Sportsground Precinct
Macarthur Heights Project
CAMPBELLTOWN, NEW SOUTH WALES
Aboriginal Archaeological Due Diligence Assessment

DRAFT REPORT

Prepared by

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Austral Archaeology Pty Ltd
Archaeological & Cultural Heritage Consultants

For

UrbanGrowth NSW

Campbelltown City Council Local Government Area

February 2015

Project No: 1429

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EXECUTIVE SUMMARY

Austral Archaeology Pty Ltd (Austral Archaeology) has been commissioned by UrbanGrowth NSW (the proponent) to undertake an Aboriginal due diligence assessment as part of the ongoing Macarthur Heights subdivision. The current study area is the Sportsground Precinct, consisting of the former University of Western Sydney (UWS) gym complex and the associated playing fields, driving range and archery range, contained within Lot 1099, DP1182558 (the project area). The study area is bound by the Main Southern Railway to the south, a modern dam to the west, undeveloped land to the east, and Stage 1 of the Macarthur Heights subdivision to the north, within the Campbelltown City Council Local Government Area (LGA), New South Wales. The study area is approximately 2 kilometres west of Campbelltown and 44 kilometres south-west of Sydney. Macarthur is a regional hub consisting of a train station, shops, a university, a TAFE facility and housing, which lies on the geographical region of the Cumberland Plain and is situated just east of the Nepean River.

The project area has previously been assessed by Jo McDonald Cultural Heritage Management in 2003 and AMBS in 2005. A further assessment was undertaken by Austral Archaeology (2012) to confirm the location of previously identified sites in relation to the proposed staging of the overall Macarthur Heights development.

The purpose of this due diligence assessment is to demonstrate that the proponent has followed the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010) to determine whether an Aboriginal Heritage Impact Permit (AHIP) is required for works to be undertaken within the Sportsfield Precinct, or whether the proposed work may proceed with caution.

In the event that this assessment reasonably determines that an AHIP is not required, should Aboriginal cultural material be identified during subsequent earthworks then this due diligence assessment provides a defence against having unknowingly harmed an Aboriginal object. However, it will be necessary to stop work and apply for an AHIP before earthworks can recommence.

Conclusions

A search of the Aboriginal Heritage Information Management System Database regarding the study area returned a result of no sites being indentified within the study area. Given the site's documented history of continuous use and development since the middle of the 20th century and the site inspection did not identify any artefacts or likely potential archaeological deposits, it is clear that this location qualifies as 'disturbed' land according to the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010).

It is concluded that the study area has very low archaeological potential and no further action is required in regards to the Aboriginal archaeological potential of the study area, except in the instance covered by Recommendation 2 below.

Recommendations

It is recommended that:

1) No further investigative work to identify potential Aboriginal cultural heritage needs to be undertaken within the Sportsground Precinct. This report documents the results of a site inspection in February 2015 that resulted in no Aboriginal sites being located within the study area. The survey and background research also confirmed the disturbed nature of the study area.

2) In the event that Aboriginal objects or deposits are encountered during earthworks, all works affecting those objects or deposits must cease immediately to allow an archaeologist to make an assessment of the find. The archaeologist may need to consult with the Office of Environment and Heritage and the relevant Aboriginal stakeholders regarding the Aboriginal objects or deposits. Section 89A of the *National Parks and Wildlife Act 1974* requires that the Office of Environment and Heritage must be notified of any Aboriginal objects discovered within a reasonable time.

3) This report contains descriptions and locational data relating to Aboriginal archaeological and cultural material and sites. Should public exhibition of this document be required, it is advisable that Austral Archaeology be contacted in order to ascertain information which should be removed prior to public release.

4) One copy of this report should be lodged with the Registrar of the Aboriginal Heritage Information Management System database at:

   AHIMS Registrar
   Office of Environment and Heritage
   PO Box 1967
   Hurstville NSW 1481

CONTENTS

FIGURES

TABLES

PLATES

1 INTRODUCTION

1.1 Introduction

Austral Archaeology Pty Ltd (Austral Archaeology) has been commissioned by UrbanGrowth NSW (the proponent) to undertake an Aboriginal due diligence assessment as part of the ongoing Macarthur Heights subdivision. The current study area is the Sportsground Precinct, consisting of the former University of Western Sydney (UWS) gym complex and the associated playing fields, driving range and archery range, contained within Lot 1099, DP1182558 (the project area). The study area is bound by the Main Southern Railway to the south, a modern dam to the west, undeveloped land to the east, and Stage 1 of the Macarthur Heights subdivision to the north, within the Campbelltown City Council Local Government Area (LGA), New South Wales. The study area is approximately 2 kilometres west of Campbelltown and 44 kilometres south-west of Sydney (Figure 1.1, Figure 1.2 and Figure 1.3). Macarthur is a regional hub consisting of a train station, shops, a university, a TAFE facility and housing, which lies on the geographical region of the Cumberland Plain and is situated just east of the Nepean River.

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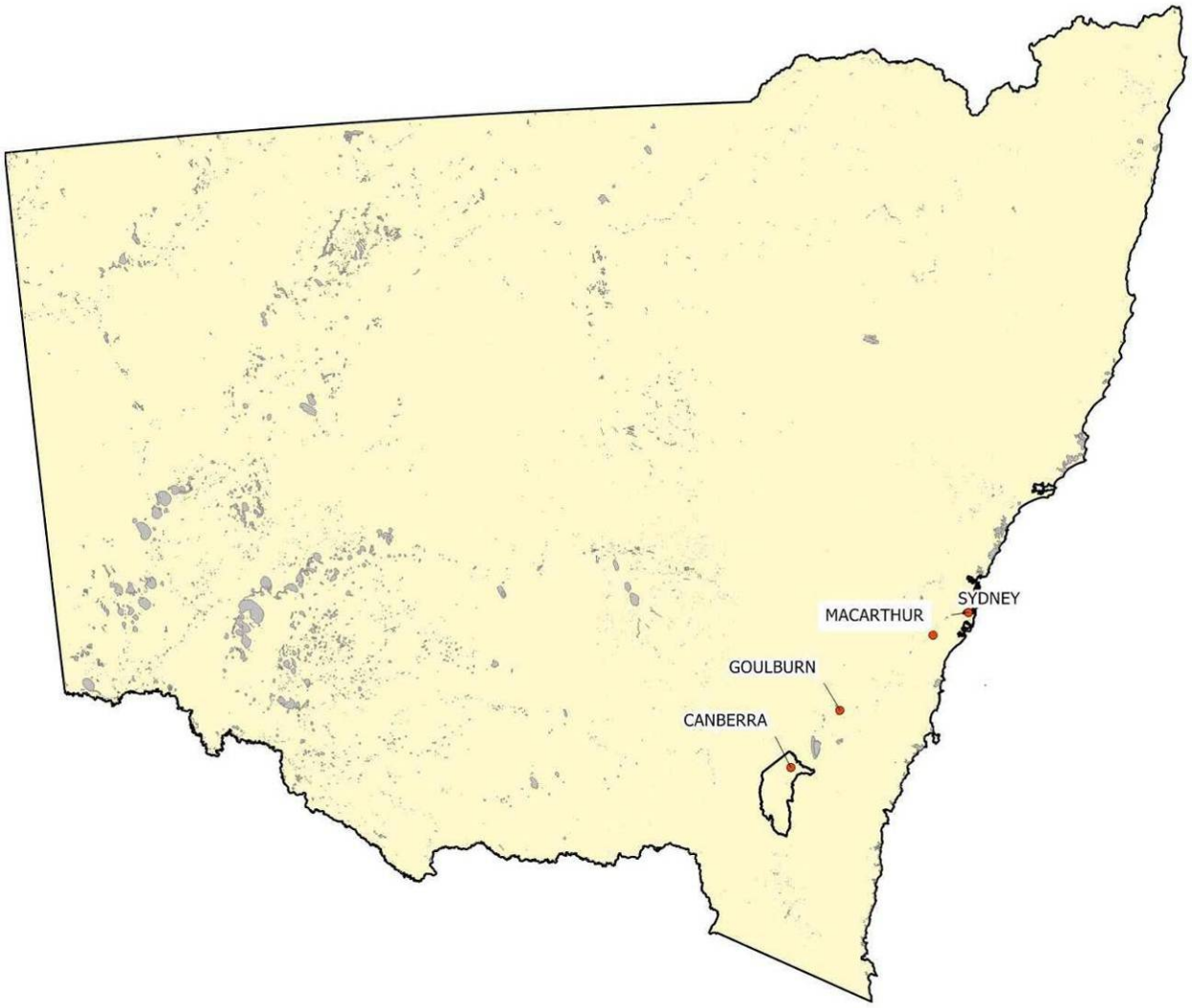

AUSTRAL ARCHAEOLOGY

Project Name: Macarthur Heights
Client: UrbanGrowth NSW
Project Number: 1429
Drawn By: David Marcus

Datum (Zone): Australia MGA94 (56)
Scale: 6400000
Source Map: Geoscience Australia
Date: 27 January 2015

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Figure 1.1 Map of New South Wales showing the location of the study area in relation to local population centres.

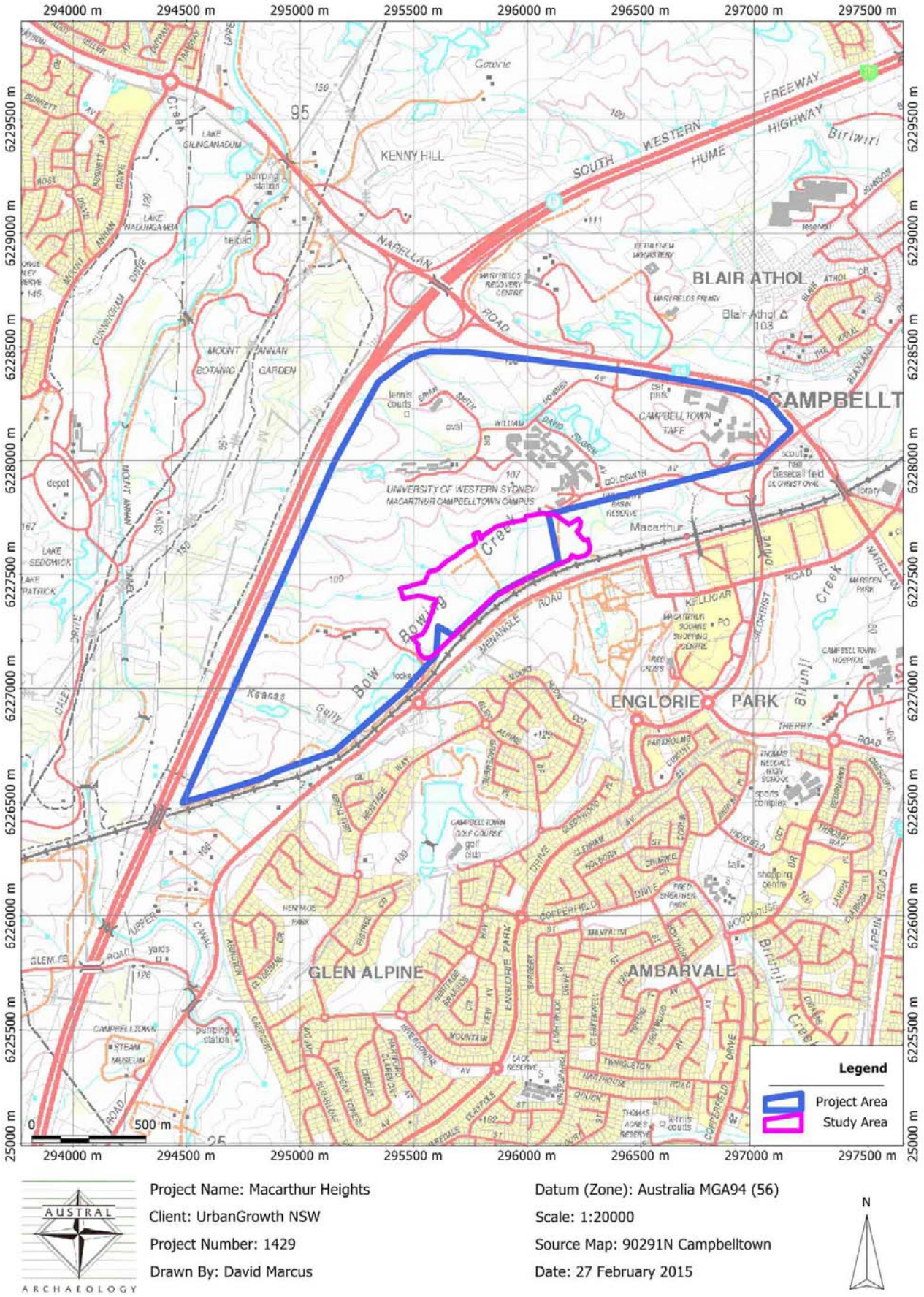

Figure 1.2 Location of the Sportsfield Precinct study area within the overall project area.

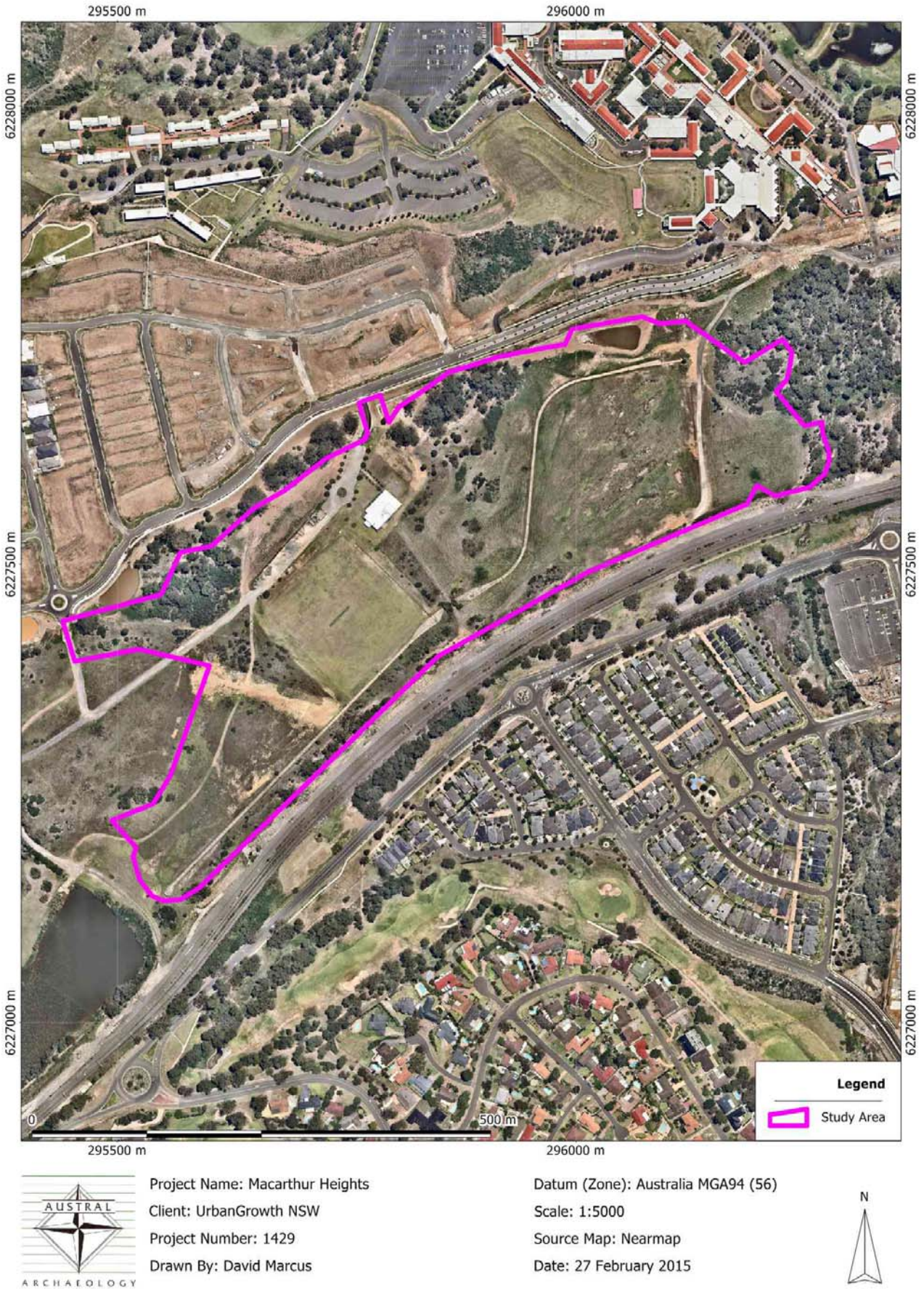

Figure 1.3 Aerial image showing location of the study area.

1.2 Objectives

The objectives of this report are as follows:

- Undertake a due diligence process to identify whether or not Aboriginal objects are, or are likely to be, present in the study area.
- Produce an archaeological predictive model to guide any management decisions regarding the study area.
- Conduct a brief site inspection to confirm the presence or absence of Aboriginal cultural heritage or areas of archaeological potential.
- Make appropriate management and mitigation recommendations.

1.3 Project Team and Acknowledgements

This project was overseen by Justin McCarthy (Managing Director). The project was managed by David Marcus (Senior Archaeologist) and fieldwork was undertaken by David Marcus. The assessment was authored by David Marcus, who also undertook the GIS mapping in this report. Management recommendations were written by David Marcus. Justin McCarthy provided input into the management recommendations and reviewed the draft report.

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

Jessica Touma	Senior Development Manager, UrbanGrowth NSW
John Drivas	Development Manager, UrbanGrowth NSW
Peter Lawrence	Project Director, UrbanGrowth NSW

1.4 Limitations of the Report

It should be noted that Austral Archaeology has been unable to obtain a copy of the original report concerning the project area by Jo McDonald (2003) as it is not currently available in the AHIMS library. Where information has been referenced to Jo McDonald (2003), the relevant information has been sourced from AMBS (2005) in all cases.

All spatial data obtained from the Office of the Environment and Heritage's (OEH's) Aboriginal Heritage Information Management System (AHIMS) database is considered to be correct unless contradicted by information contained in an archaeological assessment or on the site card. The veracity of the coordinate and datum of each site has not been tested unless specifically referenced in this report.

The statement of archaeological potential only applies to subsurface features or deposits associated with the Aboriginal and European occupation of the site and not to any built heritage items currently on the site.

This due diligence assessment has not included consultation with or review by Aboriginal stakeholders. It has been conducted solely as an exercise to determine whether further investigation of the Aboriginal archaeological potential of the study area is justified.

The results, assessments and judgements contained in this report are constrained by the standard limitations of historical research and by the unpredictability inherent in archaeological zoning from the desktop. Whilst every effort has been made to gain insight to the historical archaeological profile of the subject site, Austral Archaeology Pty Ltd cannot be held accountable for errors or omissions arising from such constraining factors.

1.5 Data Restrictions

This report contains descriptions and locational data relating to Aboriginal archaeological and cultural material and sites. This information is considered sensitive and of great importance to the Aboriginal community. As a result, public exhibition of this report in its present form would not be appropriate.

Should public exhibition of this document be required, it is advisable that Austral Archaeology be contacted in order to ascertain information which should be removed prior to public release.

Additionally, Aboriginal readers should be aware that this report may contain the names of members of the Aboriginal community who are now deceased. Austral Archaeology apologise for any distress which this may cause.

1.6 Abbreviations

The following abbreviations are used within this report:

AHC	Australian Heritage Council
Burra Charter	The Australia ICOMOS Charter for Places of Cultural Significance
CHL	Commonwealth Heritage List
CMP	Conservation Management Plan
DCP	Development Control Plan
DoP	NSW Department of Planning
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&BC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPI	Environmental Planning Instrument
Heritage Act	*New South Wales Heritage Act 1977*
ICOMOS	International Council on Monuments and Sites
LEP	Local Environmental Plan
LGA	Local Government Area
NHL	National Heritage List
NP&W Act	*National Parks and Wildlife Act 1974*
NSW HC	New South Wales Heritage Council
NT Register	Register of the National Trust (NSW)
OEH	Office of Environment and Heritage
PAD	Potential Archaeological Deposit
RAIA	Royal Australian Institute of Architects
RMS	Roads and Maritime Services
RNE	Register of the National Estate
SEPP	State Environmental Planning Policy
SHI	State Heritage Inventory
SHR	State Heritage Register
SOHI	Statement of Heritage Impact

Refer also to the document Heritage Terms and Abbreviations, published by the Heritage Office and available on the website: http://www.environment.nsw.gov.au/heritage/index.htm.

2 STATUTORY CONTEXT

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

Table 2.1 details the Australian acts, guidelines and regulations which have been identified as being applicable or with the potential to be triggered with regards to the proposed development.

Table 2.1: Federal and State Acts

Federal Acts

Federal Acts:	Applicability and implications
Environment Protection and Biodiversity Conservation Act 1999	This act has not been triggered and so does not apply. • 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.
Aboriginal and Torres Strait Islander Heritage Protection Amendment Act 1987	Applies. • 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.

State Acts

State Acts:	Applicability and implications
National Parks and Wildlife Act 1974 (NP&W Act)	Applies. • Section 86 – Prohibits unknowingly causing harm or desecration to any Aboriginal object or place without an Aboriginal Heritage Impact Permit (AHIP) or other 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 OEH 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 site through development or relocation.
National Parks and Wildlife Regulations 2009 (NP&W Reg.)	Applies. • 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 the production of a cultural heritage assessment report to accompany AHIP applications.

The Environmental Planning and Assessment Act 1979 (EP&A Act)	Applies. • This project is being assessed under Part 4 of the EP&A Act. • Sections 86, 87, 89A and 90 of the NP&W Act will apply.
NSW Heritage Act 1977	This act has not been triggered and so does not apply. • No Aboriginal sites listed on the State Heritage Register are present or in close proximity to the study area.

State and Local Planning Instruments

Planning Instruments	Applicability and implications
Local Environmental Plans (LEP)	The following LEP is applicable • *Campbelltown (Urban Area) Local Environmental Plan 2002*
Development Control Plans (DCP)	The following DCP is applicable: • *University of Western Sydney Development Control Plan 2008*

Aboriginal Community Consultation Guidelines

Guidelines	Applicability and implications
OEH *Aboriginal cultural heritage consultation requirements for proponents 2010*.	The development is to be conducted in accordance with Part 4 of the EP&A Act 1979. • 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.

2.1 The National Parks and Wildlife Act 1974

Aboriginal cultural heritage in New South Wales is protected under the *National Parks and Wildlife Act 1974* (NP&W Act), with additional clarification provided by the *National Parks and Wildlife Regulations 2009* (NP&W Regulations).

All Aboriginal objects and places are provided blanket protection under Section 86 of the NP&W Act, which makes the harming of any Aboriginal object an offense, irrespective of intent. Several defences against prosecution are provided by Section 87 of the NP&W Act, including having undertaken a due diligence assessment which has "reasonably determined that no Aboriginal object would be harmed" by the proposed activity. The minimum standards for such a due diligence assessment are detailed in Section 80A of the NP&W Regulations and in the Duie Diligence CoP (DECCW 2010), which forms the basis of the tasks conducted in this Aboriginal due diligence assessment.

2.2 Section Summary

Searches of the Australian Heritage Places Inventory (AHPI), the National Heritage List and the NSW Heritage Council State Heritage Register (SHR) websites identified no recorded historic sites in close proximity to 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 *Campbelltown (Urban Area) Local Environmental Plan 2002*, produced in accordance with the EP&A Act, makes provision for the protection of Aboriginal heritage, archaeological sites and potential archaeological sites, but no places or objects within the study area are recorded in the LEP.

3 LANDSCAPE CONTEXT

The natural environment of an area influences not only the availability of local resources, such as food and 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 any given region. Equally important is the range of other associated characteristics which are specific to different land systems and geologies. In turn this affects resource availability of, for example, 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 Landscapes

The project area incorporates Harrison's Dam, which collects water from Bow Bowing Creek as it runs from west to east through the project area. Furthermore, the Sydney Water Supply Upper Canal System runs 700 metres west of the project area, although the creation of the man-made waterway is relatively recent.

The project area is bounded by the Hume Highway to the west, Narellan Road to the north, Gilchrist Drive to the east and the Main Southern Railway to the south. The site is predominantly cleared land which has been subject to continual grazing practices. The central and eastern areas have also been subject to large scale development related to the construction and operation of the University of Western Sydney campus. The local topography is characterised by moderately sloped hills and flats associated with Bow Bowring Creek, interspersed with southward and eastward running drainage lines.

The main physiographic unit within which the project area is located is the Cumberland Plain, which consists, with the exception of the Razorback Range (south of the project area), of low-lying, undulating plains and low hills, lying on Wianamatta Group shales and sandstones. A complex and dense network of waterways and channels are present throughout the Plain (Hazelton & Tille 1990:2).

The underlying geology of the project area, the Wianamatta Group, is a Middle Triassic deposit with major outcrops in the Liverpool to Picton and Appin to Mittagong areas. The Wianamatta Group consists of Ashfield Shale, of black sideritic claystone and limonite, underlying Bringelly Shale, of a predominantly shale sequence with sandstone. Increasing occurrences of sandstone fragments are noted in the upper-most sections of the shale, while occasional calcareous claystone, laminate and coal can also be present. Most of the igneous rocks which are found in the Wianamatta Group are of basaltic composition (Hazelton & Tille 1990:3, 27, 70).

The project area itself falls into two soil landscapes, identified mainly as Blacktown (**bt**) but with Luddenham (**lu**) on the western fringe of the project area (Figure 3.1), while the study area consists solely of Blacktown (bt), which is summarised below.

*3.1.1 Blacktown (**bt**)*

The Blacktown soil landscape is a residual landscape characterised by low undulating rises on Wianamatta Group shale. Local relief is generally between 10 to 30 metres, while slopes are generally less than 5%, but occasionally up to 10%. Crests and ridges are broad (200 to 600 metres) with rounded tops and convex upper slopes morphing into concave lower slopes. Drainage lines are often broad and valleys are flat. Minor to moderate amounts of sheet and gully erosion have occurred in specific locales within the soil landscape (Hazelton & Tille 1990:27-28).

Topsoil consists of a friable greyish brown loam (**bt1**) that can contain rounded, fine gravel shale and charcoal fragments. This overlies a hard setting brown clay loam (**bt2**) that is classed as a subsoil. It commonly contains ironstone gravel shale fragments while charcoal and roots are rarely present. Below this is a strongly pedal, mottled brown, light clay (**bt3**) containing increasing amounts of gravel shale fragments. Finally, there is a light grey, plastic mottled clay (**bt4**) containing weathered ironstone, with occasional gravel shale fragments and roots. Soil depth or the presence of the different soil materials can vary considerably, dependant on location within the landscape (Hazelton & Tille 1990:28-29).

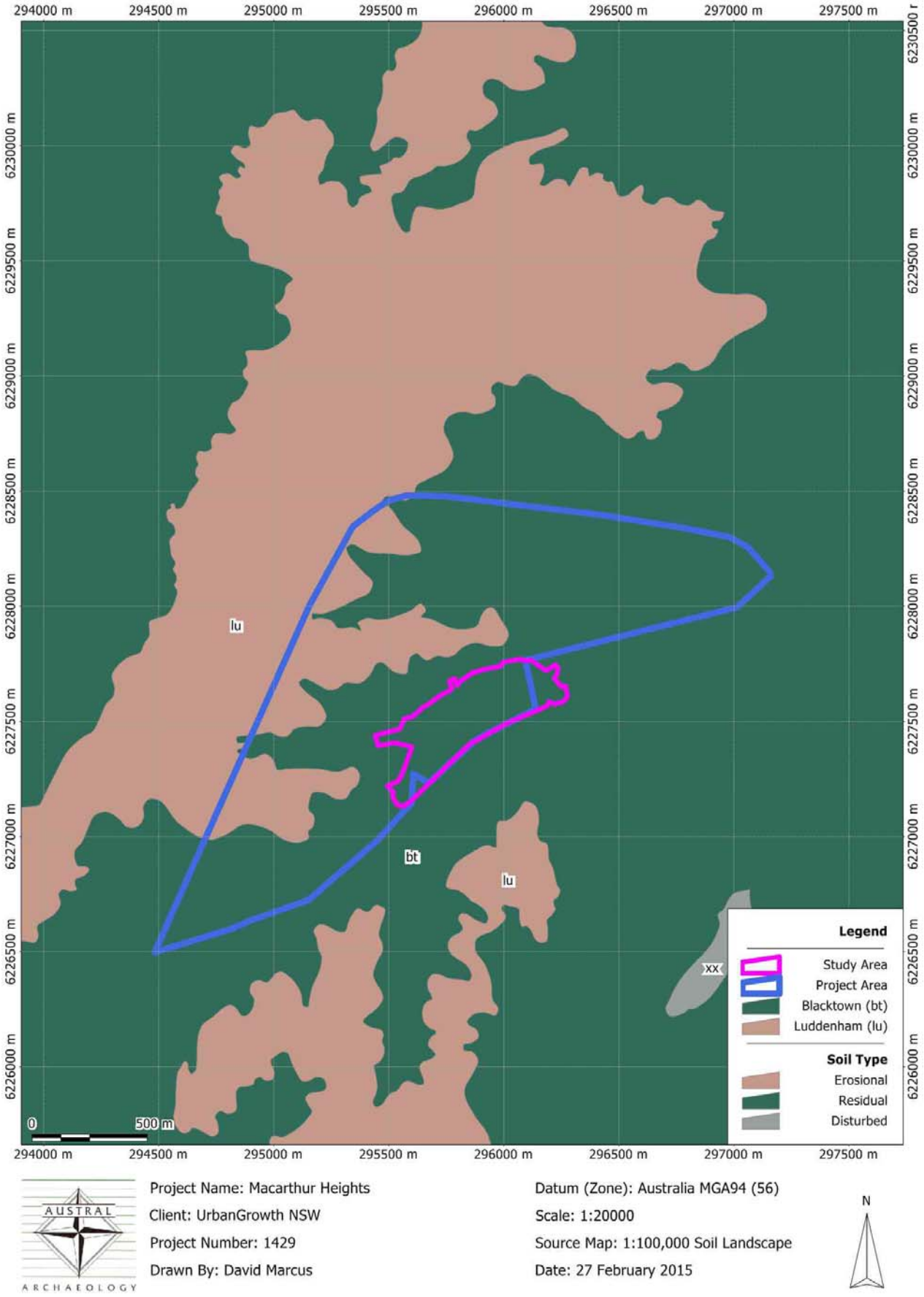

Figure 3.1 The study area in relation to the underlying soil landscapes.

3.2 Topography and Landform

The region surrounding the project area is typical of the transition from Luddenham to Blacktown soil profile, consisting of undulating hills with 5% to 10% slopes in the west (the Luddenham soil landscape) dropping to low hills and valley flats in the east of the project area (the Blacktown soil landscape). Drainage lines generally run south-eastwards through the project area, with the exception of Bow Bowing Creek which runs north-east.

3.3 Hydrology

The project area is located within Nepean River catchment which, in conjunction with the Grose River, forms one of the main water systems in central New South Wales. The major watercourse in the vicinity of the project area is the Nepean River, which flows northwards approximately 3 kilometres west of the project area. The headwaters of the Nepean River are found in the Southern Highlands, near Robertson, before it flows north-west towards Penrith and joins the Grose River to become the Hawkesbury River.

The project area contains 1st, 2nd and 3rd order creeks which merge and flow south-east through the project area before joining the 4th order Bow Bowing Creek, in the southern portion of the project area (Figure 3.2 and Figure 3.3).

The study area itself contains the highly modified course of Bow Bowing Creek, which runs along the southern edge of the study area. The creek has been altered to run underground, below a concrete stormwater drain for run-off. Within the study area is also a 3rd order creek, which joins Bow Bowing Creek through another underground drain, and a 1st order creek, although it was not possible to locate this creek during the fieldwork.

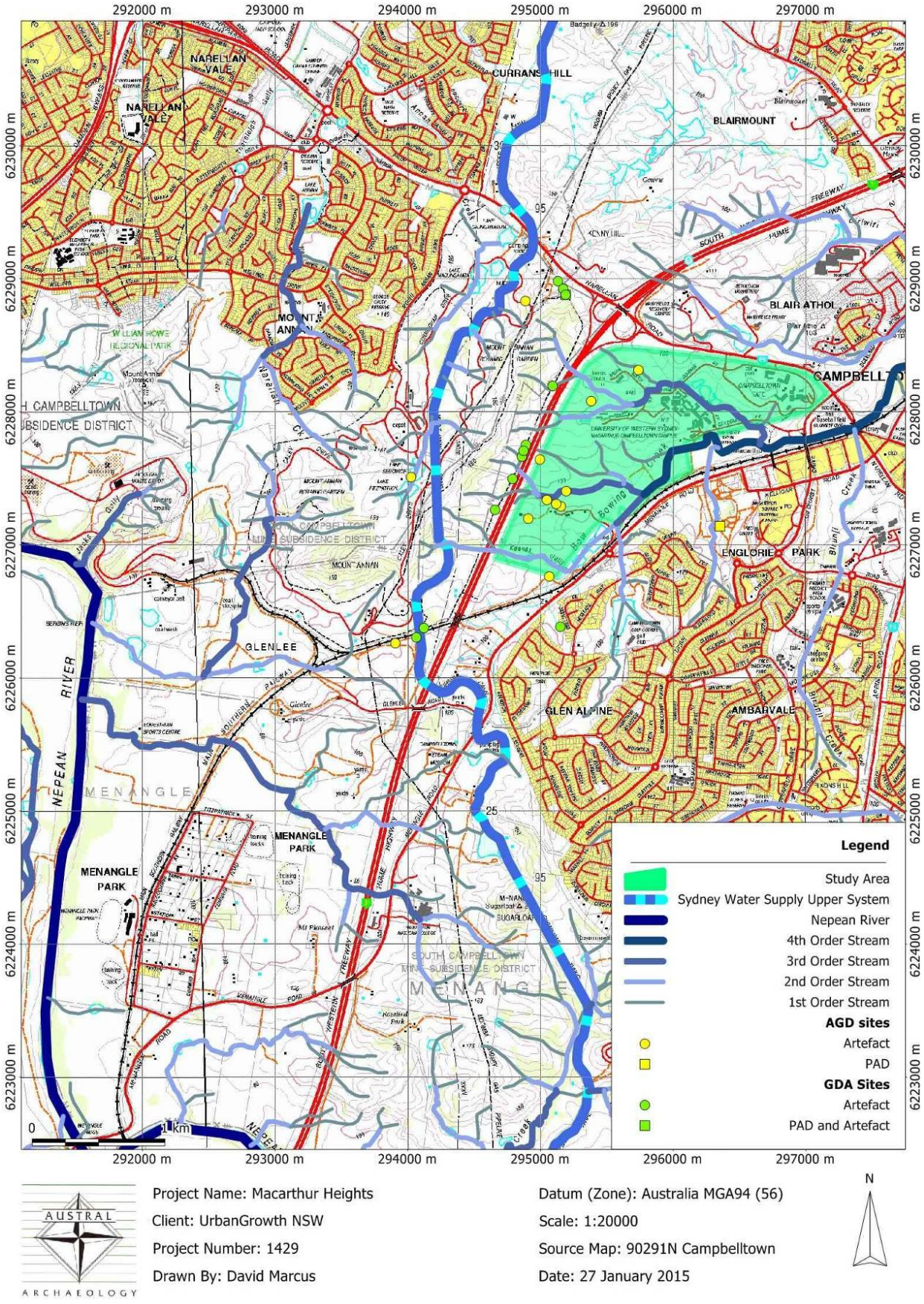

Figure 3.2 Map showing hydrology and stream order surrounding the project area in relation to site distribution**.**

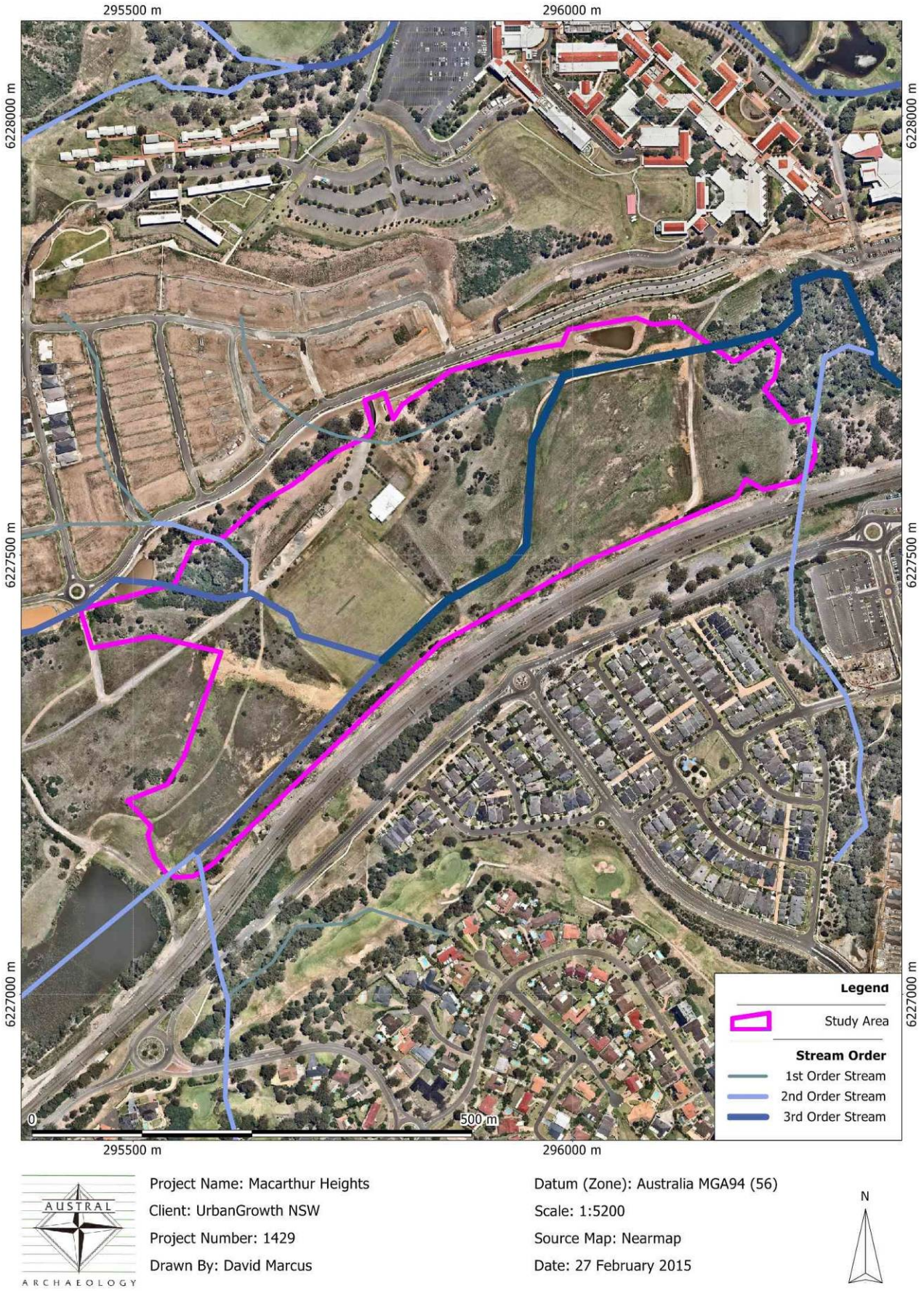

Figure 3.3 Map showing hydrology of the study area.

3.4 Climate

The climate of the Cumberland Lowlands is warm temperate with a maritime influence, resulting in cool to mild winters and warm to hot summers. Average temperatures at Picton range from an summer average of 28.1°C to winter average of 16.9°C, with occasional overnight frosts. Rainfall totals are highest in the summer, with rain occurring on an average of 38 days per year and with approximately 700 millimetres of rainfall each year (Hazelton & Tille 1990:4).

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 project area would have exploited resources from the nearby Nepean River as well those within the smaller drainage lines such as Bow Bowing Creek. Vegetation has been predominantly cleared but would have consisted of tall open-forest (wet sclerophyll forest), open-forest and woodland (dry sclerophyll forest). The areas of tall open-forest would have included Sydney blue gum and blackbutt, while open-forests in drier areas would have included forest red gum, narrow-leaved ironbark and grey box (Benson & Howell 1990:75). Smaller grasses and shrubs covering the ground would have included Kangaroo Grass (*Themeda australis*), as well as *Danthonia* Sp., *Chloris ventricose, Poa labillardieri, Aristida ramose, Sporobolus creber* and *Bothriochloa decipiens* (Benson & Howell 1990:72).

The Cumberland Plains would have once supported a wider variety of native fauna prior to European settlement in the late 18th century. According to European observations, the study area and its surrounds were once home to a wide variety of mammals including possums, wallaroos, kangaroos, swamp wallabies, swamp rats, sugar gliders, squirrel gliders and bandicoots (Attenbrow 2002:42; Kohen 1985, 1993:28). The Hawkesbury and Nepean River systems would have also provided faunal resources such as estuarine fish species, mussels and crayfish, a diverse range of water birds and waders, small reptiles such as lizards, and plant species including yams (Kohen 1985, 1993:27-28). To provide an example of the variety of different faunal resources available to Aboriginal people, the Atlas of NSW Wildlife identifies 351 native species in the Campbelltown LGA; 214 bird species, 54 mammals, 50 reptiles, 30 amphibians, two snails and one insect. However, of these, at least 72 are listed as threatened or endangered.

3.6 Past Land Use Practices

The early settlement and economy of the Campbelltown Region focused on the naturally fertile soil and ideal growing conditions for European crops. Following the large-scale clearance of the native vegetation, Campbelltown gained a reputation as the “granary of the colony“, from the crops of wheat and other cereals which were grown there. After a disastrous bout of fungus all but destroyed the wheat crop in the early 1860s, large swathes of land were instead set aside for pastoralism, and, in particular, dairy farming (Benson & Howell 1990:75).

The project area itself has been affected by vegetation clearance and as a result is now covered in a young regrowth of native vegetation, especially along the creeks and gullies. There is no direct evidence of agricultural practices having occurred within the project area, primarily due to the relative steepness of the project area, although in light of the above historical accounts it is highly likely to have contributed to the removal of the original native vegetation.

Specifically documented disturbances that have affected the project area are predominantly associated with the development of the UWS campus and the Campbelltown TAFE campus in the mid 1980s. These include the installation of services, construction of buildings and landscaping of the campus grounds.

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 as well as by stock grazing. However, this is likely to have resulted in localised artefact displacement rather than destruction of Aboriginal sites. The construction of the campuses severely affected and disturbed the original soil landscape and as a result it is highly unlikely that archaeological material has survived intact within these specific zones of disturbance.

Both previous assessments within the project area have noted the overall amount of ground disturbance which has occurred within the project area, and the consultants acknowledge that only a small percentage of the project area remains lightly disturbed (AMBS 2005:4; Jo McDonald CHM 2003:15). Results of the pedestrian assessment conducted by AMBS emphasise the highly disturbed nature of the project area, particularly in regards to creeklines and surveyed landscapes (AMBS 2005:8).

The study area has undergone specific disturbances relating to the creation of both the main gym building, the associated playing field, archery range and golf driving ranges, and the construction of the underground stormwater drain and concrete run-off drain for Bow Bowing Creek. These works would have included levelling, excavation, civil earthworks and landscaping works.

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. Initial 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.

Agricultural practices would have impacted the existing landscape in a number of ways, particularly through land clearance which would have left the original soil profile vulnerable to erosion and disturbance. Activities such as harrowing, ploughing and animal grazing on exposed soils are therefore likely to have affected the integrity of the archaeological resource to some degree. However, this is likely to have resulted in localised artefact displacement rather than the destruction of Aboriginal sites.

The highest level of disturbance would have been caused by the levelling of the area for the creation of the main gym complex and the playing fields, archery range and golf range, coupled with the modification works to Bow Bowing Creek. These works are likely to have significantly disturbed any archaeological resource which had survived earlier disturbances intact.

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 and the potential impacts on archaeological resources.

Past Land Uses	Potential Impacts on Archaeological Resources
Historical land clearance and grazing	Loss of native grasses and trampling on the ground has lead to increased erosion and potential dispersal of ground artefact scatters.
Vegetation clearance	The potential loss of scarred trees from the subject land.
Levelling of playing fields, archery range and golf driving range	Extremely high levels of earth disturbance resulting in the complete removal of artefacts from their stratographic context.
Levelling of raised area for construction of gym complex	Earth disturbance leading to the potential disturbance and dispersal of artefacts from their stratographic context.
Modification to the course of Bow Bowing Creek	High levels of earth disturbance resulting in the removal and dispersal of artefacts from their stratographic context.
Installation of services for the gym	Earth disturbance leading to the potential disturbance and dispersal of artefacts from their stratigraphic context.
Construction of roads to the north of the Sportsfield Precinct	Earth disturbance leading to the potential disturbance and dispersal of ground artefact scatters.
Landscaping of the campuses grounds	Earth disturbance leading to the potential disturbance and dispersal of artefacts from their stratigraphic context.

4 ABORIGINAL ARCHAEOLOGICAL CONTEXT

4.1 The Cumberland Plain Archaeological Context

Archaeological investigations of the Cumberland Plains, and in particular the Macarthur, Menangle and Narellan areas, 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 Campbelltown 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 Plains and Nepean River Valley extends back well into the Pleistocene, or 10,000 years ago. Currently, the oldest accepted date for an archaeological site in the Sydney region is a date of about 14,700 years Before Present (BP), which was obtained from Shaws Creek Rockshelter K2, located to the north of Penrith (Attenbrow 2002:20). Relatively early dates were also obtained by McDonald et al (1996) for artefact bearing deposits at open site RS1 (AHIMS #45-5-0982) on Mulgoa Creek, Regentville, but the reliability of these dates is uncertain (McDonald *et al* 1996:61-62).

4.1.1 Population and Contact History

Population estimates at the time of contact are notoriously problematic as Aboriginal groups avoided the early settlers and were highly mobile. Another factor which complicates an accurate estimation is the effect of European diseases such as influenza and smallpox, which decimated Aboriginal populations soon after contact.

The present study area is thought to lie at the western boundary of the Tharawal tribe, as mapped by Tindale (1974). The Tharawal territory is believed to have extended south from Botany Bay to the Shoalhaven River and inland as far as Campbelltown and Camden (Attenbrow 2002:34) while the Gundungurra occupied the land to the west of the Tharawal (AECOM 2010:14, Niche 2010:17). However, 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 (Niche 2010:17). As such, defined borders for tribal groups need to be recognised as an artificial constraint designed by anthropologists (Organ 1990:xliii) and, in the words of Traditional Owner Glenda Chalker of the Cubbitch Barta Native Title Corporation, the area is both “Gundungurra and Tharawal tribal country” (Niche 2010:17).

The pre-contact population numbers for the study area are not known and, due to smallpox and influenza epidemics preceding the arrival of European settlers into the region (Attenbrow 2002:21), it is unlikely that the early European explorers were able to successfully grasp the traditional population size.

While early contact between Aboriginals and Europeans in the area was initially neutral, a combination of a long drought and an influx of Aboriginal people pushed off neighbouring lands resulted in escalating violence throughout 1814 to 1816 (Austral Archaeology 2011:12). The inevitable conclusion was reached in 1816, when troops under the command of Captain Wallis caused the death of a number of Aboriginal people camped at Cataract Gorge (Heritage Concepts 2007:13). This saw the end of spirited resistance, and led to an increased attempt by Aboriginal people to enter into the cultural and economic lifestyle of the European settlers.

Following the massacre, the number of Aboriginal people in the Maldon area remained low, with 63 Aboriginal people being reported as living at Stonequarry in 1838, and only 80 Aboriginal people reported at Picton in 1862 (Dibden, in AECOM 2010:14). Despite these setbacks, there were reports of Aboriginal people in the Camden area still hunting using traditional methods and camping along the Nepean River right up to the late 19th century (AECOM 2010:14, Atkinson 1988:7).

This ethnohistory should be employed with caution and Hiscock (2008:17) has recently argued that even very early historical accounts may not be a suitable basis for analogy. As Aboriginal groups had to change their economic, cultural and political practices in order to cope with the social impacts of disease in the historic period, he argues that it is likely that similar drastic changes happened in the past in response to "altered cultural and environmental circumstances" following the arrival of Europeans. Social disruption in the Cumberland Plains region caused by European settlement pushing Aboriginal people to the fringes of their traditional lands would have caused such drastic changes.

4.1.2 Material Culture

The material culture of the Aboriginal people of the Sydney 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 of the Sydney region.

Spears in the Sydney region were usually made of a grasstree spike (for the shaft) with a hardwood point. Stone, bone, shell or wood were sometimes used as barbs (Turbet 2001:40). Thin and straight spear-throwers were made from wattle (Turbet 2001:40). Fishing spears were usually tipped with four hardwood prongs with bone points (Attenbrow 2002:117, 119; Turbet 2001:42). Fish were also caught by means of shell or bird talon fish hooks (Attenbrow 2002:117; Turbet 2001:45).

Bark of various types were used for making such diverse items as wrappings for new-born babies, shelters, canoes, paddles, shields and torches (Attenbrow 2002:Table 10.1). Resin from the grasstree was used as an adhesive for tool and weapon making (Attenbrow 2002:116; Turbet 2001:36). Similarly, 'Boomerang' is believed to be a Darug word. Various kinds of boomerangs and clubs were made from hardwoods as were such items as digging sticks (Attenbrow 2002:112; Turbet 2001:37-39, 45).

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 (McDonald 2000d). 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.

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 NSW was identified by archaeologist F.D. McCarthy who named it the 'Eastern Regional Sequence' (McCarthy 1976:96-98). McCarthy identified '*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 the source of academic debate, with Stockton & Holland (1974:53-56) offering an alternative to McCarthy's theory by proposing four phases of the Eastern Regional Sequence. 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* referred to McCarthy's *Eloueran* phase. Stockton and Holland's won the day and their terms are used in the Sydney region today (Attenbrow 2002:156).

Broadly speaking, Capertian assemblages contain tools which are generally larger in size than later assemblages but also contain smaller tools, such as thumbnail scrapers and dentated saws. 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 Stockton & Holland (1974:53-56) referred to this period as the *Early Bondaian* and *Middle Bondaian* phases. Edge ground implements appear in region 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 the Elouera continued to be used. This is known as the *Late Bondaian* phase. On the Cumberland Plains, 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 2002:156). In coastal areas, and possibly through the Sydney Basin, both the use of quartz and the use of the bipolar flaking technique increased through time, although this tendency is less marked on the western Cumberland Plain (Attenbrow 2002:153-159, Corkill 1999:135)

4.1.3 Food

Both estuarine and terrestrial resources were exploited by Aboriginal hunter-gathers in the Cumberland region. Land mammals that were hunted for food included kangaroos, possums, sugar gliders, wombats and echidnas as well as native rats and mice (Attenbrow 2002:70). Birds, such as the mutton bird and brush turkey, were also eaten and it is recorded that eggs were a favourite food (Attenbrow 2002:75-76, Table 7.3). Evidence of yam harvesting has also been recorded on the Hawkesbury River and fish traps are known to have been used in the Nepean River (Kohen 1985, 1993:25). Kohen also points to evidence of the burrawong being a staple food for the Darug people (Kohen 2009:5).

Attenbrow (2002:76) noted that "Sydney vegetation communities include over 200 species that have edible parts, such as seeds, fruits, tubers/roots/rhizomes, leaves, flowers and nectar". Observations from the earliest European settlers describe Aboriginal people in the Sydney region eating a wide range of plants foods including roasted fern-roots, fruits the size of a cherry, a type of nut and the root of an orchid species. As Attenbrow (2002:76-79) points out, however, the settlers' lack of knowledge of the local plant species make identification of the various plants exploited by Aboriginal people difficult.

In summary, the Cumberland Plain and the Hawkesbury River and associated tributaries provided a wide variety of plant and animal resources which were used by local Aboriginal populations for artefact manufacture, medicinal purposes, ceremonial items and food.

4.1.4 Early Archaeological Models

In the early 1980s, Foley (1981) developed a general site distribution model for forager settlement patterns. Although the model presents a more sedentary occupation than was probably present on the Cumberland Plain, the general principles can be considered a useful indicator of sites located across the Australian landscape.

The model splits hunter-gatherer sites into two main categories; 'residential base camps' and 'activity areas'. 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 4.1 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 generally low amount throughout the rest of the landscape, mainly while travelling between activity areas and the base camp. However, the model 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.

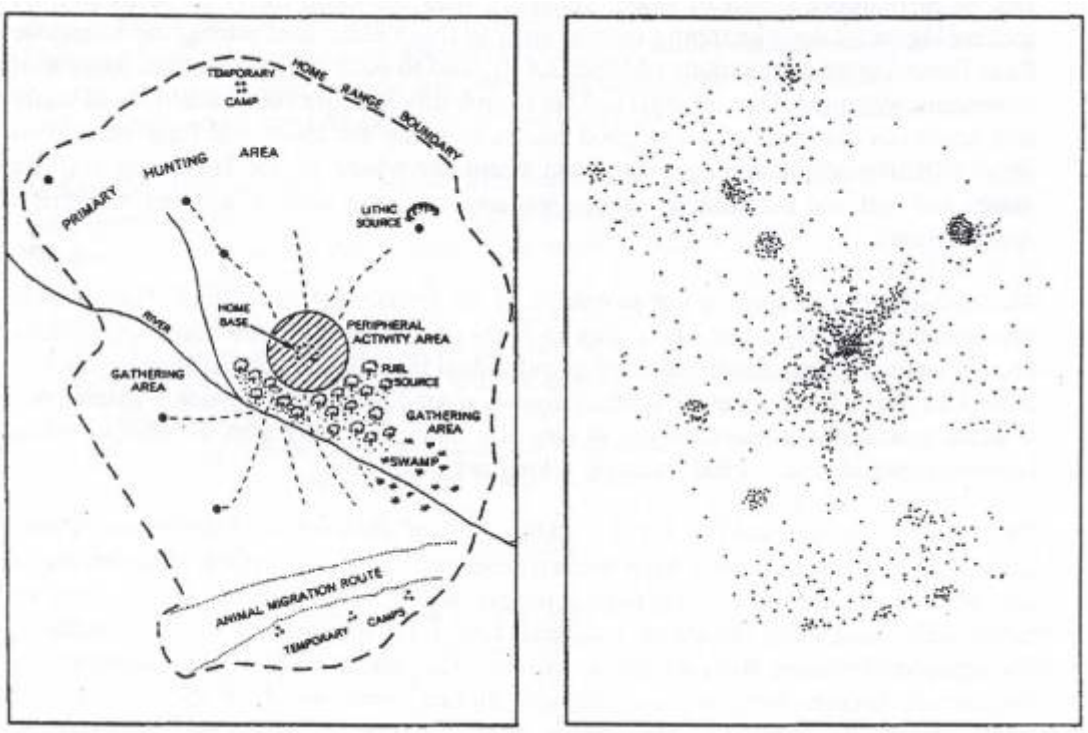

Figure 4.1 **Foraging Model** (Foley 1981)

Models specific to the Cumberland Plain were initially based on ethno-historic records, due to the lack of recorded sites at this time. One of the earliest models was developed by Kohen in his 1986 study, where he created a general model of site occurrence, chronology and function for the region. The chronological component of his model posited that Aboriginal occupation of the Cumberland Plain occurred primarily during the mid to late Holocene (*circa* 4,500 BP) and was related to an increase in Aboriginal population in the area and the introduction of a new stone tool technology known as the 'small tool tradition'. He also argued that prior to the mid Holocene, Aboriginal occupation of the area was concentrated on and around the Nepean River and the coast.

Archaeological assessments over the last three decades have indicated that access to water is an important determining factor in site location on the Cumberland Plain. Haglund (1980), based on survey work in Blacktown, predicted that sites would most likely be located near creeks and soaks, and on high ground near water. A predictive site model proposed by Smith (1988, 1989) supported these predictions based on site distribution near Rickaby's Creek and Londonderry. This model stated that sites would most commonly be found along permanent and temporary creek lines and around swamp margins, with creek flats and banks considered to be focal topographical features for site location (Smith 1988:133, 1989:2).

As the Cumberland Plain is dominated by occurrences of stone artefacts, proximity to raw materials and degree of stone tool reduction have also been subject to analysis and predictive modelling. In 1981, Dallas & Witter (in Ozark 2004:10) put forward the distance decay model, which suggests that artefacts generally have less cortex and get smaller with increasing distance from raw material sources.

Observations made by Smith (1988:108-109) also suggested that there is a tendency for stone artefacts with a greater percentage of cortex (known as primary and secondary artefacts) to be found near raw material sources, while artefacts with no cortex (tertiary artefacts) are concentrated away from raw material sources. She also found that the size of a site, based on the number of artefacts, does not necessarily correlate with distance from the raw material source, suggesting that not all large sites on the Cumberland Plain are associated with raw material extraction (Smith 1988: 106). Benton and Levy (OzArk 2004:10) state, however, that with archaeological investigations locating more sources of raw material, particularly silcrete, throughout the Cumberland Plain, it has become more difficult to test the distance decay model. Furthermore, Benton and Levy suggest that the distance decay model is unable to explain raw material preference. AMBS (2002:31) also suggest that "simple proportional differences in raw material might not be a good archaeological indicator of quarrying behaviours".

4.1.5 Later Work

As a direct consequence of numerous archaeological investigations being undertaken due to rapid development across the Cumberland Plain, an increasing number of Aboriginal sites have been identified and recorded in the last 15 to 20 years.

Access to a greater amount of data allowed McDonald (1997a) to undertake a more detailed analysis of site types and their distribution over the Cumberland Plain. Although McDonald noted that lack of archaeological visibility was a significant issue, she found open artefact scatters and open camp sites to be the dominant site type (89% of all sites recorded), followed by isolated finds and a combination of open or other site types (3.5%), and scarred trees (2.1%). Open sites were found in all landscape units but McDonald determined the high proportion of sites located on creek banks appeared to be a reflection of surface visibility and taphonomy rather than being indicative of patterns of discard (McDonald 1997a:36). She also revealed that virtually none of the sites that had been excavated on the Cumberland Plain could be characterised on the basis of surface evidence alone due to an obvious disparity between the numbers of surface and sub-surface artefacts (McDonald 1996, see also OzArk 2004:9).

As a corollary to these findings it was deemed that existing predictive models, which relied heavily on the presence of surface evidence across only small areas of land, were inadequate (McDonald 1996). It was therefore assumed that sub-surface results could provide the necessary data to predict site location and/or site variability. After extensive salvage and test excavations carried out for the Rouse Hill Test Excavation Programme (McDonald and Rich 1993; McDonald *et al* 1994) and the Rouse Hill (Stage 2) Infrastructure Project (McDonald 1996), 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 subsurface structural integrity. Sites in alluvium possess potential for stratification.*
- *While ploughing occurs in many areas of the Cumberland Plain, this only affects the deposit up to 30 centimetres deep, and even then 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 also far greater than was previously identified on the basis of surface recording and limited test excavation. Intact knapping floors, backed blade manufacturing sites, heat treatment locations, a number of apparently specialised tool types and generalised camp sites were all found following more detailed investigations.*
- *Two Early Bondaian dates (between 5000 and 3000 BP) provide a context for backed blade manufacture.*
- *Overall site patterning is identifiable on the basis of environmental factors, where 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 1996:115).*

McDonald *et al* (1994) also argued that environmental factors, such as stream order, were integral to developing a predictive model for the Cumberland Plain. Stream order modelling as a predictive tool can be utilised to anticipate the potential for Aboriginal camp site locations in the landscape based on the order of water permanence. McDonald (1997a, 1997b, and 1999) in particular, has drawn on stream order modelling in order to forecast the potential nature and complexity of sites in the Cumberland Plain. These models can also be used to predict the possible range of activities carried out at a particular site and the frequency and/or duration of occupation.

Analysing stream order can allow researchers to locate areas of water permanence, which would have been vital for Aboriginal people. Abundant food and other resources are more likely to occur in areas of water permanence which would in turn attract Aboriginal occupation. McDonald's excavations of open artefact scatter sites at the ADI site in St Marys provided evidence of such a correlation (McDonald 1997b:133).

According to McDonald, the range of lithic activities and the complexity of the resulting stone assemblage observed at a location of permanent water also differ depending on stream order. Large knapping events tend to occur in proximity to sources of permanent water (McDonald 2001). 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 usually 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 often be more diffuse.

Overall, artefact scatters in the vicinity of a higher order ranking streams 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 occupation 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:134-135).

It is therefore possible, McDonald concluded, that 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, 2000d:19). Site location and duration of occupation predictions therefore relate to stream order in the following ways:

- *In the headwaters of upper tributaries (i.e. first order creeks) archaeological evidence will be sparse and represent little more than a background scatter;*
- *In the middle reaches of minor tributaries (second order creeks) 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 (third 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 (fourth order) 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* (McDonald, 2000d:19).

Predictive modelling has also been used by McDonald with regards to the procurement and usage of stone material on the Cumberland Plain, with especial reference to the source of silcrete on Plumpton Ridge. The results of McDonald's (2007) salvage excavation at the Colebee Release Area have provided some insight into procurement, processing and dispersal trends associated with the quarry site. The results also lent support to Dallas and Witter's (1981 in Ozark 2004:10) distance-decay model, with McDonald noticing artefact size and percentage of cortex decreasing with distance from the quarry. McDonald (2007:133) found that at the Plumpton Quarry site, 11% of artefacts retained some cortex while at Rouse Hill, more than 5 kilometres away, less than 5% of artefacts retained cortex. Similarly, cores had an average size of 60 millimetres at the quarry but were less than 40 millimetres at Rouse Hill, while between 2 to 4 percent of all artefacts identified were larger than 50 millimetres at the quarry site, but less than 1% were larger than 50 millimetres at Rouse Hill (McDonald 2007:133). Assemblage composition also changed with the distance to the quarry.

McDonald (2007:134) has noted, however, that these results do not necessarily indicate an increasingly conservative use of silcrete corresponding with an increased distance from Plumpton Quarry, as they are based on large-sized assemblages in a rich archaeological landscape and a number of sites with dense artefact distribution have also been recorded at Rouse Hill.

Paul Irish (2006:11) further notes that in areas of the Blacktown soil landscape, as found in the study area, archaeological evidence is generally limited to the upper topsoil, or A-Horizon. The subsoil in such cases is usually a brown clayey loam with gravel, overlying a clay subsoil which is archaeologically sterile. Therefore, while PADs are frequent in the Cumberland Plains, they are limited to areas which retain the original topsoil.

Biosis, after surveying areas outside of the immediate vicinity of the Nepean River, concluded that although tributaries and gullies of the river system were the most archaeologically rich, a background scatter of artefacts was present throughout the Plains (Biosis 2006:54-55). This model was later confirmed by Biosis following test excavations which showed occupation of lowland plains only resulted in low density stone artefact sites (Niche 2010:20).

The most recent predictive model has been created 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 51-100 metres from 4th order streams, and within 50 metres of 2nd order streams* (White and McDonald 2010:36).

In agreement with Niche (2010:24), it is held that these results are directly transferable to other parts of the Cumberland Plains, although the sandstone gullies associated with the Nepean River and Harris Creek are not present in the current study area.

4.2 Heritage Database Search Results

4.2.1 Aboriginal Heritage Information Management System Search Results

A search of the OEH AHIMS database was undertaken on 27 January 2015 (Client Service ID 160490).

The results from the AHIMS search identified 34 previously recorded sites within a 1 kilometre radius of the study area (Table 4.2 and Figure 4.2). Of these sites, 14 were listed with coordinates which place them within the project area. Isolated artefact UWS_TP40_IF (#52-2-3959) is located within the study area. However, this site formed part of an Aboriginal Heritage Impact Permit application made during development work in the riparian corridor.

Table 4.1: Summary of sites listed within the project area.

AHIMS Site Number	Site Name
52-2-2116	TLC 4 / UWS 1
52-2-3222	Macarthur Square Campsite 1
52-2-3057	IF 6
52-2-3059	UWS 2
52-2-3060	UWS 3
52-2-3061	UWS 4
52-2-3062	UWS 5
52-2-3966	UWS TP40 IF
52-2-3967	UWS TP20 IF
52-2-3956	UWS_TP19_AS
52-2-3957	UWS_TP20_IF
52-2-3958	UWS_TP25_IF
52-2-3959	UWS_TP40_IF

A preliminary examination of the results of the AHIMS search suggested that there is an error in the dataset and two sites have been duplicated. Following the completion of Aboriginal archaeological test excavations in the green corridor separating Stage 1 and Stage 4, Austral Archaeology registered four new sites (Austral Archaeology 2013). However, six sites were actually added to AHIMS, with site UWS TP20 IF (#52-2-3967) being a duplication of site UWS_TP20_IF (#52-2-3957), and site UWS TP40 IF (#52-2-3966) being a duplication of site UWS_TP40_IF (#52-2-3959).

The AHIMS Registrar has been notified of this error and has advised that both sites have since been removed from the AHIMS database (Davi Foto pers. comm. 3 February 2015). Both sites are discounted from the following discussion.

Table 4.2: Summary of sites recorded within 1km radius of the study area.

Feature Type	Total	%
Artefact (stone) single / scatter	30	93.75%
Potential Archaeological Deposit (PAD) + Artefact (combined)	2	6.25%
TOTAL	**32**	**100%**

Table 4.2 shows that there are two different site types represented by the search results: stone artefacts and PADs with artefacts. The vast majority of the registered sites are stone artefacts (both isolated finds or open artefact scatters). This site type represents 30 reported sites, or 93.75% of the overall site type frequency in the localised search. The remaining 6.25% of sites are PADs with artefacts (n=2).

It should be noted that 13 of the sites listed in the AHIMS search have coordinates provided in the AGD datum, while 21 sites have coordinates in the current GDA datum. Plotting a site in the wrong coordinate system results in the site being incorrectly located approximately 200 metres north-east or south-west of its correct location, dependant on the coordinate system. For the purpose of the following map, it is assumed that the correct coordinate system has been registered for each site.

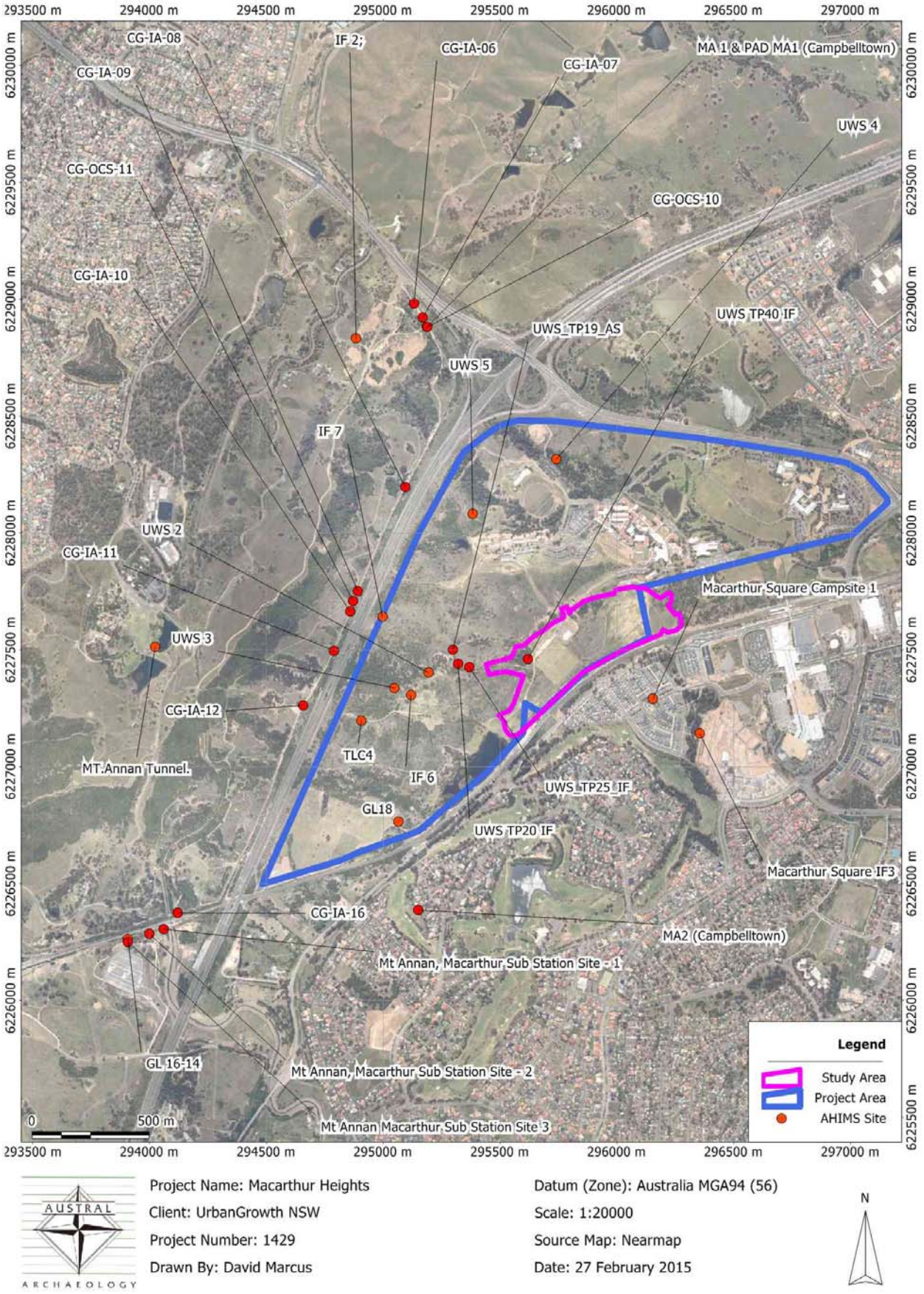

Figure 4.2 Distribution of previously recorded Aboriginal archaeological sites in the area surrounding the current project area and study area.

4.3 Previous Archaeological Investigations in the Vicinity of the Subject Land

Although European observers recorded various aspects of the lifestyles of Aboriginal people around the Central Coast 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. Even then, the relatively undisturbed nature of the study area has resulted in the need to examine reports from a wider area.

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, engraved or pigmented images or midden material.

4.3.1 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 4.1 below outlines the details and results of some relevant archaeological consultant's reports from the region. Please note that this is not a complete list.

Table 4.3: A Summary of Archaeological Consultant Reports from the Region

Reference	Study area location/ description	Results	Site distribution / Conclusion
Hanrahan 1981, 1982a and 1982b	Currans Hill/Menangle Park	Nine artefact scatters located along Narellan Creek.	Only one site (N2) was considered high density, while of the nine sites, only N5 was believed to have associated PAD.
Bonhomme 1986	Currans Hill/Menangle Park	Identified archaeological deposts associated with sites N2 and N5.	Re-assessment of the sites identified by Hanrahan (1982a). Test excavation conducted at N2 and N5 showed undisturbed archaeological deposits. N5 assessed as a temporary campsite while N2 was important focus of activity at junction of ridge and valley.
Haglund 1989	Currans Hill/ Menangle Park	Archaeological excavation recovered 259 artefacts from N2 and 41 from N5.	Salvage excavation at sites N2 and N5. Haglund reports that the types of artefacts and raw materials were similar, despite difference in artefact densities.
McDonald 1990	Menangle Park	two artefact scatters recorded on ridgelines.	Notes that the geology of the study area is most likely to contain low concentration artefact scatters along ridges and creeks. Silcrete was dominant material.
English 1994	Harrington Park	Three artefact scatters and seven isolated artefacts.	Sites occurred on ridges and alongside Narellan Creek. All sites adjudged to have low archaeological significance. Silcrete was main raw material, followed by mudstone, chert and quartz.
Brayshaw McDonald Pty Ltd 2001	Menangle Park	New artefact scatter discovered through subsurface excavation.	Test excavation revealed sites discovered by McDonald (1990) were heavily disturbed and contained no archaeological significance.
Dibden 2003	Camden Gas Project, including the area immediately SW of the current study area	Survey of large area around Menangle identifying 21 sites, including GL 18	Many sites were in areas of indentified historical disturbance and were isolated artefacts. GL18 consisted of a low density silcrete artefact scatter at a creek junction, with possible PAD.
Jo McDonald CHM 2003	UWS Campbelltown (present study area)	Identified eight PSAs, six PADs and five isolated finds.	Generally located on ridgelines or in close proximity to creeks. None of the sites were registered with AHIMS.
AMBS 2005	UWS Campbelltown (present study area)	Two additional PADs and two additional isolated finds were identified.	All site were identified on or near creeks and ridgelines. As a result of the new sites, the PSAs were extended.
Dominic Steele 2005	Camden Gas Project, Menangle	Seven artefact scatter and two isolated artefacts recorded	Mostly low density artefact scatters of predominantly silcrete, located near creeks and ridges. Several sites were believed to contain PADs.

Reference	Study area location/ description	Results	Site distribution / Conclusion
Heritage Concepts 2006	Macarthur Substation, Menangle Park	One scar tree and associated PAD, as well as one PADs based on topography and one based on the presence of isolated artefacts.	PAD 2 identified based on favourable topography for settlement which was unlikely to have been disturbed by Europeans while also allowing for quick sediment build up. The remainder of the study area outside the other PADs was also accepted to have moderate potential for subsurface deposits.
Paul Irish 2006	Macarthur Substation, Menangle Park; Supplementary Report	Refuted the Aboriginal scar tree recorded in the previous report.	Reassessment of PADs recorded by Heritage Concepts (2005).
Navin Officer 2008	Menangle Park/Mount Annan	Identification of two artefact scatters and one PAD	Sites recorded on ridges and upper slopes, away from creeks and waterlines.
Biosis 2010	Camden Gas Project: Northern Expansion	28 sites identified, mainly scarred trees and artefact scatters in a variety of landforms. Also reassessed three previous sites and two PADs within the study area	Sites were assessed to be of low to moderate significance. Twelve isolated artefacts recorded and twelve artefact scatters containing no more than five artefacts. Silcrete was the dominant material, followed by mudstone.

5 THE LOCAL AND REGIONAL CHARACTER OF ABORIGINAL LAND USE AND MATERIAL TRACES

The range of environments and landscapes within the Cumberland Plain and along the Hawkesbury-Nepean River had a profound influence upon the lives of the Aboriginal people who lived there. As hunters and gatherers, Aboriginal people were reliant on their surroundings to provide food. Their transitory lifestyle affected population size, social interactions and degree of mobility. This can be confirmed in the archaeological record. Ethnographic accounts were once the primary source of archaeological investigation. However with the recent spread of urban development within New South Wales, archaeological investigations have increased in frequency.

The pre-European context of the Cumberland Plain is one of small bands of Aboriginal people living a mobile hunting and gathering lifestyle. The Tharawal people were the traditional owners of the area around Campbelltown. Population estimations at the time of contact were difficult to estimate due to disease decimating populations. The social structure of pre-European groups was slightly stratified with elders of clans holding decision making capabilities. Subsistence activities were sexually dimorphic and the spirituality of groups is detailed and explained through an oral tradition of Dreamtime. Material culture, such as tools, was made of a variety of materials such as bark, resin, shell, bone and reeds. Hard stone raw material that was made into stone tools is the main element of this tool kit to remain in the archaeological record.

The pre-European environment of the Cumberland Plain provided an extensive resource base associated with the multitude of water sources. These water sources include fresh water rivers (the Hawkesbury-Nepean River) and fresh water creeks (including Birunji and Bow Bowing creeks). Habitats associated with these water systems would have supported a wide range of animals, fish, birds and mammals, all of which would be rich in proteins and would have been in abundant supply. The pre-European Cumberland Plain landscape would have been the setting for a variety of human activity. This human activity would have included camping, hunting, gathering, cooking, ceremonies, and other cultural activities associated with semi-permanent settlement sites in the region.

Early archaeological investigations of the Cumberland Plain within the Sydney Basin by Haglund (1980), Kohen (1986) and Smith (1989), among others, and later work by McDonald (i.e. 1993a 1993b, 1996, 2000a, 2000b, 2000c, 2001, 2002) has helped develop methods of predicting the location and likelihood for Aboriginal sites within the landscape. This model is primarily based on the presence of reliable water sources, with an underlining principle that within 100 metres of fresh water creeks, the likelihood of Aboriginal site occurrences increases. Supplementing this basic predictive statement, a more specific site predictive tool, Stream Ordering, is used. This states that the more permanent and reliable the water sources is, then the more frequent and complex Aboriginal activities in those locales become.

Several archaeological investigations of the landscape surrounding the project area have helped build an understanding of the Aboriginal archaeological record in this area. Site distribution is more prevalent on the creeks which are frequently found on the Cumberland Plains, with a secondary concentration of sites on ridgeways. Scarred trees are unlikely to be present due to the removal of most remnant native vegetation within the project area, but they are known from the immediate surrounds.

Artefact scatters within the search area include formal artefact groups such as ground stone axes, cores, hammer stones and debitage flakes. Flakable stone material has been shown to be locally available both within the local region and from known locales such as Picton.

5.1 Summary of Aboriginal Material Traces Within the Local Region

Based upon analysis of information obtained from the OEH AHIMS search, the local and regional archaeological and environmental contexts, the types of sites which occur in the wider region and may occur within the current subject land are considered below. In discussing the distribution of site types or traits across the region, Attenbrow (2002:49) notes that:

> "shell middens…are associated with estuarine and ocean shorelines…A large number of sites are associated directly with sandstone – rockshelters with midden or deposit and/or images (usually pigmented images), engraved images and grinding grooves on rock platforms, stone arrangements, abraded channels and waterholes…In addition, almost all of the recorded open middens are located directly on sandstone as that is where they preserve best. On the other hand, the Cumberland Plain is dominated by open deposits because of its shale geology and lack of sandstone."

Open camp sites or isolated finds of durable material of flaked or ground stone that have been discarded across the site may be present. The presence of *manuports* potentially could occur at the study area. Manuports are stone artefacts of raw materials not naturally occurring within the soil profiles of a given site; essentially they have been brought onto the site by Aboriginal people from somewhere else.

Scarred trees are the result of the removal of bark and/or wood for the purpose of manufacturing shelters, canoes and shields and/or for designs carved into wood for a range of aesthetic, functional and ceremonial reasons which are currently not fully understood. Evidence for tree scarification is more likely to be observed on large and mature trees (depending upon the species). Unless the tree is at least 100 years old, scarring is unlikely to be of Aboriginal origin.

6 ARCHAEOLOGICAL PREDICTIVE MODELLING

An assessment of archaeological potential usually considers the historic sequence of occupation in comparison to the structures which are currently extant, as well as the impact that the more recent constructions and works would have had on the earlier occupation phases and, as such, the likely intactness of the archaeological resource. This, in turn, is tied in with the extent to which a site may contribute knowledge not available from other sources to current themes in historical archaeology and related disciplines.

In regard to the assessment of the study area, the archaeological potential depends upon the anticipated likelihood for the survival of buried structural fabric and cultural deposits as well as an estimation of archaeological integrity. Structural fabric refers to what is generally regarded as building or civil engineering remnants. Cultural deposits refer to archaeological deposits, i.e. deposited sediments containing artefacts etc.

Having analysed the historical evidence in the previous chapters, the following section presents a summary of the potential for a physical archaeological resource to be present in the study area, that is, its archaeological sensitivity/potential.

6.1 Aboriginal Predictive Modelling

In general, an archaeological predicative statement on any project 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 of the project area and degree of disturbance. These are addressed in the following sections.

The moderate climate of the Cumberland Lowlands and its location within the wider Nepean River catchment is believed to have been conducive to Aboriginal occupation in the past. The project area lies within a resource base associated primarily with the Nepean River water source. 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 project 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 Tharawal language or, less certainly, to the Gundungurra language groups.

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

- Archaeological sites occur on most landforms;
- Site frequency and density are dependent on their location in the landscape;
- There is a dominance of low density surface open artefact scatters and isolated finds;
- There is a paucity of scarred trees remain due to land clearance;

- Artefact scatters are commonly located in close proximity to permanent water sources along creek banks, alluvial flats and low slopes. The artefact scatters are largely concentrated within 100 metres of a 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 while archaeological material is also present beyond the immediate creek surrounds, it is in decreasing artefact densities;
- Fewer sites occur on ridge tops and crests;
- Subsurface archaeological deposits are often recovered in areas where no visible surface archaeological remains are evident;
- The dominant raw material used in artefact manufacture is silcrete and fine grained silicious 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 debitage;
- 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;
- Aboriginal scarred trees may be present in areas where remnant old growth vegetation exists, however these are quite rare on the Cumberland Plain; and
- PADs are most likely to occur along valley floors and low slopes in well-drained areas.

As a result of these statements, it is reasoned that any historically undisturbed areas are considered archaeologically and culturally sensitive. While these statements provide an adaptable framework for applying a predictive model to the study area, additional models that are directly relevant to, and inclusive of the study area have also been developed. These models, in addition to general studies of the Cumberland Plain and Hawkesbury-Nepean River region and the search of AHIMS have helped to predict what certain site types and patterns of observation can be expected during the fieldwork for this particular assessment. These are:

- The study area is likely to contain an extremely low density artefact scatter, considered to be present as a discreet 'background' threshold across the Cumberland Plain.
- Stone artefact scatters including open sites, isolated artefacts and background scatters, are the types of sites most likely to occur.
- PADs are likely to be present within undisturbed parts of the study area, even where surface artefacts do not occur.
- Stone artefacts are likely be smaller than 50 millimetres and are unlikely to retain cortex due to the distance from the known silcrete quarry at Plumpton Ridge.
- Silcrete will likely be the most dominant raw material type present, however mudstone, chert, tuff, quartz, basalt and quartzite are also likely to be present.
- At the study area contains a third order creek, there is a likelihood of identifying sites compared to the rest of the Cumberland Plain.
- Disturbance including land clearance, building construction, farming, grass coverage and areas of dense vegetation may impact visibility and the potential to identify artefacts. Some of these may also impact the integrity of surface and sub-surface deposits.

Based on these general statements for the Cumberland Plains and the known land use history of the study area, it is possible to make the following predictive statements with regards to the study area:

- Stone artefact scatters and PADs are likely to be present, due to the presence of second order streams. The actual presence of such sites are purely dependant on localised levels of disturbance.
- Scarred trees are unlikely to occur as no remnant old growth forests occur within the study area.

- Burials are highly unlikely to occur in the study region as they are only known from areas of aeolian sand along the Hawkesbury River.
- Rockshelters will not occur in the study area due to a lack of appropriate geology.
- Shell middens are highly unlikely to occur due to lack of a permanent water source.
- Grinding grooves are unlikely to occur due to the lack of appropriate geology.
- Stone arrangements are unlikely to occur in the study area due to their rarity, although examples are known to occur in the Cumberland Region.

7 SITE INSPECTION

A site inspection was undertaken by David Marcus of Austral Archaeology on 19 February 2015, which revealed high levels of disturbance in accordance with the documented historical land use of the study area.

The majority of the study area consists of relatively flat, low-lying land either side of Bow Bowing Creek and a spur of higher land which crosses the study area. Various parts of the study area have been artificially levelled for the creation of the main building, the archery range and the golf driving range.

The gym complex is situated on raised land located at the base of the foothills dropping down from the north-east. The spur extends westwards across the study area, and provides vehicular access to the train line, crossing Bow Bowing Creek via a simple bridge (Figure 7.1).

Either side of the spur, the ground sharply drops approximately 2 to 3 metres down to a valley floor either side of Bow Bowing Creek. The course of the creek has been heavily modified through the construction of a concrete channel, which serves to formalise the route of the creek and which overlies an underground stormwater drain (Plate 7.1). Metal grills in the base of the channel allowing excess water to flow into the underground drain (Plate 7.2).

The northern part of the study area, to the north-east of the spur, was used as a driving range and the concrete channel for Bow Bowing Creek curves through this part of the study area (Plate 7.4 and Plate 7.5). The topography consists of gently undulating ground, with greater levels of levelling having occurred to the south of the concrete channel consistent with the conversion of the area to the driving range.

To the south-east of the spur, the ground has been artificially levelled to create a playing field (Plate 7.6) and, further west, an archery range (Plate 7.8). The land between the archery range and playing field is less visibly disturbed and consists of the same gently undulating terrain identified to the east of the spur.

The higher spur of land containing the main gym building has also been levelled (Plate 7.10), with a basketball court constructed to the north of the building Plate 7.12). To the east of the main building is a small landscaped garden, fronting a paved area containing the main car park and access track (Plate 7.13).

One issue which the pedestrian survey identified was the difficulty in determining the degree of levelling works which have occurred within the study area. It was originally considered that the raised spur of land may reflect the original ground level of the study area, and the lower lying ground either side of the spur were artificially created. However, on consideration it is more likely that low-lying land either side of the spur reflects the original topography of the area, and that this was later flattened to create a level playing field and a flat area for the driving range and archery range. The raised spur of land is likely to be a natural raised area which was then modified to allow for an access track to the railway over the creek and low-lying valley floor.

Overall, visibility during the survey was good, ranging from highest between the archery range and playing field and around the edges of the playing field itself, and lowest on the lowland to the north-east of the spur (Plate 7.14, Plate 7.15 and Plate 7.16). This corresponded with areas containing thinner grass cover to the south-west of the spur contrasting with the thicker grass cover to the north-east of the spur. Exposures in the study area were generally concentrated around areas of erosion and areas where earlier earthworks had been undertaken.

The topsoil present in the study area was a light reddish brown sandy silt, which had sheet eroded in places to reveal an underlying deposit of ironstone or shale. This is considered typical of the Blacktown (**bt**) soil landscape.

As noted above, the survey did identify significant levels of disturbance which affect the archaeological potential of the study area. In the first instance, the survey confirmed that almost the entirety of the study area had undergone varying degrees of levelling or general landscaping work. Secondly, Bow Bowing Creek has been highly modified through the construction of both the underground drain and overland drainage channel. These works would have significantly disturbed any archaeological deposits associated with the creek to a considerable depth.

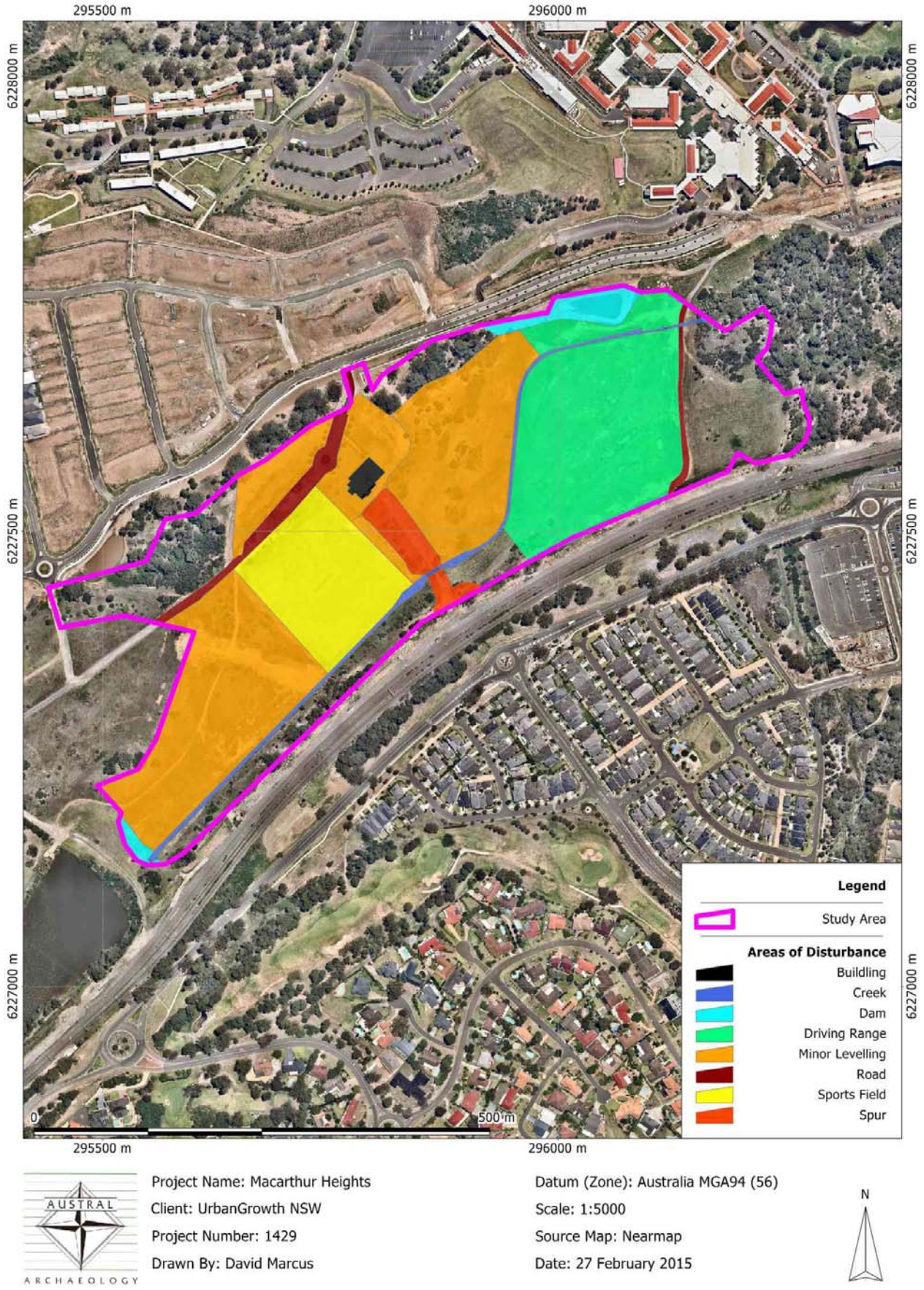

Figure 7.1 Areas of disturbance identified during pedestrian survey.

Very little in the way of old growth vegetation was identified within the study area. The majority of vegetation consisted of small shrubs and sparse trees, primarily along the northern edge of the study area.

The results obtained from the pedestrian survey demonstrate that the study area bears little similarity to the original topography of the land prior to vegetation clearance and landscaping occurring throughout the 20th century.

The site inspection did not identify any Aboriginal cultural heritage constraints within the study area. Where surface visibility was high, no stone artefacts were identified. After examining the topography and disturbance history of the study area, it is also unlikely that any PADs are present in the study area due to the high degree of 20th century earthworks present within the study area.

Plate 7.1 North-east facing view along drainage channel for Bow Bowing Creek, adjacent to playing field.

Plate 7.2 Drain set into base of the drainage channel, with water visible in the base of the drain.

Plate 7.3 North-east facing view showing spur and bridge over Bow Bowing Creek.

Plate 7.4 North facing view showing drainage channel and grasslands to the east of the spur.

Plate 7.5 East facing view over the former driving range.

Plate 7.6 South-east facing view towards the railway line. Note the minor drainage channel separating the playing field from the spur.

Plate 7.7 North-east facing view over playing field. Note gym building sat on raised spur.

Plate 7.8 South-west facing view looking from playing field towards the archery range.

Plate 7.9 North-east facing view showing levelled playing field.

Plate 7.10 East facing view along main gym building.

Plate 7.11 North-west facing view along the side of the gym building.

Plate 7.12 South-west view looking over levelled area towards basketball court and gym building.

Plate 7.13 West facing view towards landscaped garden in front of gym building.

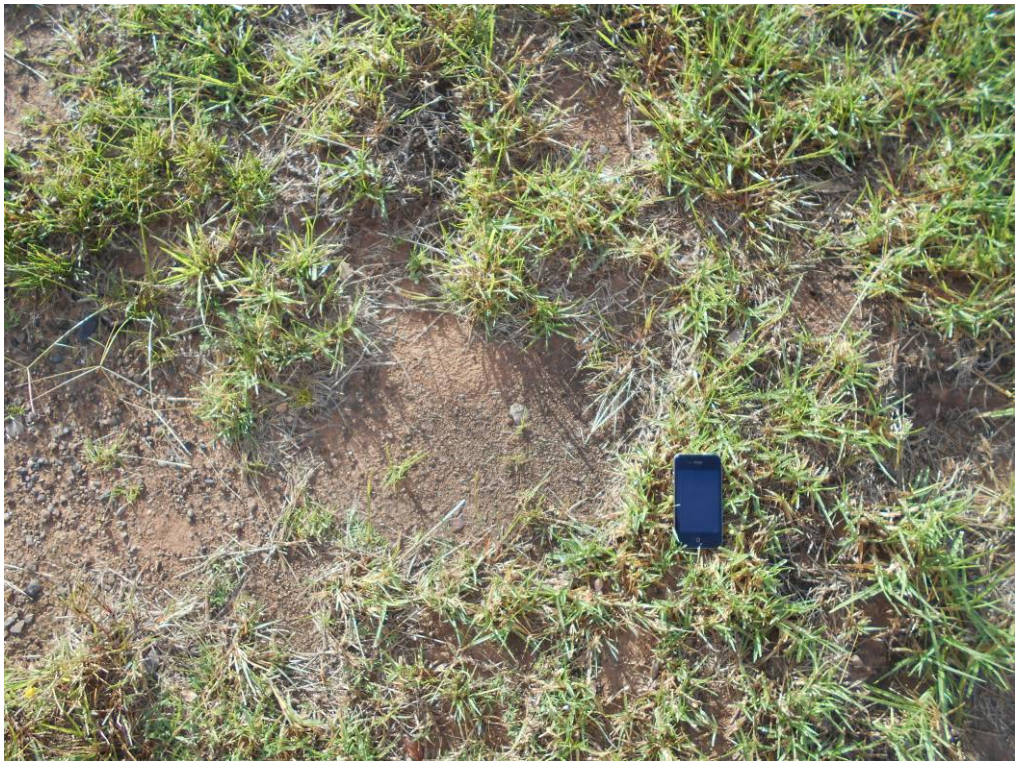

Plate 7.14 General view of ground visibility within levelled area around playing field.

Plate 7.15 General view of ground visibility to the west of the playing field.

Plate 7.16 General view of ground visibility on spur.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

A search of the OEH's AHIMS database regarding the property returned a result of no sites within the study area. Given the site's documented history of continual use and development since the middle of the 20th century and the site inspection which did not identify any artefacts or likely PADs, it is clear that this location qualifies as 'disturbed' land according to the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECCW 2010).

It is concluded that the study area has very low archaeological potential and no further action is required in regards to the Aboriginal archaeological potential of the study area, except in the instance covered by Recommendation 2 below.

8.2 Recommendations

It is recommended that:

1) No further investigative work to identify potential Aboriginal cultural heritage needs to be undertaken within the Sportsground Precinct. This report documents the results of a site inspection in February 2015 that resulted in no Aboriginal sites being located within the study area. The survey and background research also confirmed the disturbed nature of the study area.

2) In the event that Aboriginal objects or deposits are encountered during earthworks, all works affecting those objects or deposits must cease immediately to allow an archaeologist to make an assessment of the find. The archaeologist may need to consult with the Office of Environment and Heritage and the relevant Aboriginal stakeholders regarding the Aboriginal objects or deposits. Section 89A of the *National Parks and Wildlife Act 1974* requires that the Office of Environment and Heritage must be notified of any Aboriginal objects discovered within a reasonable time.

3) This report contains descriptions and locational data relating to Aboriginal archaeological and cultural material and sites. Should public exhibition of this document be required, it is advisable that Austral Archaeology be contacted in order to ascertain information which should be removed prior to public release.

4) One copy of this report should be lodged with the Registrar of the Aboriginal Heritage Information Management System database at:

   AHIMS Registrar
   Office of Environment and Heritage
   PO Box 1967
   Hurstville NSW 1481

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