Australian museum
BUSINESS SERVICES

813-913 Wallgrove Road, Horsley Park: Heritage Impact Assessment

Prepared by Australian Museum Business Services
for Gazcorp Pty Ltd

Final Report

May 2013

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Executive Summary

Australian Museum Business Services (AMBS) has been commissioned by Gazcorp Pty Ltd (Gazcorp), to prepare a heritage impact assessment (HIA) for a proposed industrial development at 813-913 Wallgrove Road, Horsley Park. The project has been designated State Significant Development, with Director-General's environmental assessment Requirements (DGRs) were issued on 14 May 2012. This HIA will form part of the Environmental Impact Statement (EIS) prepared by Gazcorp under Part 4.1 of the *Environmental and Planning Assessment Act* 1979 (EP&A Act).

The study area is located in Horsley Park, approximately 33km south west of the city of Sydney. It is approximately 52ha in area, comprising Lot 5 DP 24090. The street address is 813 – 913 Wallgrove Road, Horsley Park. The proposed industrial development will provide for a range of distribution and warehousing facilities on the site.

An Aboriginal heritage assessment for the property was begun in 2008; however, following the survey and the preparation of an early draft report, the project was delayed due to the need to resolve infrastructure issues relating the surrounding area. The development proposal was therefore unable to progress, prior to the current assessment being commissioned.

Aboriginal community consultation was undertaken in accordance with the OEH *Aboriginal Cultural Heritage Consultation Requirements For Proponents 2010.* Following consultation with registered Aboriginal community groups (for details regarding consultation, see Section 3), a survey of the study area was conducted on 21 March 2012 by AMBS archaeologist Jenna Weston, accompanied by Aboriginal community representatives.

The proposed industrial development of Lot 5 DP 24094 will impact on Aboriginal artefact scatters AHIMS Site 45-5-3684 (WR1 Prospect) and site WR2, and partially impact on potential subsurface archaeological deposit within an area of archaeological sensitivity on the eastern side of Reedy Creek (Figure 7.1). As the development is proceeding under Part 4.1 of the EP&A, Gazcorp is not required to apply for an AHIP prior to undertaking the proposed development, but would need to comply with the Minister's Conditions of Approval for the project.

AHIMS Site 45-5-3684 and site WR2 have been assessed as having low research potential, and low overall scientific significance. As such, additional archaeological investigation of these sites prior to or during the proposed development is not necessary, as it is unlikely to enhance current archaeological understanding of the region or knowledge of past Aboriginal activities and land use.

The proposed industrial development at Wallgrove Road is to include preservation of most of the area adjacent to Reedy Creek within a riparian corridor, and possibly within a setback at the southern side of the property. This area to be conserved encompasses a significant portion of the area of archaeological sensitivity identified adjacent to Reedy Creek, which is the most archaeologically sensitive landform within the study area. This area of conservation will provide an offset for the unavoidable loss of AHIMS Site 45-5-3684 and WR2, and the partial loss of the remainder of the area of archaeological sensitivity.

It is considered that the lower slopes within c.100m east of Reedy Creek and its confluence, which have not been impacted by construction of the dam and cattle pen, may have moderate–high significance and research potential. This area of archaeological sensitivity has the potential to reveal a continuity of activity within the landscape in the vicinity of Reedy Creek, and to complement the excavation by JMCHM (2004) further along Reedy Creek. The JMCHM excavation was located on

the edge of the floodplain, which is further from the creek. Although this excavation was not near a confluence, the stream order was the same (third) as at the confluence. The JMCHM investigation was considered to have at least partially described the likely range of activities that may have occurred in closer proximity to the main creek channel, whereas an excavation near the confluence may recover high densities of artefacts (or bring to light further information regarding Aboriginal occupation around confluences, cf. ENSR 2009), which would therefore provide a more detailed picture of activity in close proximity to the creek. Further, it was noted that 'more permanent occupation may have taken place in closer proximity to the creek and its water holes' (JMCHM 2004:76), which includes the land adjacent to Reedy Creek and the confluence, within the area of archaeological sensitivity.

The potential alluvial soils along the creek and confluence may also have stratified deposit, and the apparent lack of modification to the landscape in this area suggests that such deposits may remain intact. This provides the potential for highly useful information to be gained from controlled excavation of this area.

As such, further archaeological investigation of this area of archaeological sensitivity, where it is proposed to be impacted by the road corridor and industrial development, is likely to increase the current scientific knowledge of the region, and particularly has the potential to contribute to the regional predictive model regarding creek confluences and low-moderate (second/third) order creeks. A representative sample of the higher density of artefacts expected in the close vicinity of the creek and its confluence is recommended.

There are no listed or potential historic heritage items within the vicinity of the study area, which will be impacted by the proposed development. The Warragamba Supply Scheme pipelines, listed on the Sydney Catchment Authority (SCA) Section 170 Register, are aligned adjacent to the northern boundary of the site and secured within SCA land. The current proposal includes a road reserve along the northern boundary, which will provide an appropriate buffer to the pipelines.

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Australian Museum Business Services (AMBS) has been commissioned by Gazcorp Pty Ltd (Gazcorp), to prepare a heritage impact assessment (HIA) for a proposed industrial development at 813-913 Wallgrove Road, Horsley Park. The project has been designated State Significant Development, with Director-General's environmental assessment Requirements (DGRs) were issued on 14 May 2012. This HIA will form part of the Environmental Impact Statement (EIS) prepared by Gazcorp under Part 4.1 of the *Environmental and Planning Assessment Act* 1979 (EP&A Act).

1.2 Study Area & Proposed Development

The study area is located in Horsley Park, approximately 33km south west of the city of Sydney. It is approximately 52ha in area, comprising Lot 5 DP 24090. The street address is 813 – 913 Wallgrove Road, Horsley Park (Figure 1.1). The proposed industrial development will provide for a range of distribution and warehousing facilities on the site (Figure 1.2).

1.3 Background to the Report

An Aboriginal heritage assessment for the property was begun in 2008; however, following the survey and the preparation of an early draft report, the project was delayed due to the need to resolve infrastructure issues relating the surrounding area. The development proposal was therefore unable to progress, prior to the current assessment being commissioned.

1.4 Methodology

This report is broadly consistent with the principles of the Burra Charter *(The Australia ICOMOS charter for the conservation of places of cultural significance).* It has been prepared in accordance with current heritage best practice and the policies of the relevant government department, the Office of Environment and Heritage (OEH), Department of Premier & Cabinet (comprising the Heritage Branch and former Department of Environment, Climate Change and Water [DECCW], and Heritage Branch, Department of Planning).

This report has been prepared in accordance with OEH guidelines as specified in the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005), the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010) and the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010); and the relevant documents in the *NSW Heritage Manual* (1996), published by the Heritage Office and Department of Urban Affairs and Planning (now the Heritage Branch, OEH), and associated supplementary publications including *Heritage Curtilages* (1996), *Assessing Heritage Significance* (2001) and *Assessing Significance For Historical Archaeological Sites and 'Relics'* (2009).

1.5 Authorship & Acknowledgements

This report has been prepared by AMBS Project Officer Jenna Weston. AMBS Project Manager Christopher Langeluddecke reviewed the report. AMBS Senior Project Manager Jennie Lindbergh reviewed the report for quality and consistency.

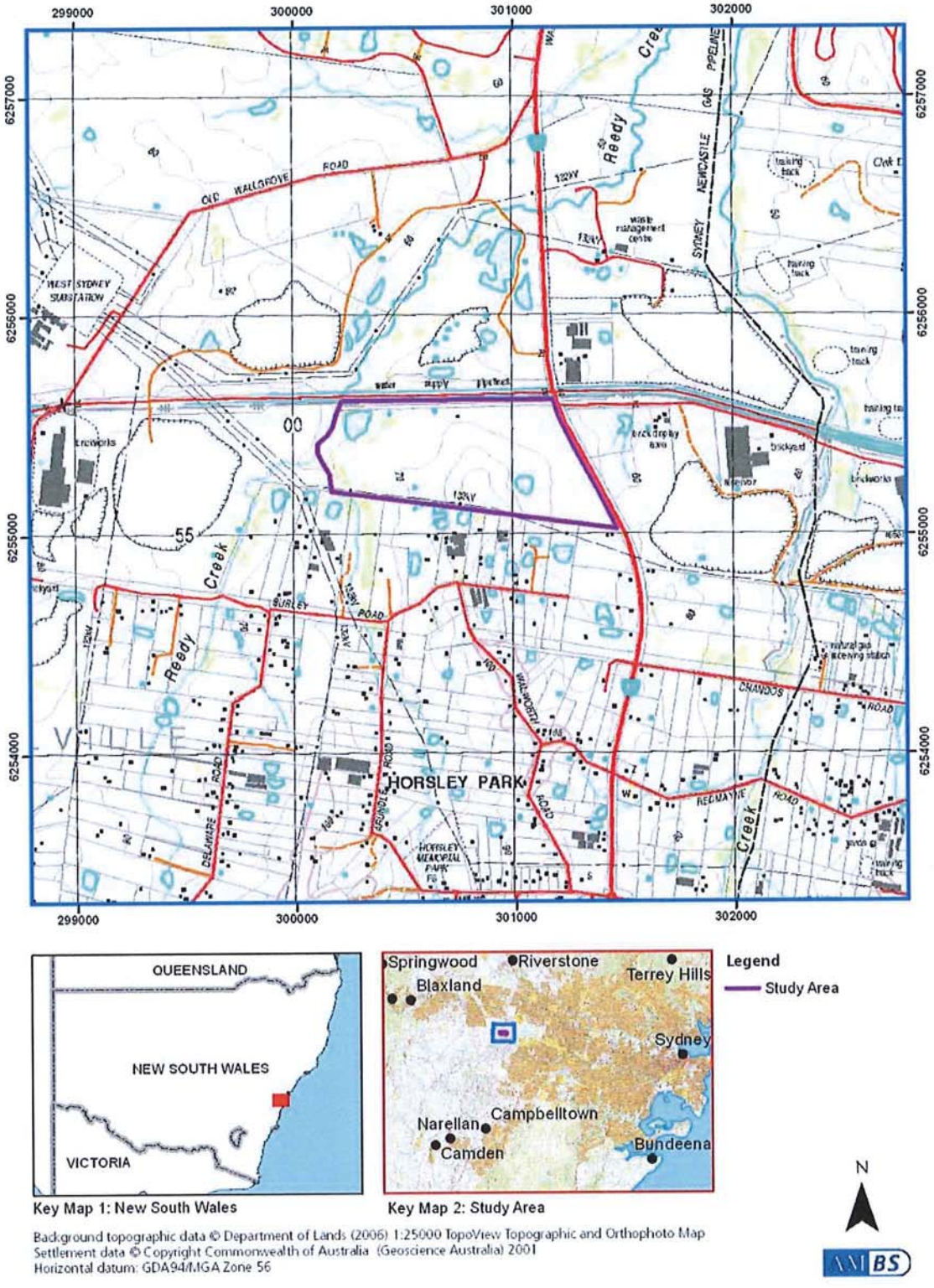

Figure 1.1 Location of the study area.

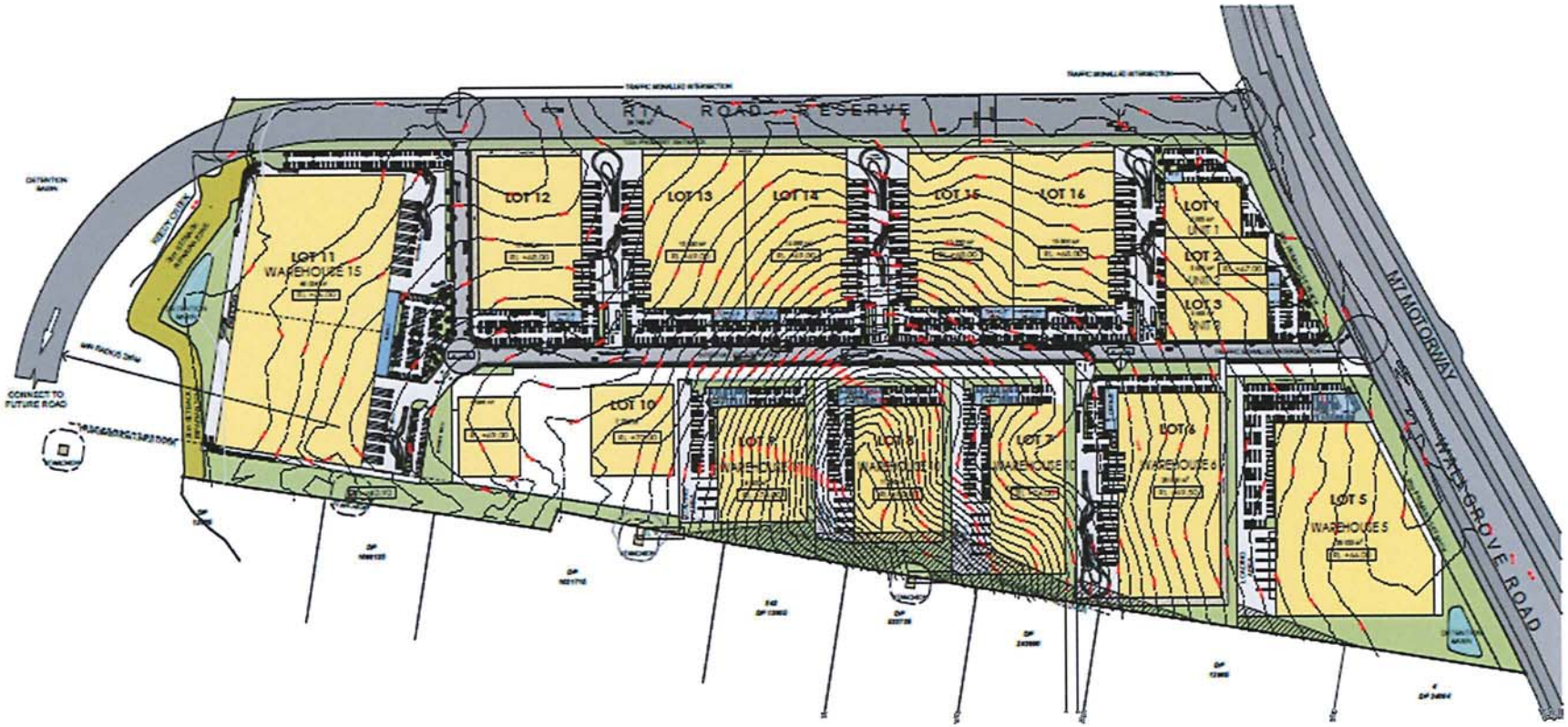

Figure 1.2 Industrial development proposed for the study area.

2 Statutory Context

2.1 Preamble

As a major project under Part 4.1 of the EP&A Act the proponent is not required to apply for approvals or permits under the *National Parks and Wildlife Act* 1974 (Amended 2010) or the *Heritage Act* 1977. However, OEH is given the opportunity to review Part 4.1 applications. The following outlines the relevant heritage context for the study area.

2.2 *Environment Protection & Biodiversity Conservation Act* 1999

The *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) provides a legal framework for the protection and management of places of national environmental significance. Several heritage lists are addressed by the EPBC Act, including the National Heritage List (NHL) and Commonwealth Heritage List (CHL). The NHL protects places that have outstanding value to the nation. The CHL protects items and places owned or managed by Commonwealth agencies. The Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) is responsible for the implementation of national policy, programs and legislation to protect and conserve Australia's environment and heritage and to promote Australian arts and culture. Approval from the Minister is required for controlled actions which will have a significant impact on items and places included on the NHL or CHL.

There are no Aboriginal or historic heritage items listed on the NHL or CHL within the study area or in its vicinity.

2.3 *National Parks & Wildlife Act* 1974 (Amended 2010) and *National Parks & Wildlife Amendment Regulation* 2010

Under the provisions of the *National Parks & Wildlife Act* 1974 (NPW Act), the Director-General of the National Parks and Wildlife Service (NPWS; now OEH) is responsible for the care, control and management of all national parks, historic sites, nature reserves, state conservation areas, karst conservation reserves and regional parks. The Director-General is also responsible, under this legislation, for the protection and care of native fauna and flora, and Aboriginal places and objects throughout NSW.

All Aboriginal Objects are protected regardless of their significance or land tenure under the NPW Act. Aboriginal Objects can include pre-contact features such as scarred trees, middens and open campsites, as well as physical evidence of post-contact use of the area such as Aboriginal built fencing and fringe camps. The NPW Act also protects Aboriginal Places, which are defined as 'is or was of special significance with respect to Aboriginal culture'. Aboriginal Places can only be declared by the Minister administering the NPW Act.

Under Section 90 of the Act, it is an offence for a person to destroy, deface, damage or desecrate an Aboriginal Object or Aboriginal Place without the prior issue of an Aboriginal Heritage Impact Permit (AHIP). The Act requires a person to take reasonable precautions and due diligence to avoid impacts on Aboriginal Objects. AHIPs may only be obtained from the Environmental Protection and Regulation Division (EPRD) of OEH.

The *National Parks and Wildlife Amendment Regulation* 2010 commenced on 1 October 2010. This Regulation excludes activities carried out in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* from the definition of harm in the Act. That is, test excavations may be carried out in accordance with this Code of Practice, without requiring an AHIP. The Regulation also specifies Aboriginal community consultation requirements (*Aboriginal Cultural*

Heritage Consultation Requirements for Proponents 2010). In addition, the Regulation adopts a Due Diligence Code of Practice which specifies activities that are low impact, providing a defence to the strict liability offence of harming an Aboriginal object.

Part of the regulatory framework for the implementation of the NPW Act is the Aboriginal Heritage Information Management System (AHIMS), maintained by OEH. AHIMS includes a database of Aboriginal heritage sites, items, places and other objects that have been reported to the OEH. Also available through AHIMS are site cards, which describe Aboriginal sites registered in the database, as well as Aboriginal heritage assessment reports, which contribute to assessments of scientific significance for Aboriginal sites. The AHIMS is not a comprehensive list of all Aboriginal heritage sites in NSW, rather it reflects information which has been reported to OEH. As such, site co-ordinates in the database vary in accuracy depending on the method used to record their location. Heritage consultants are obliged to report Aboriginal sites identified during field investigations to OEH, regardless of land tenure, or whether such sites are likely to be impacted by a proposed development. The results of a site search for the local area are presented in Section 3.3.2.

2.4 Heritage Act 1977

The NSW *Heritage Act* 1977 (Heritage Act) provides protection for heritage places, buildings, works, relics, moveable objects, archaeological sites and precincts that are important to the people of NSW. These include items of Aboriginal and non-Aboriginal heritage significance. Where these items have particular importance to the state of NSW, they are listed on the State Heritage Register (SHR).

There are no Aboriginal or historic heritage items listed on the SHR within the study area or in its vicinity.

2.4.1 Sydney Catchment Authority Section 170 Register

Section 170 of the Heritage Act requires government instrumentalities to maintain a Heritage and Conservation Register (Section 170 Register). This Register provides a list of assets which may have State or local heritage significance, including:

(i) heritage items under environmental planning instruments,
(ii) items subject to interim heritage orders,
(iii) items listed on the State Heritage Register,
(iv) items identified by the government instrumentality as having State heritage significance.

There are no Aboriginal heritage items listed on the Sydney Catchment Authority (SCA) Section 170 Register within the study area or its vicinity. The following historic heritage item is located immediately to the north of the study area:

Name	Primary Address	Significance
Warragamba Supply Scheme	LGAs of Wollondilly, Penrith, Fairfield and Blacktown	Local

The Warragamba Supply Scheme includes two major steel pipelines of 2.1m and 3m diameters, which convey water from Warragamba to Sydney. The pipelines are aligned adjacent to the northern boundary of the site and secured within SCA land. The current proposal includes a road reserve along the northern boundary, which will provide an appropriate buffer to the pipelines.

2.4.2 Roads & Maritime Services Section 170 Register

There are no Aboriginal or historic heritage items listed on the RMS Section 170 Register within the study area or its vicinity.

2.5 Environmental Planning and Assessment Act 1979

The EP&A Act is the main act regulating land use planning and development in NSW.

Part 4, Division 5.1, Clause 89J of the Act lists the approvals and legislation that does not apply to state significant development projects. This includes approvals and permits under the Heritage Act and the NPW Act.

The EP&A Act also controls the making of environmental planning instruments (EPIs). Two types of EPIs can be made: Local Environmental Plans (LEPs) covering local government areas; and State Environment Planning Policies (SEPPs), covering areas of State or regional environmental planning significance. LEPs commonly identify, and have provisions for, the protection of local heritage items and heritage conservation areas. The study area is located in the Fairfield LGA.

2.5.1 Fairfield LEP 1994

Part 6 Clauses 30-32 of the Fairfield LEP 1994 provide for the protection of heritage buildings, places, works and trees, and archaeological relics, including Aboriginal objects.

There are no Aboriginal or historic heritage items listed on Schedule 4 Heritage Items of the Fairfield LEP within the study area or its vicinity.

2.5.2 Sydney Regional Environmental Plan 31 (Regional Parklands)

Part 3, Clause 16 'Cultural Heritage' of the Sydney Regional Environmental Plan 31 (Regional Parklands) provides for the protection of heritage items, places and archaeological sites within the Western Sydney Regional Parklands area. No Aboriginal or historic heritage items are identified on Schedule 3 'Heritage items'.

2.6 Non-Statutory Registers

2.6.1 Register of the National Estate

The Register of the National Estate (RNE) was originally established under Section 22 of the *Australian Heritage Commission Act 1975* (AHC Act). Since the establishment of the NHL and CHL, there is now a considerable level of overlap between the RNE and heritage lists at the national, state and territory, and local government levels. From February 2012, all references to the RNE have been removed from the EPBC Act and the AHC Act. The RNE is now being maintained on a non-statutory basis as a publicly available archive.

There are no or historic Aboriginal heritage items listed on the RNE within the study area or its vicinity.

2.6.2 National Trust of Australia (NSW)

The National Trust of Australia is a private, not-for-profit organisation committed to conserving Australia's heritage. Listing with the National Trust of Australia does not have statutory authority; however, it does have a role in raising public awareness of heritage issues.

There are no Aboriginal or historic heritage items listed on the National Trust Register within the study area or its vicinity.

3 Aboriginal Heritage Context

3.1 Aboriginal Consultation

Aboriginal community consultation is an integral part of the Aboriginal cultural heritage assessment process, and this project has been undertaken in accordance with the OEH *Aboriginal Cultural Heritage Consultation Requirements For Proponents 2010* (see Appendix A). The aims of the consultation process are to:

- provide the opportunity for the local Aboriginal community to provide input into identifying cultural heritage values and be involved in the heritage assessment process;
- provide the opportunity for the local Aboriginal community to inspect the study area with the aim of identifying Aboriginal sites and areas of archaeological and cultural sensitivity;
- identify the Aboriginal cultural heritage significance of the study area;
- integrate Aboriginal heritage values into the heritage assessment; and
- provide an opportunity for the local Aboriginal community to comment on the heritage management strategy and proposed outcome.

AMBS wrote to the following organisations on 24 January 2013, requesting notification of any Aboriginal organisations who may wish to register as stakeholders:

- OEH;
- Deerubbin Local Aboriginal Land Council (DLALC);
- National Native Title Tribunal (NNTT);
- Office of the Registrar, Aboriginal Land Rights Act 1983 (ORALRA);
- Native Title Services Corporation (NTSCorp);
- Sydney Metropolitan Catchment Management Authority (SMCMA); and
- Fairfield City Council.

A Native Title search undertaken on 29 January 2013 by the NNTT found no registered native title claimants, native title holders or registered Indigenous Land Use Agreements for the study area.

OEH advised that the following organisations should be contacted:

- DLALC;
- Darug Aboriginal Cultural Heritage Assessments (DACHA);
- Darug Aboriginal Land Care Inc. (DALCI);
- Darug Custodian Aboriginal Corporation (DCAC);
- Darug Land Observations (DLO);
- Darug Tribal Aboriginal Corporation (DTAC);
- Gunjeewong Cultural Heritage Aboriginal Corporation (GCHAC);
- Yarrawalk (a division of Tocomwall Pty Ltd); and
- Amanda Hickey Cultural Services (AHCS).

In accordance with OEH requirements, an advertisement was placed in the Fairfield Advance on 30 January 2013 (see Appendix A). The advertisement sought expressions of interest for participation in the Aboriginal heritage assessment process for this project. The closing date for registrations was 13 February 2013. No responses to the advertisement were received.

In summary, the following Aboriginal parties registered their interest to be consulted on this project:

- DLALC;
- DACHA;
- DALCI;

- DCAC;
- DLO;
- DTAC;
- Yarrawalk/Tocomwall;
- AHCS; and
- Widescope Indigenous Group (WIG).

Details of the proposed development and a draft heritage assessment methodology were sent to each of the registered Aboriginal parties on 19 February 2013. Two responses were received (see Appendix A).

Registered Aboriginal stakeholder organisations which participated in a survey of the study area on Thursday 21 March 2013 are listed in Table 3.1. DLALC was unable to provide a representative on the day of the survey.

Table 3.1 Aboriginal community fieldwork participants.

Organisation	Field Representative
DACHA	Tim Wells
DALCI	Des Dyer
DCAC	Tom Wright
DLO	Paul Goddard, Lin Goddard
DTAC	Dennis Hardy
Yarrawalk/Tocomwall	Ricky Fields

The draft Aboriginal HIA report was provided to each registered Aboriginal stakeholder group for review and comment on 10 April 2012. Information provided by the Aboriginal community groups has been integrated into the assessment, and also attached in Appendix A. It should be noted that, although DALCI and DLO requested monitoring of topsoil removal, AMBS does not consider such monitoring to be warranted, given the lack of archaeological potential outside of the area of archaeological sensitivity, where excavation is recommended in areas where impact is to occur (see Section 8.1.2).

3.2 Environmental Context

An understanding of environmental factors within the local landscape provides a context for past human occupation and history of an area. The analysis of environmental factors contributes to the development of the predictive modelling of archaeological sites, but it is also required to contextualise archaeological material and to interpret patterns of past human behaviour. In particular, the nature of the local landscape including topography, geology, soils, hydrology and vegetation are factors which affect patterns of past human occupation. Current land use practices have the potential to affect the visibility of archaeological material; they may obscure, or expose archaeological sites. In addition, previous disturbances may have also exposed archaeological material, such as excavation for dams or other ground disturbance. It is important that such factors are also considered in making assessments of archaeological resources in an area and understanding the distribution of observed sites.

3.2.1 Geology, Soils & Topography

The study area is located on the Bringelly Shale of the Wianamatta Group, which consists of shale with some sandstone beds (Sydney 1:250,000 Geological Map). No outcrops of sandstone are present within the study area. This geological landscape does not generally result in stone outcroppings suitable as surfaces for art (such as engraving and drawing/painting), sharpening stone axes/tools or artefact manufacture, or as shelters for camping. As such, rock engravings/art sites, axe grinding grooves, shelter and quarry sites are highly unlikely to be present in the study area.

The study area is located within the northern part of the Cumberland Plain, which is typified by low undulating topography. The topography of the study area itself comprises a crest in the central south of the study area, which slopes down to the north, east and west. A floodplain is present in the west of the study area, adjacent to Reedy Creek (see below). Two distinct ridge features are present in the wider landscape, one to the north (in the Wonderland area) and one to the north east (near a bend in Wallgrove Road).

The study area comprises three soil landscapes: Luddenham, Blacktown and South Creek (Penrith 1:100,000 Soil Landscape Series Sheet 9030). Luddenham soils occur throughout the centre of the study area; Blacktown soils occur on the eastern and western margins of the study area; and South Creek soils occur along Reedy Creek and its tributary on the western boundary of the study area (Figure 3.1).

The soils of the Luddenham landscape are highly erosional and comprise shallow dark podzolic soils or massive earthy clays on crests. The soils of the upper slopes are moderately deep red podzolic soils, while those on the lower slopes are moderately deep yellow podzolic soils and prairie soils (Bannerman & Hazleton 1990:63).

The Blacktown soil landscape consists of gently undulating rises on Wianamatta Group shales (local relief to 30m, slopes usually less than 5%). The landscape is characterised by broad rounded crests and ridges with gently inclined slopes. The soils comprise brownish black loam, red podzolic soils and brown podzolic soils on crests and upper slopes, and loam and red and brown podzolic soils overlying yellow podzolic soils on the lower side slopes. The subsoil is highly plastic and moderately reactive with low fertility and poor drainage. Vegetation consists of cleared eucalypt woodland and tall open forest (dry schlerophyll forest) (Bannerman & Hazelton 1990:28).

South Creek soils comprising red clays and sands and yellow podzolics, occur mainly in drainage lines, flats and floodplains. Vegetation commonly consists of *Angophora subvelutina*, *Eucalyptus amplifolia* and *Casuarina glauca*. *Eleocharis sphacelata*, *Junctus usitatus* and *Polygonum* spp. are common where channels are silted up. *Melaleuca* spp. and *Leptospermum* spp. may occur on more elevated stream banks (Bannerman & Hazelton 1990:68-9). The potential for stratified or in situ archaeological deposits is most likely in the fluvial South Creek soils which underlie Reedy Creek, although this depends on the level of previous disturbance to these soils.

Aboriginal occupation was often focussed on prominent landforms such as ridges, which were favourable locations for camping and travelling, and from which surrounding plant and animal resources could be viewed. However, they also camped on lower, elevated areas adjacent to reliable water sources, such as Reedy Creek. The study area would have been suitable for camping, although Eastern Creek (which Reedy Creek joins approximately 2.5km downstream) is likely to have been most frequently occupied (see Section 3.2.2).

3.2.2 Hydrology & Drainage

The study area is on the Cumberland Plain within the Eastern Creek/Hawkesbury River catchment area. An unnamed second order tributary forms the southern part of the western boundary of the study area, and flows into Reedy Creek, which forms the northern part of the western boundary of the study area. This forms Reedy Creek into a third order stream. Three dams are present in the study area: one near the north-west corner of the study area, a smaller one in the central south east of the study area, and the smallest one in the central south west of the study area. The low-lying alluvial flats adjacent to Reedy Creek are prone to flooding; however, the land within the study area which is

immediately adjacent to the creek is raised slightly above the level of the creek, and therefore does not seem to be prone to flooding.

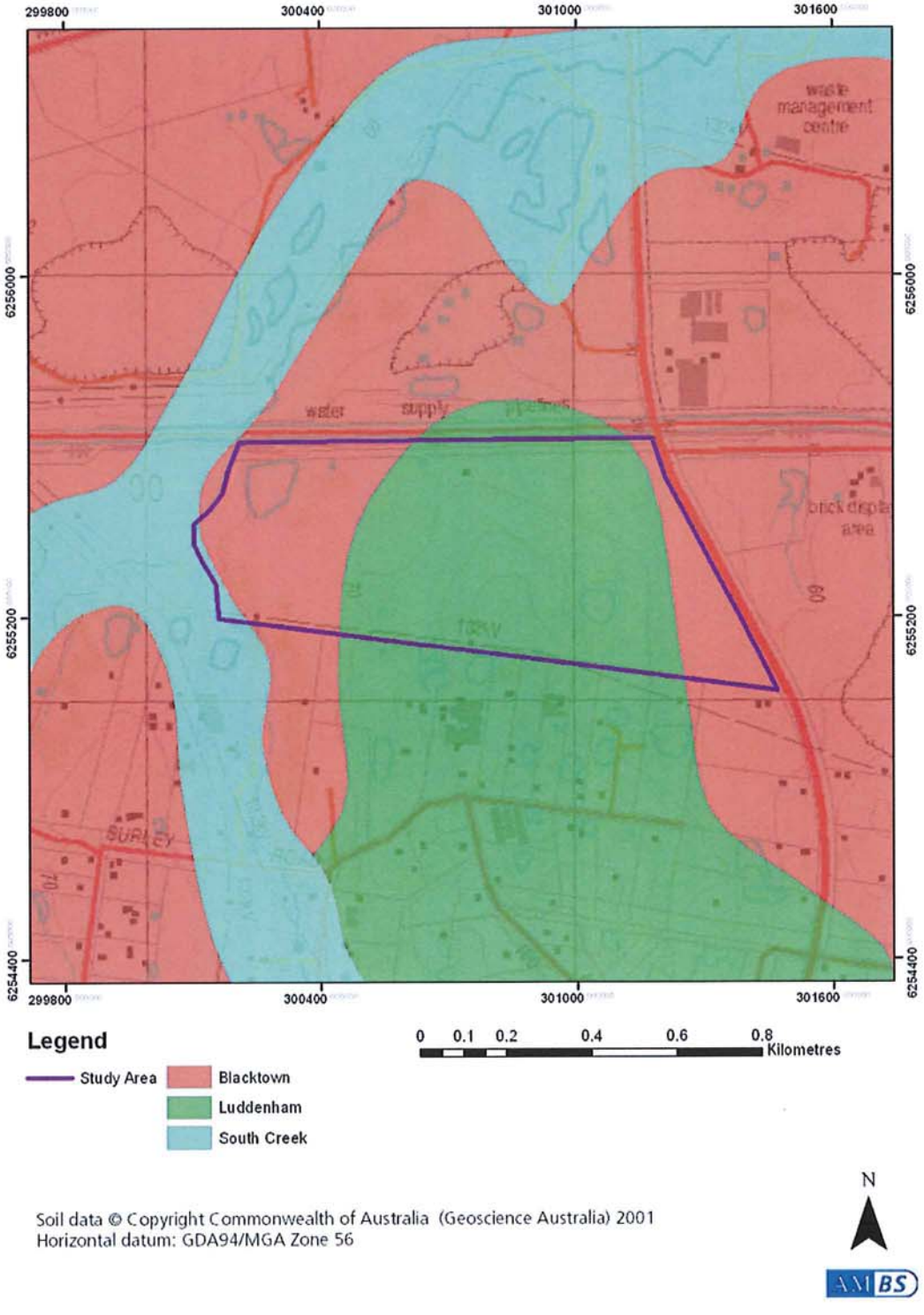

Figure 3.1 Soils within the study area.

There are several higher order creeks further from the study area, including Eastern Creek (c.1.2km north east) and Ropes Creek (c.2.5km west). Prospect Reservoir is located approximately 2km east of the study area. In short, the area is well-drained, with ample water to have supported Aboriginal occupation. As such, occupation sites including open stone artefact scatters may occur within the

study area or its vicinity. However, as the larger, more reliable creeks in the region, Eastern and Ropes Creeks are likely to have been most frequently occupied for their water and food resources.

3.2.3 Vegetation

There are several stands of trees throughout the study area, predominantly comprising eucalypts clustering around the south eastern, south western and north western corners of the study area, through the centre of the study area, and in the north eastern part of the study area. She-oaks and paperbarks are present along the creek. This vegetation appears to be predominantly regrowth, as the study area has been used for pastoralism. The vegetation in the remainder of the area is mainly grass for pasture, with some copses of small shrubby plants, and lantana encroaching in a number of areas, including adjacent to the creek.

3.2.4 Land Use & Disturbance

The Warragamba–Prospect Water Supply Pipelines are immediately to the north of the study area. An electricity transmission line is located immediately to the south, leading to the Sydney West Substation which is approximately 1km north-west, and a quarry for Austral Bricks is also located to the north-west. Wallgrove Road and the M7 Westlink are located to the east. However, the study area itself has remained largely undeveloped apart from pastoral use, including the construction of corrals (a large corral for cattle in the western part of the study area, and a corral on in the central eastern side which is probably for horses), several sheds which are currently in disrepair, and three dams. The soil from the excavation of the largest dam has been spread throughout the surrounding area. Construction of this dam also appears to have diverted the northern part of Reedy Creek, and the landscape surrounding this section of the creek (in the north western corner of the study area) has been substantially modified. As such, there has been a history of European use and disturbance to the original ground surface, which will have impacted to some extent upon the integrity of any Aboriginal sites that were present in the study area.

3.3 Aboriginal Archaeological Context

This section describes the nature of the known Aboriginal archaeology of the study area, based upon a review of relevant archaeological reports and publications, and a search and review of previously recorded sites in the OEH AHIMS. This review and discussion allows for the development of a predictive model for potential Aboriginal sites within the study area, and establishes context for a comparative significance assessment. Summary descriptions of site types are provided in Table 3.2.

Table 3.2 Summary descriptions of Aboriginal site types referred to in this report.

Site Type	Details
Open camp sites/ stone artefact scatters/ isolated finds	Open camp sites represent past Aboriginal subsistence and stone knapping activities, and include archaeological remains such as stone artefacts and hearths. This site type usually appears as surface scatters of stone artefacts in areas where vegetation is limited and ground surface visibility increases. Such scatters of artefacts are also often exposed by erosion, agricultural events such as ploughing, and the creation of informal, unsealed vehicle access tracks and walking paths. These types of sites are often located on dry, relatively flat land along or adjacent to rivers and creeks. Camp sites containing surface or subsurface deposit from repeated or continued occupation are more likely to occur on elevated ground near the most permanent, reliable water sources. Flat, open areas associated with creeks and their resource-rich surrounds would have offered ideal camping areas to the Aboriginal inhabitants of the local area. Isolated finds may represent a single item discard event, or be the result of limited stone knapping activity. The presence of such isolated artefacts may indicate the presence of a more extensive, in situ buried archaeological deposit, or a larger deposit obscured by low ground visibility. Isolated artefacts are likely to be located on landforms associated with past Aboriginal activities, such as ridgelines that would have provided ease of movement through the area, and level areas with access to water, particularly creeks and rivers.

Middens	Shell middens result from Aboriginal exploitation and consumption of shellfish, in marine, estuarine or freshwater contexts. Middens may also include faunal remains such as fish or mammal bone, stone artefacts, hearths, charcoal and occasionally, burials. They are usually located on elevated dry ground close to the aquatic environment from which the shellfish has been exploited and where fresh water resources are available. Deeper, more compacted, midden sites are often found in areas containing the greatest diversity of resources, such as river estuaries and coastal lagoons.
Scarred trees	Tree bark was utilised by Aboriginal people for various purposes, including the construction of shelters (huts), canoes, paddles, shields, baskets and bowls, fishing lines, cloaks, torches and bedding, as well as being beaten into fibre for string bags or ornaments. The removal of bark exposes the heart wood of the tree, resulting in a scar. Over time the outer bark of the tree grows across the scar (overgrowth), producing a bulging protrusion around the edges of the scar. Trees may also have been scarred in order to gain access to food resources (e.g. cutting toe-holds so as to climb the tree and catch possums or birds), or to mark locations such as tribal territories. The locations of scarred trees often reflect historical clearance of vegetation rather than the actual pattern of scarred trees. Unless the tree is over 150 years old, scarring is not likely to be of Aboriginal cultural origin; therefore, these sites most often occur in areas with mature, remnant native vegetation.
Axe grinding grooves	Grinding grooves are the physical evidence of tool making or food processing activities undertaken by Aboriginal people. The manual rubbing of stones against each other creates grooves in the rock, which are usually found on flat areas of soft rock such as sandstone, in areas of creek beds and other water sources. They are often associated with rock pools in creek beds and on platforms to enable the wet-grinding technique.
Quarries	Aboriginal quarry sites are sources of raw materials, primarily for the manufacture of stone tools, but also for ochre procurement. They are only found where raw materials (stone or ochre) occur within the landscape, and where these have been exploited in the past. Such sites are often associated with stone artefact scatters and stone knapping areas. Loose or surface exposures of stone or cobbles may be coarsely flaked for removal of portable cores. Raw materials can be sourced to these sites and provide evidence for Aboriginal movement and/or exchange.
Rock engravings	Rock engravings are a type of Aboriginal art, and are often located on high vantage points along ridge lines at the headwaters of creeks, but can be located on any suitable fine grained stone surface.
Shelter sites with art (engraving, painting or drawing) or occupation deposit	These are art or occupation sites located in areas where suitable rock outcrops and surfaces occur, where weathering has resulted in suitable overhangs or recesses in boulder outcrops or cliff-lines.
Bora/ceremonial	Aboriginal ceremonial sites are locations that have spiritual or ceremonial values to Aboriginal people. Aboriginal ceremonial sites may comprise natural landforms and, in some cases, will also have archaeological material. Bora grounds are a ceremonial site type, usually consisting of a cleared area around one or more raised earth circles, and often comprised two circles of different sizes, connected by a pathway, and accompanied by ground drawings or mouldings of people, animals or deities, and geometrically carved designs on the surrounding trees. Unfortunately, the raised earth features are easily destroyed by agricultural and pastoral activities, vegetation growth and exposure to weather.
Stone arrangements	Stone arrangements usually consist of geometric arrangements of portable stone on prominent rock outcrops, such as vantage points along escarpments where other key landmarks are visible. Some stone arrangements also include circles and pathways. They are thought to be ceremonial in nature, and may have also sometimes been used for corroborees (dances), fights or judicial meetings. Stone arrangements are often isolated from known camp site areas.
Natural mythological (ritual) sites	These types of sites are usually identified by the local Aboriginal community as locations of cultural significance, and they may not necessarily contain material evidence of Aboriginal associations with the place.
Carved trees	Carved trees generally marked areas for ceremonial purposes, or the locations of graves.

Burial sites	Aboriginal burial of the dead often took place relatively close to camp site locations. This is due to the fact that most people tended to die in or close to camp (unless killed in warfare or hunting accidents), and it is difficult to move a body long distances. Soft, sandy soils on, or close to, rivers and creeks allowed for easier movement of earth for burial; and burials may also occur within rockshelters or middens. Aboriginal burial sites may be marked by stone cairns, carved trees or a natural landmark. Burial sites may also be identified through historic records, or oral histories.
Contact/ historical sites	These types of sites are most likely to occur in locations of Aboriginal and settler interaction, such as on the edge of pastoral properties or towns. Artefacts located at such sites may involve the use of introduced materials such as glass or ceramics by Aboriginal people, or be sites of Aboriginal occupation in the historical period.

3.3.1 Regional Archaeological Context

At the time of European settlement, the Aboriginal people of the Sydney region lived in local clans. Groups local to the study area are likely to have belonged to the Darug (Dharug) language groups (Attenbrow 2010:23,32).

Aboriginal occupation of the Sydney region is likely to have spanned at least 20,000 years, although dates of more than 40,000 years have been claimed for artefacts found in gravels of the Cranebrook Terrace on the Nepean River (Nanson et al. 1987; Stockton 1993; Stockton & Holland 1974). Late Pleistocene occupation sites have been identified on the fringes of the Sydney basin and from rock shelter sites in adjoining areas. Dates obtained from these sites were 14,700 years Before Present (BP) at Shaws Creek in the Blue Mountain foothills (Kohen et al. 1984), c.11,000 BP at Loggers Shelter in Mangrove Creek (Attenbrow 1981, 2004), and c.20,000 BP at Burrill Lake on the South Coast (Lampert 1971). The majority of sites in the Sydney region, however, date to within the last 3,000 to 5,000 years, with many researchers proposing that occupation intensity increased from this period (Kohen 1986; McDonald 1994; McDonald & Rich 1993). This increase in sites may reflect an intensity of occupation which was influenced by rising sea levels, which stabilised approximately 6,500 years ago. Older occupation sites along the now submerged coastline would have been flooded, with subsequent occupation concentrating on and utilising resources along the current coastlines and in the changing ecological systems of the hinterland (Attenbrow 2010).

The spread of urban development across the Cumberland Plain, particularly over the last few decades, has meant that archaeological investigations have intensified with the need for environmental impact assessments. Most archaeological investigations conducted within this framework have been restricted by small study areas (as defined by individual developments) and limited project briefs. As a result, the Cumberland Plain has become the most intensively investigated archaeological landscape in Australia. The studies carried out over these decades of development in the west provide a broad picture of the archaeological context of the region.

A number of predictive models relating to Aboriginal occupation patterns and site locations have been formulated through archaeological investigations in the Cumberland Plain (Dallas 1989; Haglund 1980; Kohen 1986; Smith 1989). More recent works have contributed to refining these models (AMBS 2000, 2002a; Jo McDonald Cultural Heritage Management [JMCHM] 1997, 1999, 2001; McDonald 1999). However, it should be noted that archaeological investigations still reveal site information in contradiction to the current, general predictive model for the area, and it is expected that further archaeological work will continue to refine the model.

The most common site types found on the Cumberland Plain are open artefact scatters/open camp sites, followed by scarred trees and isolated finds. Shelter sites and grinding grooves are also found, although mainly around the periphery of the Plain in sandstone geology. Key trends are summarized below:

- site frequency and density are directly related to the location of sites within the landscape;
- complex sites are usually located close to permanent water sources, with major confluences being a key requirement for occupation sites, and would have been used intensively by larger groups, or used repeatedly by smaller groups over a longer period of time;
- sites with large numbers of artefacts can occur on ridge tops and hill crests;
- sites situated in alluvial soils retain the potential for stratified deposits;
- Potential Archaeological Deposits (PADs) are most likely to be located along valley floors and low slopes in well-drained areas; and surface artefact distribution does not accurately reflect the composition or density of subsurface archaeological deposits. Some areas with few or no surface manifestations have often been shown to contain subsurface archaeological deposits.
- artefact scatters are most commonly linked to the close proximity of permanent water sources in areas such as creek and river banks and alluvial flats. The majority of these sites are located within 100m of permanent fresh water;
- artefact assemblages generally comprise a small proportion of formal tool types with the majority of assemblages dominated by unretouched flakes and debitage;
- high concentrations of artefacts are more likely to be located within resource rich areas;
- silcrete is the dominant raw material used for tool manufacture, followed by chert (also known as tuff). Silcrete sources are located in the north western Cumberland Plain at places such as St Marys, Plumpton Ridge (the closest source to the study area, approximately 5km north west), Marsden Park, Schofields, Riverstone, Deans Park, Llandilo and Ropes Creek. Other raw materials include indurated mudstone from Nepean River gravels, quartz, porphyry and hornfels which may be derived from Rickabys Creek gravels, and basalt;
- stands of remnant old growth vegetation retain the potential for scarred trees to be present; however, large scale land clearance of the plain in general means that such stands of vegetation are rare; and
- evidence of post-contact camp sites may be located in close proximity to early European houses and farms, or official buildings.

Regional trends indicate that Aboriginal sites are most frequently located in close proximity to permanent water courses; on creek banks and alluvial flats, or on high ground, and within range of food resources and the raw materials for tool making. However, some exceptions have been demonstrated in excavations at Mungerie Park and Parklea Leisure Centre, where large artefact scatters were identified up to 200-250m from major watercourses (AMBS 2000). McDonald suggested that this site distribution pattern may be due to surface visibility and site formation processes, rather than a true depiction of the cultural distribution of artefacts across the landscape (1994, cited in Mills & Kelton 2002). In 2009, ENSR Australia Pty Ltd (ENSR) undertook excavations at the Oran Park and Turner Road Land Release Precincts, approximately 5.5km south west of the project study area, and concluded that:

> *The archaeological landscape revealed by this investigation suggests that archaeological models derived from other regions or other areas should not be applied uncritically. There was no evidence for greater complexity (defined as intricacy) associated with confluences. There was no evidence of greater densities of archaeological material associated with higher order watercourses. Instead it appears that archaeological deposit in the south west [Cumberland Plain] is of relatively low density with occasional clusters in association with all areas of reliable water regardless of stream order. Future assessments in south west Sydney would benefit from paying greater attention to the investigation of areas within 300m of all reliable watercourses (i.e. more than the conventional 50 m vicinity of watercourses) (ENSR 2009:66).*

ENSR also found that large sites tend to be located in elevated areas with a good outlook over surrounding major creek valleys, at a distance of over 150m from creeks. It was suggested that this

may reflect strategic defensive positioning of camp sites within a cultural interaction zone between three different language groups; the Darug, Gundungurra and Tharawal speaking peoples (ENSR 2009). It should be noted that the ENSR excavations were concerned with testing archaeological patterning throughout a large landscape; however, this type of landscape model has not been extensively tested in other archaeological studies, and further work is needed to determine whether this pattern is seen in other areas. It is also possible that the 'strategic defensive positioning' of sites will not be seen in areas that were not major cultural interaction zones between Aboriginal groups.

Previous studies have also highlighted the problems inherent in characterising archaeological sites on the Cumberland Plain solely by the presence of visible surface stone artefacts, and the importance of test excavation in establishing the nature and density of archaeological material in the Cumberland Plain. Studies have demonstrated that the average ratio of subsurface artefacts to those found at surface could be 25:1, with more recent work indicating this could be as much as 2,000:1 in some locations (JMCHM 2001). Further, the detection of sites is often influenced by factors such as previous land-use and disturbance, and location within the landscape (JMCHM 2003). A high proportion of sites located in the region are found in disturbed contexts (e.g. Smith 1989).

3.3.2 Local Archaeological Context

Site Types

A search of the AHIMS database was undertaken on 24 January 2013 (AHIMS ID 90408), and 109 registered Aboriginal sites are identified within approximately 2km of the study area. The search results are presented in Figure 3.2 and Figure 3.3, and are summarised in Table 3.3.

Table 3.3 Summary of Aboriginal sites previously recorded near the study area (data obtained from AHIMS search [ID: 90408] on 24/01/13).

Site types	Count	Percentage
Open camp site	85	78
Isolated find	11	10.1
PAD	7	6.4
Scarred tree	3	2.8
PAD, open campsite	2	1.8
Scarred tree, open campsite	1	0.9
Total	**109**	**100%**

One Aboriginal site (AHIMS #45-5-3684) is registered within the study area. The site was recorded during the original assessment of the study area in 2008 and, although a survey was undertaken and a site card prepared, the report was never finalised. The site comprises four stone artefacts exposed on the wall of a dam, in the north western part of the study area. The most common sites previously recorded in the local area are stone artefact sites, either open campsites or isolated finds. A small number of PADs and scarred trees have also been recorded in the area. Sites tend to cluster along Eastern, Ropes and Reedy Creeks, which would have been major sources of water and food resources in the region; and within open areas where sites have been preserved by the lack of development.

Eleven of the sites appear to be duplicate recordings, notably eight sites along Eastern Creek; including AHIMS #45-5-2598, the duplicate recording of which plots to the north of the study area, while the original (and most likely accurate) recording was to the north east of the study area; and a scarred tree (AHIMS #45-5-2987) which has been recorded twice, once in association with stone artefacts (AHIMS #45-5-2983). JMCHM (2004:2) notes that this scar is unlikely to be of Aboriginal origin, but is likely to have resulted from attempts to push the tree over using machinery. The scar was replicated on another tree in the vicinity.

Other sites in the near vicinity of the study area include an isolated find (AHIMS #45-5-2796) identified during a survey for the Western Sydney Orbital (now known as the M7); and a PAD (AHIMS #45-5-2986) and open campsite (AHIMS #45-5-2984), both of which have been excavated (see below; JMCHM 2004).

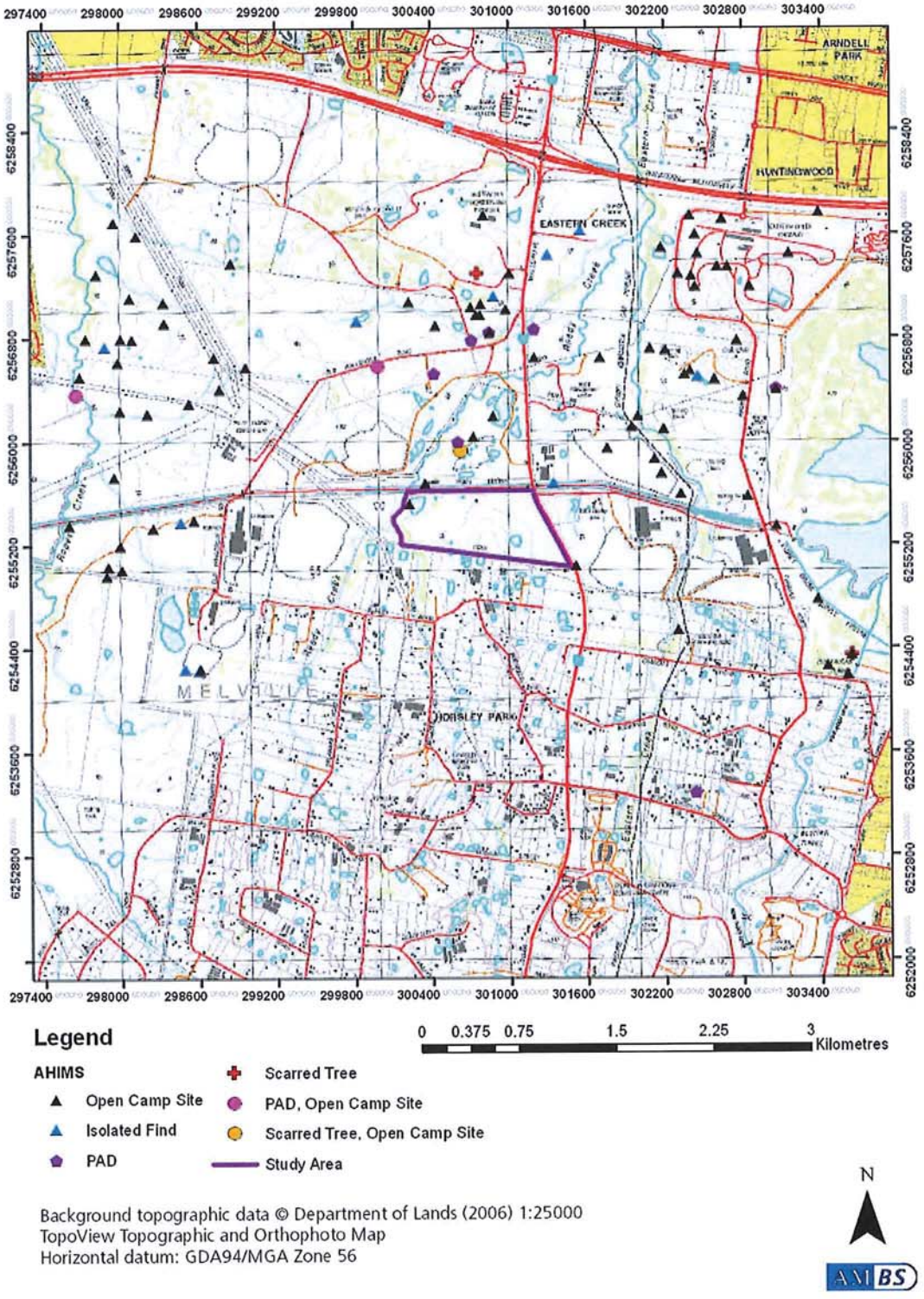

Figure 3.2 AHIMS sites in the vicinity of the study area (AHIMS search ID 90408; 24/01/13).

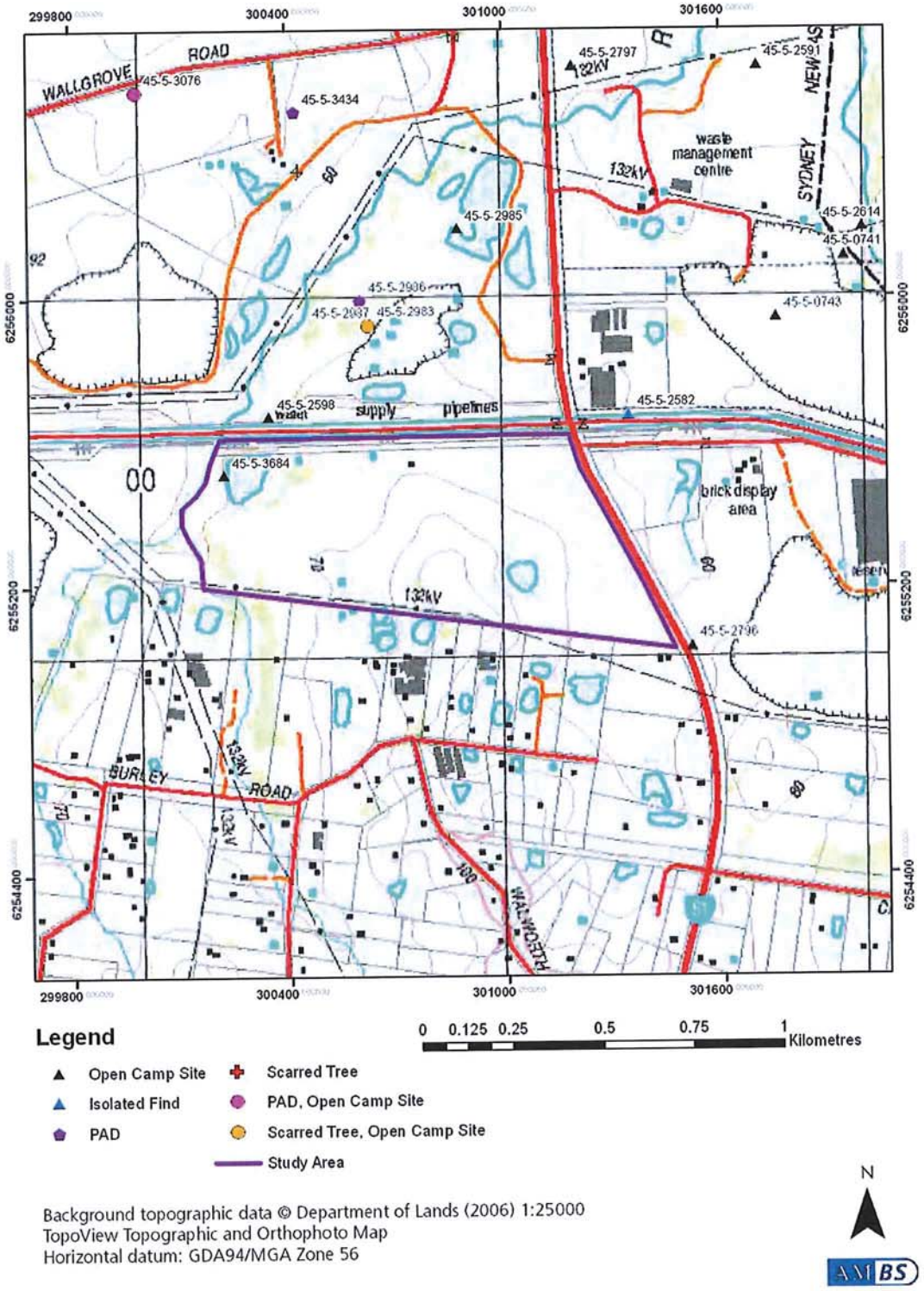

Figure 3.3 AHIMS sites in closest proximity to the study area (AHIMS search ID 90408; 24/01/13).

Previous Archaeological Investigations

There have been a number of archaeological investigations in the general area (see Appendix A). The reports most relevant to the study area are those by JMCHM (2002, 2004), Kelton (2001b) and