disturbance situated within a residual soil profile, such as the Blacktown (bt) profile present in the western portion of the study area;
- Scarred trees have a low probability of being present due to the widespread vegetation clearance in the study area, although old growth vegetation which may contain scar trees are present along the banks of Jerry's Creek;
- Grinding Grooves are unlikely to be present due to a lack of suitable requirements (i.e. exposed bedrock near to a water source);
- Burials are unlikely to be present, due the lack of sandy locations suitable for inhumation;
- Ceremonial grounds are unlikely to be present due to their general rarity within New South Wales;
- Rockshelter sites are unlikely to be present due to the lack of suitable rocky outcrops in the study area;
- Shell middens are unlikely to be present due to the distance from a permanent and deep water source; and,

- Stone arrangements are unlikely to be present due to their general rarity within New South Wales.

5 ABORIGINAL ARCHAEOLOGICAL SURVEY

5.1 SURVEY METHODOLOGY

The specific survey methodology developed for this assessment was guided by the survey requirements as set out in the CoP. The survey methodology was designed to optimise the investigation of areas where archaeological materials may be present and visible, as well as investigation of the broader archaeological potential of the study area. The field inspection of the study area therefore paid close attention to areas of favourable landform conditions.

The key survey variables of ground visibility, which considers the amount of ground surface which is visible and not covered by any vegetation; and exposure, which defines areas where dispersed surface soils and vegetative matter afford a clear assessment of the ground, were assessed across the study area and within each landform element. Overall survey coverage and calculated survey effectiveness was recorded. Note that the effectiveness of the field survey was largely dependent on the degree of ground surface visibility.

5.2 SURVEY RESULTS

An archaeological survey of the study area was undertaken on 7 July 2020 by David Marcus (Director, Austral) and William Andrews (Graduate Archaeologist, Austral). For the purpose of recording the survey results, each landform within the study area was examined as a separate survey unit.

The survey identified varying degrees of impacts as having occurred within the study area. These impacts could be categorised into those relating to the clubhouse, the use and maintenance of the golf course, and the construction of services and associated infrastructure.

In general, areas surrounding the trees, greens and bunkers on holes were highly disturbed and associated with varying degrees of landscaping involving both excavation and dumping of soil (Figure 5.1, Figure 5.2, and Figure 5.3). Elsewhere within the study area was evidence of excavation for underground services, identified through the presence of manhole covers (Figure 5.4), and the construction of infrastructure such as pathways for the use of golfers (Figure 5.5). Widespread sheet erosion of topsoil, typical of the Luddenham (lu) soil profile (c.f. Section 3.1.1) was also present adjacent to a number of watercourses within the study area (Figure 5.6, Figure 5.7). Additional disturbances present in the study area included the construction of the clubhouse (Figure 5.8) and the surrounding clubhouse (Figure 5.9).



Figure 5.1 North-west facing view showing green, with bunker and surrounding landscaping (1m scale).



Figure 5.2 East facing view showing green and associated landscaping in background (1m scale).



Figure 5.3 South-east facing view showing landscaping on ridgeline (1m scale)



Figure 5.4 North-east facing view showing manhole cover (1m scale).



Figure 5.5 North facing view showing constructed pathways (1m scale).



Figure 5.6 East facing view showing repeated erosion on path and within gully (1m scale).



Figure 5.7 North facing view showing widespread sheet erosion on hill slope (1m scale).



Figure 5.8 West facing view showing clubhouse (1m scale).



Figure 5.9 South facing view showing carpark adjacent to clubhouse (1m scale).

The topography of the study area varied considerably and incorporated 6 different landforms, which were generally divided by Jerrys Creek. The western part of the study area consisted of a hillslope which was generally flatter in the vicinity of the clubhouse, but sloped eastwards and north-eastwards down towards Jerrys Creek (Figure 5.10, Figure 5.11 and Figure 5.12). Either side of the creek, the topography consisted of a steep section of bank dropping down to an alluvial flat (Figure 5.13). The eastern part of the study area consisted predominantly of hillslopes which were highest in the south-eastern corner of the site, and dropped westwards towards Jerrys Creek, and north-westwards (Figure 5.14, Figure 5.15), towards an area of gullies and alluvial flats present along the northern and central part of the site (Figure 5.16, Figure 5.17).



Figure 5.10 North-east facing view showing gentle slope towards Jerrys Creek (1m scale).



Figure 5.11 South facing view showing west to east slope of hillslope (1m scale).



Figure 5.12 North-east facing view showing slope down towards Jerrys Creek (1m scale).



Figure 5.13 South facing view showing alluvial flats adjacent to Jerrys Creek (1m scale).



Figure 5.14 East facing view looking upslope on gentle hillslope (1m scale).



Figure 5.15 East facing view looking upslope along southern boundary of site (1m scale).



Figure 5.16 East facing view showing gullies along northern study area boundary (1m scale).



Figure 5.17 West facing view showing gullies and undulating landscape along northern boundary (1m scale).

In general, visibility was poor across the entirety of the study area, with much of the study area consisting of thick, well-maintained grass (c.f. Figure 5.1 and Figure 5.15). Exposures were limited to areas of paths (Figure 5.18), patches of erosion on fairways (Figure 5.19), near to alluvial gullies (Figure 5.16), and below areas of trees (Figure 5.12 and Figure 5.14). Where the soil profile was visible (Figure 5.20 and Figure 5.21), it consisted of the typical profile expected of Luddenham (lu) soils, with an eroded lu1 soil overlying lu2 and lu3.



Figure 5.18 East facing view showing vehicle track and footpath (1m scale.)



Figure 5.19 South facing view showing area of erosion on fairway (1m scale).



Figure 5.20 Typical soil profile within exposure (1m scale).



Figure 5.21 Second example of soil profile within exposure (1m scale).

The pedestrian survey identified a total of 5 artefacts. Two of these artefacts, a brown chert flake measuring 60 millimetres by 20 millimetres by 20 millimetres (Figure 5.22) and a red chert flake with cortex measuring 45 millimetres by 32 millimetres by 12 millimetres (Figure 5.23) were identified on the track leading from the clubhouse eastwards to Jerrys Creek at the location shown in Figure 5.8. These two artefacts have been designated 'Wallacia Golf Course AS1'. Two additional artefacts, a flake of banded chert measuring 55 millimetres by 43 millimetres by 8 millimetres (Figure 5.24) and a banded chert flake measuring 44 millimetres by 38 millimetres by 12 millimetres (Figure 5.25) were identified on the eastern side of Jerrys Creek, near the break of slope from the hillslope to the alluvial flat in the northern part of the site (Figure 5.26). These two artefacts have been designated 'Wallacia Golf Course AS2'. A single artefact was also found on an area of raised ground overlooking a drainage gully in the northern part of the site in an area of erosion below a green (Figure 5.27). This artefact consisted of a small silcrete flake measuring 32 millimetres by 25 millimetres by 12 millimetres, and is designated 'Wallacia Golf Course IF1'. The survey also confirmed the presence of areas of PAD within the study area relating to the hillslopes present either side of Jerrys Creek and along the northern boundary of the study area.



Figure 5.22 Artefact 1 from Wallacia Golf Course AS1.



Figure 5.23 Artefact 2 from Wallacia Golf Course AS1.



Figure 5.24 **Artefact 1 from Wallacia Golf Course AS2.**



Figure 5.25 **Artefact 2 from Wallacia Golf Course AS2.**



Figure 5.26 West facing view showing location of Wallacia Golf Course AS2 (1m scale).



Figure 5.27 East facing view showing location of Wallacia Golf Course IF1.

Table 5.1 Survey Coverage

Survey Unit	Landform	Survey unit area (m ²)	Visibility (%)	Exposure (%)	Effective Coverage area (m ²)	Effective Coverage (%)
1	Alluvial Flat	54,179	2	5	54	0.09
2	Creek	13,204	20	40	1,056	8
3	Bank	16,040	2	5	16	0.09
4	Gullies	54,923	10	20	1,098	2
5	Hillslope	305,973	1	2	61	0.02

Table 5.2 Landform Summary

Landform	Landform area (m ²)	Area effectively surveyed (m ²)	% of landform effectively surveyed	Number of sites	Number of artefacts or features
1	54,179	Alluvial Flat	54	0	0
2	13,204	Creek	1,056	0	0
3	16,040	Bank	16	0	0
4	54,923	Gullies	1,098	0	0
5	305,973	Hillslope	61	3	5

6 IMPACT ASSESSMENT

This section outlines, according to Heritage NSW guidelines, the potential harm that the proposed activity may have on identified Aboriginal objects and places within the study area (OEH 2011b, DECCW 2010a).

6.1 ASSESSING HARM

This section outlines the assessment process for addressing potential harm to Aboriginal objects and/or places within the study area, as outlined by Heritage NSW (OEH 2011b, p.12).

6.1.1 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

An objective of the NPW Act, under Section 2A(1)(b)(i) is to conserve '*places, objects and features of significance to Aboriginal people*' through applying the principles of ecologically sustainable development (ESD) (Section 2A (2)). ESD is defined in Section 6(2) of the *NSW Protection of the Environment Administration Act 1991* as '*...the effective integration of social, economic and environmental considerations in decision-making processes*'. ESD can be achieved with regards to Aboriginal cultural heritage, by applying the principle of inter-generational equity, and the precautionary principle to the nature of the proposed activity, with the aim of achieving beneficial outcomes for both the development and Aboriginal cultural heritage.

INTERGENERATIONAL EQUITY

The principle of intergenerational equity is where the present generation ensures the health, diversity and productivity of the environment for the benefit of future generations. The Department of Environment and Climate Change (DECC), now Heritage NSW, states that in terms of Aboriginal cultural heritage 'intergenerational equity can be considered in terms of the cumulative impacts to Aboriginal objects and places in a region. If few Aboriginal objects and places remain in a region (for example, because of impacts under previous AHIPs), fewer opportunities remain for future generations of Aboriginal people to enjoy the cultural benefits of those Aboriginal objects and places.' (DECC 2009, p.26).

The assessment of intergenerational equity and understanding of cumulative impacts should consider information about the integrity, rarity or representativeness of the Aboriginal objects and/or places that may be harmed and how they illustrate the occupation and use of the land by Aboriginal people across the locality (DECC 2009, p.26).

Where there is uncertainty over whether the principle of intergenerational equity can be followed, the precautionary principle should be applied.

PRECAUTIONARY PRINCIPLE

Heritage NSW defines the Precautionary Principle as 'if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation' (DECC 2009, p.26).

The application of the precautionary principle should be guided through:

- A careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment.
- An assessment of the risk-weighted consequences of various options.

DECC (2009, p.26) states that the precautionary principle is relevant to the consideration of potential impacts on Aboriginal cultural heritage, where:

- The proposal involves a risk of severe or irreversible damage to Aboriginal objects and/or places or the value of those objects and/or places.
- There is uncertainty about the Aboriginal cultural heritage values, scientific, or archaeological values, including in relation to the integrity, rarity or representativeness of the Aboriginal objects or places proposed to be impacted.

Where either of the above is likely, a precautionary approach should be taken and all effective measures implemented to prevent or reduce harm to Aboriginal cultural heritage values.

6.1.2 TYPES OF HARM

When considering the nature of harm to Aboriginal objects and/or places, it is necessary to quantify direct and indirect harm. The types of harm, as defined in the Guide (OEH 2011b, p.12), and are summarised in Table 6.1. These definitions will be used to quantify the nature of harm to identified Aboriginal objects and/or places that have been identified as part of this assessment. The Code states that the degree of harm can be either total or partial (DECCW 2010b, p.21).

Table 6.1 Definition of types of harm

Type of harm	Definition
Direct harm	May occur as the result of any activity which disturbs the ground including, but not limited to, site preparation activities, installation of services and infrastructure, roadworks, excavating detention ponds and other drainage or flood mitigation measures, and changes in water flows affecting the value of a cultural site.
Indirect harm	May affect sites or features located immediately beyond, or within, the area of the proposed activity. Examples of indirect impacts include, but are not limited to, increased impact on art in a shelter site from increased visitation, destruction from increased erosion and changes in access to wild food resources.

6.2 PROPOSED WORKS

The proposed works within the study area are mainly concerned with the redevelopment of the eastern half of the study area from a golf course to a proposed cemetery, which will include 27,000 burial plots, a chapel, administration building, internal roads, parking areas and amended access from Park Road.

The golf course will be configured to include 9 holes, a new pool, gym, putting and bowling greens, and alterations and additions to Wallacia Golf Club.

Other works will also include tree removal and landscaping, fencing, civil and stormwater works and new intersection works along Park Road.

It is understood that the construction works will involve:

- Large scale groundworks including extensive earth work, subsurface excavation and levelling.
- Construction of roadways, pathways, buildings related to the funerary services
- Installation of associated services including stormwater, sewerage and electrical services.
- Associated landscaping works and tree removal.

6.3 PREDICTED IMPACT ON THE POTENTIAL ARCHAEOLOGICAL RESOURCE

In accordance with the key aims of the testing programme, the nature and extent of the archaeological deposit is yet to be characterised. While a full impact assessment will be undertaken once the full extent of Aboriginal heritage within the study area is known, at present, it is understood that the proposed works are likely the following impacts:

Table 6.2 Predicted impact to identified sites within the study area

Site Number	Type of Harm	Degree of Harm	Consequence of Harm
Pending (Wallacia Golf Course AS1)	Direct	Total	Total loss of value
Pending (Wallacia Golf Course AS2)	Direct	Total	Total loss of value
Pending (Wallacia Golf Course IF1)	Direct	Total	Total loss of value

Wallacia Golf Course & Memorial Park Masterplan

PARK ROAD, WALLACIA



Figure 6.1 Site Plan associated with the Study Area (plan provided by the proponent)

7 AVOIDING AND MINIMISING HARM

7.1 CUMULATIVE IMPACTS AND OPTIONS TO AVOID HARM

The Guide to Reporting requires this ACHA to consider the effects of cumulative impacts under the principles of Economically Sustainable Development. In essence, this requires the acknowledgement that while a single development might have a minimal impact, it forms part of a slow urbanisation process which results in the widespread loss of environmental and cultural resources.

The study area forms part of part of the Cumberland Plain, where impacts to sites of potential Aboriginal cultural heritage have often been considered. Much of the surrounding area was previously farmland overlooking the Nepean River which has been converted to either residential subdivisions or utilised as public spaces. As such, most of the area was relatively untouched by human development, with agricultural processes having limited effects on the Aboriginal cultural material that is likely to be present in the area. Although many studies have been undertaken, it is still necessary for development works along the Cumberland Lowlands to undergo an assessment as there is still a great deal that is not understood or known about the people who lived in the area for tens of thousands of years before European settlement. This is doubly important as once development begins, all evidence of the past is removed.

It is therefore considered that the cumulative impacts on Aboriginal heritage within the study area are moderate.

7.2 MANAGEMENT AND MITIGATION STRATEGIES

A program of archaeological testing is recommended in order to fully determine the nature and extent of cultural heritage present within the study area.

Following the implementation of the testing program, it will be possible to prepare management and mitigation strategies.

8 RECOMMENDATIONS

The following recommendations have been developed after considering the archaeological context, environmental information, consultation with the local Aboriginal community, the findings of the excavation results and the predicted impact of the proposed development on archaeological resources. It is recommended that:

- 1) Archaeological test excavations are to be undertaken to determine the nature and extent of the Aboriginal archaeological resource present within the study area in accordance with the CoP (DECCW 2010a). As the study area currently presents land access issues, it is recommended that the requirement for test excavations be included as a condition of consent associated with the Development Application being lodged with Penrith City Council.
- 2) The results of the test excavation are to be appended to this assessment as an addendum report.
- 3) As Aboriginal cultural material has been identified within the study area, an application must be made for an AHIP prior to construction impacts occurring.
- 4) One copy of the final report should be lodged with the Registrar of the AHIMS database and provided to all Registered Aboriginal Stakeholders.

REFERENCES

AMBS 2009, *Aboriginal Heritage Impact Permit Works: Upper Nepean River Environmental Flow Releases*, Report for Snowy Mountains Engineering Corporation Australia Pty Ltd on behalf of the Sydney Catchment Authority.

Attenbrow, V 2002, *Sydney's Aboriginal past: investigating the archaeological and historical records*, Sydney: UNSW Press, viewed 23 September 2019, <<https://trove.nla.gov.au/version/19854069>>.

Austral Archaeology 2011, *Windsor Museum, NSW*, Report for Hawkesbury Council.

Austral Archaeology Pty Ltd 2007, *St. Thomas Road, Mulgoa, NSW, Aboriginal Archaeological and Cultural Heritage Assessment*, Report for Stanton Dahl Architects on Behalf of Sydney Anglican Schools Corporation.

Austral Archaeology Pty Ltd 2010, *St. Thomas Anglican Church Mulgoa, NSW*, Report for Sydney Anglican Schools Association.

Austral Archaeology Pty Ltd 2013, *Fernhill Estate, Mulgoa, NSW; AHIP Application for Proposed Residential Subdivision*, Report for Cubelic Holdings Pty Ltd.

Austral Archaeology Pty Ltd 2019, *Nepean Gardens, 13 Park Rd, Wallacia, NSW (Lot 2 DP 1108408, Lot 1 DP 1254545, Lot 3 DP 18701 and Lot 4 DP 18701); Aboriginal Due Diligence Assessment*.

Australian Museum Consulting 2014, *Environmental Survey of Commonwealth land at Badgerys Creek: Aboriginal Heritage*, Report for SMEC Australia.

Bannerman, SM & Hazelton, PA 2011, *Soil Landscapes of the Penrith 1:100,000 Sheet Interactive CD-ROM*, NSW Office of Environment and Heritage, Sydney.

Barton, H & McDonald, J 1995, *Archaeological Survey at Jerry's Creek Bridge, near Wallacia, Southern Cumberland Plain, NSW*, Report for The Roads and Traffic Authority NSW.

Benson & Howell 1990, 'Taken for Granted: the bushland of Sydney and its suburbs'.

Brayshaw 1981, 'Archaeological Survey of the Route of the Natural Gas Pipeline between Sydney and Newcastle (Plumpton - Kooragang Island).'

Brayshaw, H 1982, *Archaeological investigation of Lot 1 in the Mulgoa District of the City of Penrith, N.S.W.*

Brayshaw, H 1983, *Archaeological Investigation of Proposed Clay/Shale Quarry in Housing Commission Site 7770, Mulgoa, South Penrith, N.S.W.*

Brayshaw, H 1999, *Warragamba Dam Spillway Archaeological Survey for Aboriginal Sites*, Report for Abogroup Constructions Pty Ltd.

Colquhoun, GP et al. 2019, 'NSW Seamless Geology Dataset v. 1.1 (Digital Dataset)'.

Dallas, M 1981, *An Archaeological Survey of the South Penrith Development Site*, Report for the Housing Commission of N.S.W.

DECC 2009, 'Operational Policy: Protecting Aboriginal Cultural Heritage', <<https://www.environment.nsw.gov.au/resources/cultureheritage/09122ACHOpPolicy.pdf>>.

DECCW 2010a, 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales'.

DECCW 2010b, 'Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales'.

Department of Environment, Climate Change and Water 2010a, 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales'.

Department of Environment, Climate Change and Water 2010b, 'Aboriginal cultural heritage consultation requirements for proponents 2010'.

Foley, R 1981, 'A Model of Regional Archaeological Structure', *Proceedings of the Prehistoric Society*, vol. 47, pp. 1–17.

Greer, S & Brayshaw, H 1983, *An Archaeological Survey of Lot 1 DP541090 at Mulgoa, N.S.W.*

Helms, R 1895, 'Anthropological Notes', in *Proceedings of the Linnaean Society of New South Wales*, 2nd Series, pp.387–414.

HLA-Envirosciences Pty Limited 1995, *An archaeological survey of Warragamba Dam proposed haulage roads Warragamba Wallacia Luddenham*, Report to Warragamba Dam Project Team.

Jo McDonald Cultural Heritage Management Pty Ltd, J 2000, 'Archaeological Survey for Aboriginal Sites: Proposed Light Industrial Subdivision "Austral Site" – Mamre Road, Erskine Park, NSW', *Report for Austral Brick Pty Ltd*.

Kayandel Archaeological Services 2017, *Proposed North Silverdale Rezoning, Silverdale Road, Silverdale, Wollondilly Shire LGA, NSW*, Report for Site Plus.

Kohen 1986, *An Archaeological Survey of 'Winbourne' at Mulgoa*, 1986.

Kohen, J 1982, *Aboriginal Sites and Contact History in the Mulgoa Valley*.

Kohen, J 1988, 'Prehistoric Settlement in the Western Cumberland Plain: Resources, Environment and Technology', *Australian Archaeology*, vol. 27, pp. 131–134.

Kohen, J 1995, 'Talk Given to the Austral Museum Society; Re-Writing Aboriginal History, the Darug Aborigines of the Sydney Area', *Unpublished Transcript*.

Kohen, J 2009, *The Aborigines of Western Sydney*, Report by Darug Tribal Aboriginal Corporation.

Kohen, James Leslie 1986, *PREHISTORIC SETTLEMENT IN THE WESTERN CUMBERLAND PLAIN: RESOURCES. ENVIRONMENT AND TECHNOLOGY*.PHD Thesis, Macquarie University.

Mathews, RH & Everitt, MM 1900, 'The organisation, language and initiation ceremonies of the Aborigines of the south-east coast of N. S. Wales', *Journal and Proceedings of the Royal Society of New South Wales*, vol. 34, pp. 262–281.

McCarthy, FD 1976, *Australian Aboriginal Stone Implements*, The Australian Museum Trust, Sydney.

McDonald 1987, *Archaeological Investigation of Open Site # 45-5-411 at Mulgoa, N.S.W.*

McDonald, J 1997a, 'Interim heritage management report: ADI Site, St Marys. Volume 1: Text, Report to Land Lease – ADI Joint Venture in response to the Section 22 Committee Interim Report.

McDonald, J 1997b, *Archaeological Investigation of the Proposed Telstra Radio Base Station, at Regentville, N.S.W.*

McDonald., J 1999, *'Test Excavation of PAD5 (RH/SP9) and PAD31 (RH/cc2) for the Rouse Hill (Stage 2) Infrastructure Project at Rouse Hill and Kellyville, NSW', Report to RHIC.*

McDonald., J, Mitchell, P, & Rich, E 1996, 'A Further Investigation of Site RS1 (# 45-5-0892) at Regentville, Mulgoa Creek, Western Sydney, NSW.'

McDonald, J & Rich, E 1993, *Archaeological Investigations for the RHIP (Stage 1) Works along Caddies, Smalls and Second Ponds Creeks, Rouse Hill and Parklea. Final Report on Test Excavation Program*, Report for Brayshaw McDonald Pty Ltd on behalf of RH (Stage 1) Pty Ltd.

National Parks and Wildlife Service 2002, *Interpretation Guidelines for the Native Vegetation Maps of the Cumberland Plain, Western Sydney, National Parks and Wildlife Services, Sydney.*

Navin, K 1987, *What Hasn't Happened to Lake Illawarra*. Unpublished BA Honours, ANU, Canberra ACT.

Niche Environment and Heritage 2010, 'Aboriginal Cultural Heritage Assessment; Appin Colliery, Ventilation Shaft No. 6.'

NSW National Parks and Wildlife Service 2002, *Native Vegetation Maps of the Cumberland Plain Western Sydney Interpretation Guidelines*, NSW NPWS, Hurstville.

OEH 2011a, 'Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW'.

OEH 2011b, 'Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW'.

Organ, M (ed.) 1990, *A documentary history of the Illawarra & South Coast Aborigines, 1770-1850: including a chronological bibliography 1770-1990*, Aboriginal Education Unit, Wollongong University, Wollongong.

Poiner, G 1976, 'The process of the year among Aborigines of the central and south coast of New South Wales', viewed 17 March 2020, <<https://trove.nla.gov.au/version/210720538>>.

Reed, AW 2010, *Aboriginal Place Names*, Reed New Holland, Sydney.

Smith, L 1989, *Interim Report: Site Survey and Site Analysis on the Cumberland Plain*, Report for NSW Parks and Wildlife Service.

Stockton, ED & Holland, W 1974, 'Cultural Sites and Their Environment in the Blue Mountains', *Archaeology & Physical Anthropology in Oceania*, vol. 9, no. 1, pp. 36–65.

Turbet, P 2001, *The Aborigines of the Sydney District Before 1788 Revised Edition*, Kangaroo Press, East Roseville.

White, E & McDonald, J 2010, 'Lithic Artefact Distribution in the Rouse Hill Development Area, Cumberland Plain', *Australian Archaeology*, vol. 70, pp. 29–38.

APPENDICES

APPENDIX A: AHIMS SEARCH RESULTS



AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : 2044
Client Service ID : 522062

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-2499	RC 13 - "Roscrea 13"	AGD	56	283890	6250660	Open site	Valid	Artefact : -	Isolated Find	
	Contact	Recorders	Doctor.Jo McDonald,Stephanie Garling					Permits		
45-5-2500	RC 12 - "Roscrea 12"	AGD	56	283820	6250850	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Doctor.Jo McDonald,Stephanie Garling					Permits		
45-5-2503	RC 9 - "Roscrea 9"	AGD	56	283870	6251600	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Doctor.Jo McDonald,Stephanie Garling					Permits		
45-5-2504	RC 8 - "Roscrea 8"	AGD	56	284100	6251880	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Stephanie Garling					Permits		
45-5-2505	RC 7 - "Roscrea 7"	AGD	56	284230	6250620	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Doctor.Jo McDonald,Stephanie Garling					Permits		
45-5-2506	RC 6 - "Roscrea 6"	AGD	56	284130	6250740	Open site	Valid	Artefact : -	Isolated Find	
	Contact	Recorders	Doctor.Jo McDonald,Stephanie Garling					Permits		
45-5-2508	RC 4 - "Roscrea 4"	AGD	56	284030	6250980	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Doctor.Jo McDonald,Stephanie Garling					Permits		
45-5-2509	RC 3 - "Roscrea 3"	AGD	56	284250	6251190	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Doctor.Jo McDonald,Stephanie Garling					Permits		
45-5-0987	WAL 1;	AGD	56	281100	6249900	Closed site	Valid	Artefact : -	Shelter with Deposit	
	Contact	Recorders	Iain Stuart					Permits		
45-5-0988	WAL 2;	AGD	56	283500	6249900	Open site	Valid	Artefact : -	Isolated Find	
	Contact	Recorders	Iain Stuart					Permits		
45-5-2349	Jerry's Ck 1;	AGD	56	281940	6250800	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Huw Barton,Tony Kondek					Permits		
45-5-2350	Jerry's Ck 2 (JC2);	AGD	56	281980	6250720	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Huw Barton,Tony Kondek					Permits		
45-5-2351	Jerry's Ck 3 (JC3);	AGD	56	281800	6250450	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Huw Barton,Tony Kondek					Permits		
45-5-0606	Winbourne WB/1	AGD	56	281480	6251780	Open site	Valid	Artefact : -	Open Camp Site	1234
	Contact	Recorders	Jim Kohen					Permits		
45-5-0608	Winbourne 3 WB/3	AGD	56	281360	6251590	Open site	Valid	Artefact : -	Open Camp Site	1234
	Contact	Recorders	Jim Kohen					Permits		
45-5-0609	Winbourne 5 WB/5	AGD	56	280980	6251600	Open site	Valid	Artefact : -	Open Camp Site	1234
	Contact	Recorders	Jim Kohen					Permits		
45-5-0610	Winbourne 6 WB/6	AGD	56	280980	6251600	Open site	Valid	Artefact : -	Open Camp Site	1234
	Contact	Recorders	Jim Kohen					Permits		

Report generated by AHIMS Web Service on 22/07/2020 for William Andrews for the following area at Datum :GDA, Zone : 56, Eastings : 280536 - 284536, Northings : 6248284 - 6252256 with a Buffer of 0 meters. Additional Info : Mapping - Planning, Number of Aboriginal sites and Aboriginal objects found is 26
This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.



Office of
Environment
& Heritage

AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : 2044

Client Service ID : 522062

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-0611	Winbourne 7 WB/7;	AGD	56	280930	6251500	Open site	Valid	Artefact : -	Open Camp Site	1234
	<u>Contact</u>		<u>Recorders</u>	Jim Kohen				<u>Permits</u>		
45-5-0612	Winbourne 8 WB/8;	AGD	56	280880	6251650	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	1234
	<u>Contact</u>		<u>Recorders</u>	Jim Kohen				<u>Permits</u>		
45-5-0613	Winbourne 9 WB/9;	AGD	56	280830	6251750	Closed site	Valid	Artefact : -, Art (Pigment or Engraved) : -	Shelter with Art.Shelter with Deposit	1234
	<u>Contact</u>		<u>Recorders</u>	Jim Kohen				<u>Permits</u>		
45-5-0614	Winbourne 10 WB/10;	AGD	56	281490	6251550	Open site	Valid	Artefact : -	Open Camp Site	1234
	<u>Contact</u>		<u>Recorders</u>	Jim Kohen				<u>Permits</u>		
45-5-2501	RC 11 - "Roscrea 11"	AGD	56	283810	6251070	Open site	Valid	Artefact : -	Isolated Find	
	<u>Contact</u>		<u>Recorders</u>	Doctor.Jo McDonald.Stephanie Garling				<u>Permits</u>		
45-5-3627	WW01	GDA	56	280870	6250810	Open site	Valid	Art (Pigment or Engraved) : -		101640
	<u>Contact</u>		<u>Recorders</u>	Australian Museum Consulting (AM Consulting)				<u>Permits</u>	3099	
45-5-2507	RC 5 - "Roscrea 5"	AGD	56	284180	6250790	Open site	Valid	Artefact : -	Isolated Find	
	<u>Contact</u>		<u>Recorders</u>	Doctor.Jo McDonald.Stephanie Garling				<u>Permits</u>		
45-5-3103	Sivendale Road 1	AGD	56	281150	6250100	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	<u>Contact</u>	T Russell	<u>Recorders</u>	Emma Lees				<u>Permits</u>		
45-5-3098	Greendale Road 1	AGD	56	281900	6248820	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	<u>Contact</u>	T Russell	<u>Recorders</u>	Emma Lees				<u>Permits</u>		

Report generated by AHIMS Web Service on 22/07/2020 for William Andrews for the following area at Datum :GDA, Zone : 56, Eastings : 280536 - 284536, Northings : 6248284 - 6252256 with a Buffer of 0 meters. Additional Info : Mapping - Planning, Number of Aboriginal sites and Aboriginal objects found is 26
This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

APPENDIX B: GLOSSARY OF TERMS USED IN ABORIGINAL CULTURAL HERITAGE ASSESSMENTS AND ARCHAEOLOGICAL REPORTS

This glossary is an extract from

GLOSSARY OF TERMS USED IN 'LITHIC' ANALYSIS

Author: Peter Hiscock, Dept. Archaeology and Anthropology

Feedback: peter.hiscock@anu.edu.au.

Date Last Modified: 28-August-97

URL: <http://artalpha.anu.edu.au/web/arc/resources/stonegloss/gloss.htm>

And

SYDNEY'S ABORIGINAL PAST

Author: Val Attenbrow

Year Published: 2002

Publisher: University New South Wales Press

Place of Publication: Sydney, NSW, Australia.

ABORIGINAL SITE: Place at which Aboriginal people have undertaken certain activities and special events.

ARCHAEOLOGICAL DEPOSIT: Soil or sediment which contains cultural materials associated with past human activities.

ARCHAEOLOGICAL SITE: A location in which evidence of past human activities exists or has previously existed.

ANGLE OF APPLIED FORCE: The angle at which the force of flaking is applied to a rock.

APPLIED FORCE: The force exerted upon a core or retouched flake.

ARTEFACT: Any object which is physically modified by humans.

ATTRIBUTE: A physical characteristic of an artefact.

BIFACIAL: An artefact which shows evidence of working on two faces.

BULB OF FORCE: The bulb of force is a convex protuberance located at the proximal end of the ventral surface of a flake, immediately below the ring crack. Also called the Positive Bulb of Force or simply 'the bulb'.

BULBAR SCAR: The negative scar that results from the bulb of force.

BURIAL SITES: Locations where people were buried and where skeletal remains have been found.

CAMPSITE: Locations where people slept overnight as well as a place where other domestic activities were undertaken.

CONCHOIDAL FRACTURE: A type of fracture which gives smoothly curved surfaces resembling the form of a bivalve shell.

CONE: Shorthand term for Hertzian cone crack, a cone shaped fracture plane extending from a circular ringcrack as a result of loading from a blunt indenter

CORE: A piece of flaked stone which has one or more negative flake scars but no positive flake scars.

CULTURAL MATERIALS: The products of human behaviour, such as stone artefacts or food debris.

DEBITAGE: Cores and unretouched flakes.

DEBRIS: 1. Any refuse discarded from a cultural system. 2. Debitage.

DISCARD: The movement of an object from its systemic context to an archaeological context.

EDGE: The junction of two surfaces of a body.

EDGE DAMAGE: The removal of small flakes from the edge of an artefact.

ERRAILURE FLAKE: A flake formed between the bulb of force and the bulbar scar. Sometimes the erraillure flake adheres to the core in the bulbar scar. The erraillure flake leaves no scar on the core, but always leaves a scar on the ventral surface of the flake. The erraillure flake is convex/concave (like a meniscus lens), has no distinct features on the 'dorsal face', but may contain compression rings on the bulbar face.

FEATHER TERMINATION: A termination of the fracture plane that occurs gradually (ie. there are no sharp bends in the plane), producing a thin, low angled distal margin.

FLAKE: 1. Any piece of stone fractured from a larger mass by the application of an external force. 2. The piece of stone struck off a core. It has a series of characteristics showing that it has been struck off. The most indicative of these features are ringcracks, showing where the hammer hit the core. Also the ventral surface may be deformed in characteristic fashion, for example having a bulb or errillure.

FLAKING: The process of fracturing stone by the application of an external force.

FORCE: The quantity of energy exerted by a moving body; power exerted; energy exerted to move another body from a state of inertia.

FRACTURE: Irregular surface produced by breaking a mineral across rather than along cleavage planes.

GRINDING STONE: An implement with a smooth, shallow concave surface which was created through use, either to abrade the surface of another artefact or to process food.

HAMMER: A fabricator used to apply a dynamic load.

HINGE TERMINATION: A fracture plane that turns sharply toward the free surface of the core immediately prior to the termination of the fracture. The bend of the ventral surface is rounded and should not be confused with a step termination.

HOLOCENE: A geological time-scale period lasting from 10,000 years ago to the present.

IN-SITU: An undisturbed archaeological feature or deposit.

KNAPPER: A human who creates stone artefacts by flaking.

KNAPPING: The process of striking rocks and causing them to fracture.

LENGTH: The distance from the platform to the termination of a flake or flake scar. Also Percussion Length.

MIDDEN: Cultural deposit in which material, such as shell, are built up in an archaeological site.

NEGATIVE BULB OF FORCE: The concave surface left after a flake has been removed.

OUTREPASSE: 1. A fracture termination where the fracture path curves markedly away from the core face and continues directly into the core, removing the base of the core and giving the flake a J shape in longitudinal cross section. 2. Any flake containing an outrepasse termination.

PLATFORM: Any surface to which a fabricator is applied when knapping.

PLATFORM ANGLE: 1. The angle between the platform and core face on a core. 2. The angle between the platform and dorsal surface on a flake. 3. The angle between the platform and flaked surface on a retouched flake.

PLEISTOCENE: A geological time-scale lasting from 2 million years ago to 10,000 years ago.

POINT OF FORCE APPLICATION: The area of the platform in contact with the indenter during knapping.

QUARRY: A location where stone or ochre has been removed by humans from a source of rock.

PRESSURE FLAKING: The process of detaching flakes by a pressing force. Also Static Loading.

REDUCTION: Process of breaking down stone by either flaking or grinding.

RETOUCHED FLAKE: A flake that has subsequently been re-flaked.

RETOUCHING: The act of knapping a flake into a retouched flake.

RING CRACK: A circular pattern of micro-fissures penetrating into the artefact around the Point of Force Application and initiating the fracture. It appears on the ventral surface usually as a semi-circular protuberance on the edge of the platform.

ROCK SHELTER: A sheltered area within a cliff-line, outcrop or boulder which has formed naturally through weathering or other geological process.

SCAR: The feature left on an artefact by the removal of a flake. Includes negative bulb, negative ringcrack and negative termination.

SCARRED TREE: Trees in which have scars formed by the removal of bark or wood in order to make canoes, shields or baskets.

SILICEOUS: Having a high silica content.

STEP TERMINATION: A fracture plane that turns sharply towards the free surface of the core immediately prior to the termination of the fracture. The bend of the ventral surface is sharp, often a right angle.

STRATIGRAPHY: The layers of sediment and cultural material that are able to be distinguished in a deposit.

TERMINATION: The point at which the fracture plain reaches the surface of a core and detaches a flake.

USE: The performance of a stone artefact in an activity involving non-stone objects.

USE-WEAR: Damage to the edges or working surfaces of tools sustained in use.

VENTRAL SURFACE: The surface of a flake created when it is removed and identified mainly by the presence of a ring crack.