Orange Abattoir Archaeological Survey Report

Prepared for Geolyse

22 January 2016

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- Land Owner – Mr Bob Healy

Other Organisations

- NSW Police – Detective Senior Constable Andrew MacLean

Biosis

- Shannon Smith and Amanda Atkinson for their assistance in the field
- Ashleigh Pritchard and James Shepherd for mapping
- Amanda Atkinson for peer review and Quality Assurance.

Abbreviations

ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
DECCW	former Department of Environment, Climate Change and Water now OEH
EPA Act	Environment Planning and Assessment Act 1979
EPBC	Environmental Protection and Biodiversity Conservation
ICOMOS	International Council on Monuments and Sites
LALC	Local Aboriginal Land Council
LGA	Local Government Area
NISP	Number of Individual Species Present
NPW	National Parks and Wildlife
NPWS	National Parks and Wildlife Service
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PAD	Potential Archaeological Deposit
SLNSW	State Library of New South Wales

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Summary

Biosis Pty Ltd has been commissioned by Geolyse to undertake an Archaeological Assessment to accompany their lodgement of a Planning Proposal for the proposed rezoning of lots from industrial and primary production lots to large lot residential.

An assessment in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010) 'the due diligence code' has been undertaken for the Project Area in order to inform responsibilities with regards to Aboriginal cultural heritage in the area. In addition to the basic tasks required for a due diligence assessment, an extended background review, as well as an archaeological survey in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b)* was conducted, in order adequately map areas of high, moderate and low archaeological sensitivity.

Consultation with the Aboriginal community is not a formal requirement of the Due Diligence process and has not been undertaken as part of this assessment. Any further cultural heritage works at this site will require Aboriginal community consultation. The survey located a total of 20 Aboriginal heritage sites; if these sites will be impacted during the proposed development then Aboriginal heritage stakeholder consultation must be undertaken as outlined in the *Aboriginal cultural heritage consultation requirements for proponents (DECCW 2010c). .*

Archaeological survey was conducted from 4 January to 8 January 2015 with a field team of two Biosis archaeologists. A total of 24 transects were undertaken throughout the different landforms with the walking transects being undertaken approximately two metres apart. The archaeological survey identified 20 Aboriginal heritage sites in the Project Area.

The following management recommendations have been developed relevant to the Project Area and influenced by:

- Predicted impacts to Aboriginal cultural heritage
- The planning approvals framework
- Current best conservation practise, widely considered to include:
  - Ethos of the Australia ICOMOS Burra Charter.
  - The *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010).

Prior to any impacts occurring within the Project Area, the following is recommended:

Recommendation 1: Further archaeological assessment

Areas identified as having a Potential Archaeological Deposit (PAD) (OA03, OA04, OA05, OA06, OA11, OA12, OA13, PAD 01, PAD 02, PAD03, PAD 04, PAD05 and PAD 06) should be avoided wherever possible. If impact to these areas cannot be avoided subsurface investigations (test excavations), undertaken in accordance with the code, will be required prior to the commencement of works. Consultation with Aboriginal stakeholders according to the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010) ('the consultation requirements') will be required for the development to proceed.

Recommendation 2: Application for an Aboriginal Heritage Impact Permit (AHIP) for the entire Project Area

If the proposed works cannot avoid harm to OA01, OA02, OA03, OA04, OA05, OA06, OA07, OA08, OA09, OA10, OA11, OA12, OA13, OA14, PAD 01, PAD 02, PAD03, PAD 04, PAD05 and PAD 06 it is recommended that an application be made to the Office of Environment and Heritage (OEH) for an area based Aboriginal Heritage Impact Permit (AHIP) for the entirety of the Project Area. The AHIP should include the following conditions:

- Impact can occur to the Aboriginal cultural heritage sites OA01, OA02, OA03, OA04, OA05, OA06, OA07, OA08, OA09, OA10, OA11, OA12, OA13, OA14, PAD 01, PAD 02, PAD03, PAD 04, PAD05 and PAD 06. All of the sites occur within the proposed works area.
- The isolated artefacts (Sites OA01, OA02, OA07, OA09 and OA10) should be relocated prior to ground disturbance and moved outside of the impact area, but within their original landscape context.
- At sites OA03, OA04, OA05, OA06, OA11, OA12, OA13 and OA14, the surface artefacts should be relocated prior to ground disturbance and moved outside of the impact area, but within their original landscape context. Any subsurface archaeological material located within the impact area, with the exception of human remains, can be destroyed.
- Impact within the limits of the area based destruction AHIP for any further Aboriginal objects encountered during construction unless human remains are involved.

For information about AHIPs and their preparation, see below.

Advice preparing AHIPs

An AHIP is required for any activities likely to have an impact on Aboriginal objects or Places or cause land to be disturbed for the purposes of discovering an Aboriginal object. The OEH issues AHIPs under Part 6 of *the National Parks and Wildlife Act 1974* (NPW Act).

AHIPs should be prepared by a qualified archaeologist and lodged with the OEH. Once the application is lodged processing time can take between 8-12 weeks. It should be noted that there will be an application fee levied by the OEH for the processing of AHIPs, which is dependent on the estimated total cost of the development project.

Where there are multiple sites within one project area an application for an AHIP to cover the entire project area is recommended.

Recommendation 3: Discovery of Aboriginal ancestral remains

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

- Immediately cease all work in the vicinity and not further move or disturb the remains.
- Notify the Coroners Office and NSW Police immediately. Following this, contact OEH's Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location. The find must also be reported to the Aboriginal parties.
- Not recommence work at that location unless authorised in writing by OEH.

Recommendation 4: Discovery of Unanticipated Historical Relics

Relics are historical archaeological resources of local or State significance and are protected in NSW under the *Heritage Act 1977*. Relics cannot be disturbed except with a permit or exception/exemption notification. Should unanticipated relics be discovered during the course of the project, work in the vicinity must cease and an archaeologist contacted to make a preliminary assessment of the find. The Heritage Council will require notification if the find is assessed as a relic.

1. Introduction

1.1 Project background

Biosis Pty Ltd has been commissioned by Geolyse to undertake an Archaeological Assessment to accompany their lodgement of a Planning Proposal for the proposed rezoning of lots from industrial and primary production to large lot residential.

An assessment in accordance with the 'due diligence code' has been undertaken for the Project Area in order to inform responsibilities with regards to Aboriginal cultural heritage in the area. In addition to the basic tasks required for a due diligence assessment, an extended background review, as well as an archaeological survey in accordance with the code was conducted, in order to adequately map areas of high, moderate and low archaeological sensitivity.

This report is intended to inform decisions relating to the management of Aboriginal cultural heritage and if required to form the basis for further approvals required under Part 6 of the NPW Act.

1.2 Project Area

The Project Area covers an area of approximately 290 hectares and is located within Orange City Council, Parish of Orange, County of Wellington (see Figure 1). The Project Area consists of;

- Lot 15 DP6694
- Lot 3 DP255983
- Lot 2 DP255983
- Lot 14 DP6694
- Lot 25 DP6694

The Project Area is also bounded by Clergate Road and the main western railway on the west and Pearce Lane in the north (Figure 2).

1.3 Project Development

The Project development will involve the rezoning Lot 15 from industrial purposes and Lot 3, 2, 14 and 25 from primary production purposes to large residential lots (see Figure 1).

1.4 Planning approvals

The planning proposal will be considered against Part 3 of the *Environmental Planning and Assessment Act 1979* NSW. Other relevant legislation and planning instruments that will inform this assessment include:

- *Environmental Protection and Biodiversity Conservation Act 1999*
- *Environmental Planning and Assessment Act 1979* (NSW)
- *National Parks and Wildlife Act 1974* (NSW)
- *National Parks and Wildlife Amendment Act 2010* (NSW)
- *Infrastructure SEPP 2007*

- *Orange Local Environmental Plan 2011*

1.5 Assessment objectives

The following is a summary of the major objectives of the assessment:

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

1.1 Aboriginal consultation

Consultation with the Aboriginal community is not a formal requirement of the Due Diligence process and has not been undertaken as part of this assessment. Any further cultural heritage assessment works at this site will require Aboriginal community consultation. If Aboriginal heritage items are located during construction and will be impacted by the construction then Aboriginal heritage stakeholder consultation must be undertaken as outlined in the consultation guidelines.

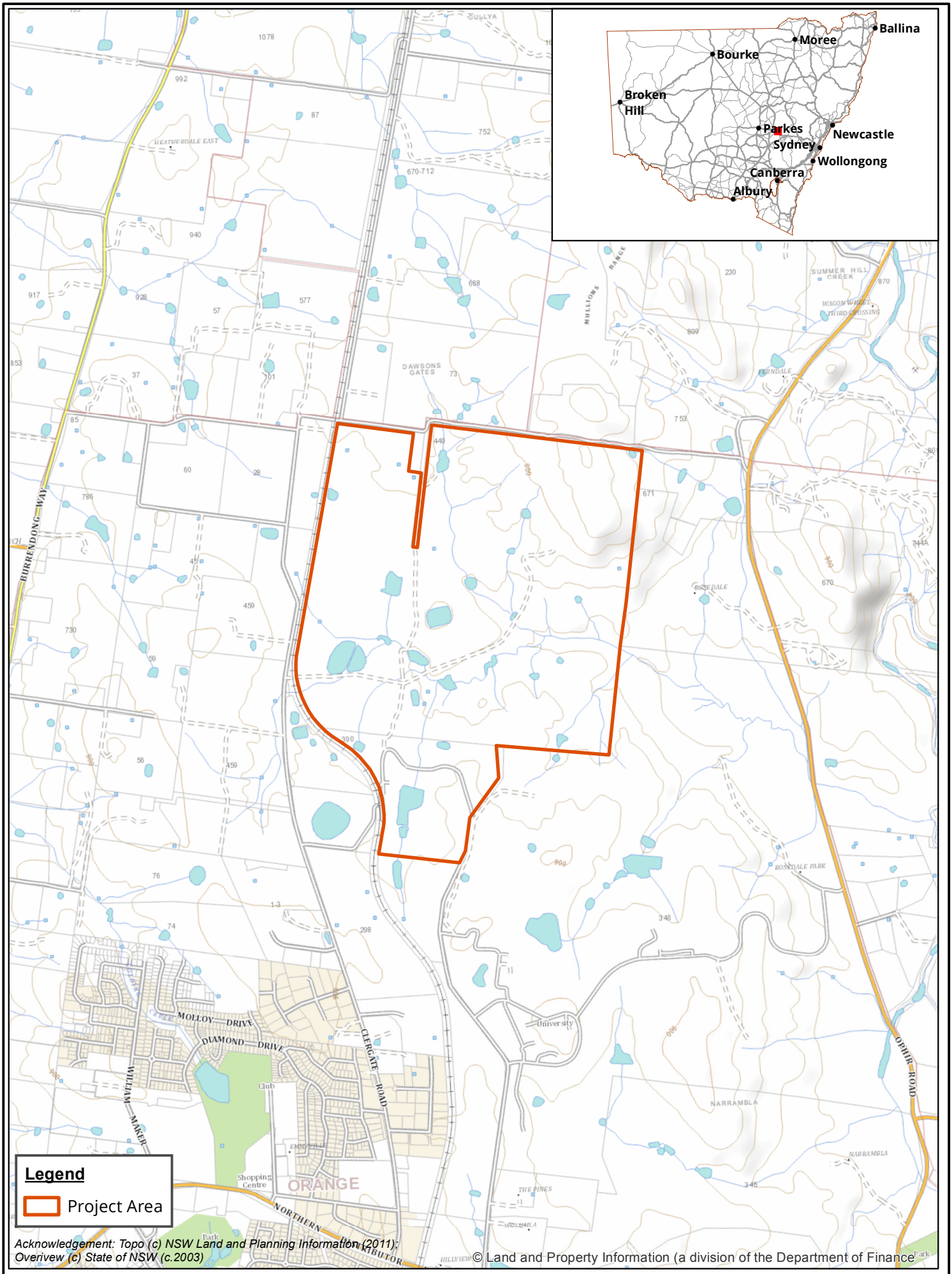


Figure 1: Location of the Project Area

Biosis Pty Ltd
Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Matter: 21507
Date: 17 December 2015,
Checked by: SAS, Drawn by: ANP, Last edited by: apritchard
Location:P:\21500s\21507\Mapping\

0 250 500 750 1,000
Metres
N
Scale 1:25,000 @ A4, GDA 1994 MGA Zone 56

Legend

Project Area

Figure 2: Project Area

0 100 200 300 400 500

Metres

Scale: 1:10,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

Biosis Pty Ltd

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

Matter: 21507,
Date: 19 January 2016,
Checked by: AA, Drawn by: JMS, Last edited by: apritchard
Location:P:\21500s\21507\Mapping\21507_ACH_F2_ProjectArea.mxd

2. Investigators and contributors

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

Table 1 Investigators and contributors

Name	Qualifications	Experience
Amanda Atkinson	**Ba (Arch/Paleo), Grad Dip. Arch**	**9 years**
Amanda Atkinson is a consultant archaeologist with Biosis Pty Ltd Wollongong office. Amanda has nine years archaeological consulting experience across south-eastern and western Australia. She is experienced in all aspects of heritage consulting with specialisation in Aboriginal archaeology. Amanda has extensive experience in the successful completion of Aboriginal and Historical assessments, archaeological surveys, excavations, permits and management plans. She is accomplished in obtaining approvals under the *NSW National Parks and Wildlife Act 1974*. Amanda has extensive experience in the successful completion of Aboriginal and Historical assessments, archaeological surveys, excavations, permits and management plans. Amanda is a diligent and highly experienced heritage consultant with extensive experience in project management. She is easily able to develop excellent working relationships with project stakeholders and manage and negotiate the relationship between Aboriginal stakeholders, government regulators and clients.		Project Roles • Lead cultural heritage advisor • Field survey • Project management • Development of recommendations • Preparation of the report
Shannon Smith	**BA, Grad Dip Arch**	**5 years**
Shannon Smith is a field archaeologist with Biosis Pty Ltd Wollongong office. Shannon has five years archaeological consulting experience and has conducted over 70 heritage projects across South Australia and Western Australia. She is experienced in all aspects of heritage consulting and has extensive experience in archaeological surveys and excavations, reporting, permit application, grant applications and analysis of cultural material. Shannon specialises in Aboriginal archaeology, with particular research interests in open air-artefacts scatters and shell middens. Shannon has primarily undertaken projects in the Pilbara region of Western Australia and has operated as the heritage consultant within large multidisciplinary teams tasked with managing heritage values. Shannon is a diligent and highly experience heritage consultant with extensive experience in project management. During her career she has worked in collaboration with a number Aboriginal Corporations, Aboriginal stakeholders, development proponents, mining companies and government regulators.		Project Roles • Field survey • Preparation of the report • Development of recommendations

Name	Qualifications	Experience
Ashleigh Pritchard	**Diploma of Spatial Information Services (GIS)**	**5 years**
Ashleigh is a GIS Operator with the Wollongong office of Biosis Pty Ltd. She has five years experience in the field of mapping and has contributed to over 400 consultant reports in both the Natural and Cultural heritage teams across New South Wales, Victoria and Queensland for a diverse range of clients. Ashleigh has utilised the functionality of GIS to undertake spatial analysis projects such as calculations of habitat loss as well as georeferencing and digitising. She has extensive experience in spatial data management and map production for large, ongoing impact monitoring projects in New South Wales Ashleigh has experience in the use of GIS in assessing and preparing high quality maps to support information for biodiversity offset requirements, including mapping of vegetation at a regional scale, assessment of 100 hectare and 1000 hectare assessment circles, connectivity assessment, calculation of vegetation cover pre- and post-development and development of assessment tools using remote sensing and handheld computers (tablets). Ashleigh has utilised a variety of software packages to create map products throughout her career including ArcMap, AutoCad and MapInfo Professional		Project Roles • Mapping
James Shepherd	**Ba of Arts Informatics (Hons)**	**9 years experience**
James Shepherd is a Senior GIS Officer working with Biosis Pty Ltd since February 2011, with over nine years professional experience in the use and application of GIS to various disciplines, particularly within the environmental and heritage consulting sectors. James is experienced in map production, spatial analysis and spatial data management and has worked with numerous clients across Australia from a range of business sectors. James is a qualified esri trainer in a number of official esri ArcGIS Desktop courses from beginner to advanced level. James has previously worked as an archaeological and heritage consultant including assisting with heritage and archaeological assessments and management plans for a number of large sites across NSW and Victoria. James has contributed to over 100 consultant reports in both the Natural and Cultural heritage teams in the form of figure production, field data preparation and management, spatial analysis, landscape interpretation and quantitative impact analysis (e.g. vegetation impacts calculations). James possesses strong analytical and problem solving skills.		Project Roles • Mapping

3. Previous archaeological assessments

A number of Aboriginal cultural heritage investigations have been conducted within the local area around the Project Area. These investigations, briefly summarised below, include the following:

Pearson (1979) undertook a survey targeting two creek valleys north of the Mitchell Hwy between Lucknow and Bathurst. Forty-two sites were recorded, with artefacts numbering between one and 92 at each site.

Pearson(1981) analysed the patterns of Aboriginal and early European settlement within the Upper Macquarie Region. This study included three shelters excavated, providing occupation dates of around 7,000 BP.

Kelton (1994) undertook a heritage assessment at Moulder Hill, 15 kilometres north of Orange. During the survey a scarred tree and an isolated artefact were located. Both sites were recorded close to an ephemeral drainage line.

Kelton (1996) undertook a heritage assessment of the 560 hectares at Ophir Reserve, north east of Orange. During this survey one previously recorded site was relocated (44-2-20) and three additional scarred trees. These sites were situated on an elevated area overlooking a creek line

Hughes and Johnston (1995) was commissioned to undertake an aboriginal assessment of the proposed routes for an access road, water pipeline and 132 kilovolt (kV) transmission line. During this assessment a total of seven Aboriginal sites, all open artefact scatters were recorded. Six sites were located within the proposed 132 kV transmission route and the others were stated within the proposed road access route to the mine site. No sites were recorded along the water pipeline route.

Oakley (2002) undertook an Aboriginal assessment of the Suma Park and Spring Creek Reservoirs, located near Orange. During this assessment a total of seven artefact scatters were recorded. The sites were located along the low gradient spurs. The artefact analysis recorded that the primary raw material was quartz with artefacts of basalt and chert also recorded. The majority of artefacts were flakes and broken flakes, with several cores also recorded.

Heritage Concepts (2003) were commissioned by Parsons Brinckerhoff to complete an Aboriginal and Historic Archaeological and Cultural Assessment. The survey investigated 632 hectares of land. A total of two sites were identified along with a number of areas highlighted as PADS.

OzArk (2009) undertook survey of 212 hectares between Leeds Parade and the Ophir Road Orange. The project surveyed hilly country interspersed with ephemeral and permanent creeks again. The survey recorded nine Indigenous sites and one PAD (Ozark 2009).

Appleton (2005) undertook an Aboriginal cultural assessment over the Euchareena Road Resource Recovery Centre, known as 'the hub site'. During the survey a scar tree (44-1-0080) and an open site comprising of a grinding stone and hand axe (44-1-0081) were recorded. It was noted that the find spot of the items is considered to be secondary and that the artefacts were not originally from that location. The proposed project did not affect the Aboriginal sites. In 2009 Ozark was commissioned by R.W.Corkery & Co. Pty Limited on behalf of Orange City Council to provide management recommendations for the identified Aboriginal heritage sites by Appleton in 2005. Ozark recommended that an Aboriginal Heritage Management Plan be written.

NTSCORP (2012) was engaged by Orange City Council to undertake an Aboriginal Heritage Study of land within the Orange City Council boundary. The purpose of the investigation was to consult with the Orange Aboriginal community, prepare a thematic history, identify and assess sites of significance and provide management recommendations. An archaeological survey was not conducted as part of the investigation;

instead information was gathered from the AHIMS data base maintained by OEH. A search of the on-line facility in July 2011 showed that 40 sites have been recorded since 2002. Most sites have been recorded as part of commercial and residential developments. The investigation revealed that there are no dates for Aboriginal sites in the Orange district. The oldest dates obtained from a site in the wider area is from two rock shelters at the Granites approximately 60 kilometres to the south-east of Wellington. Occupation began at this site in 7150 BP.

Hanson (2012) was engaged by R W Corkery & Co Pty Ltd to create an Aboriginal Cultural Heritage Management Plan for the East Guyong Quarry. The Quarry is located approximately 22 kilometres southeast of Orange. No Aboriginal sites were identified.

Pardoe (2013) was engaged by Barrick to prepare an Aboriginal Cultural Heritage Assessment for the Cowal Gold Mine Extension Modifications. The Cowal Gold Mine is located approximately 38 kilometres north-east of West Wyalong. The field survey of the proposed disturbance areas associated with the Modification were carried out over a period of four days. Based on the results from previous surveys, three registered Aboriginal heritage sites, all artefact scatters (43-4-0021, 43-4-0022 and 43-4-0024) and the Wamboyne Back Plains Site 1 (43-4-0044) were located. Other objects have also been previously recorded and collected from within the area during previous cultural heritage assessments and surveys, however these objects represent a component of the regional background distribution rather than individual sites.

Ozark (2014a) were commissioned by Peter Basha Planning and Development to undertake an archaeological assessment of Lot 99 DP 756869 and Lot 43 DP1154795 located at Silverdown Way and Dean Drive. The project proposed to develop the areas into a Residential subdivision. During the survey no new sites were recorded and no archaeologically sensitive landforms were identified. Areas identified as areas of 'Aboriginal Archaeological Potential', as identified by **Heritage Concepts (2003)** were reassessed. It was concluded that those landforms were not archaeologically sensitive, nor likely to contain unidentified archaeological deposits.

Ozark (2014b) was commissioned by Fenlor Group Pty Ltd, on behalf of Landorange Partnership to undertake an Aboriginal heritage assessment of the rezoning on a portion of land approximately 5 kilometres north-east of Orange. No new Aboriginal sites were identified within the Survey Area, although two pieces of rhyolite were noted, but there was not sufficient information to classify them as stone artefacts.

Williams (2014b) was engaged by Geolyse to undertake an Aboriginal Heritage Due Diligence Assessment of the Orange Southern Feeder Road Stage 1 area. The area had been previously surveyed by the Orange LALC who had identified three potential scarred trees and one stone artefact. These locations were inspected during this assessment and it was determined that they were not sites. The results from the assessment was that the development could proceed with causation and no further archaeological assessment was required.

NSW Archaeology (2015) was engaged by Geolyse to conduct an Aboriginal heritage assessment of Summer Hill Estate, north of Orange. A field inspection was conducted and eleven sites were located and recorded within the survey area. All eleven sites consisted of isolated stone artefacts. The artefacts were recorded in generally disturbed areas and it was argued that they did not possess an archaeological potential deposit. The final recommendations were that an Aboriginal Cultural Heritage Assessment Report and formal Aboriginal Consultation be undertaken prior to work commencing. An AHIP would also be needed for all eleven sites.

Access Archaeology & Heritage (Williams 2015) was commissioned by Geolyse Pty Ltd to undertake an Aboriginal Cultural Assessment of a proposed pip line installation intended to service the South Orange Urban Release Area. This assessment followed an Aboriginal Heritage Due Diligence study **(Williams 2014a)** that recorded one scatter of two stone artefacts on the surface of Hawkes Lane. During the assessment Aboriginal community consultation was undertaken. The proposed development would impact on both sites

and a final recommendation of the assessment was tat an AHIP was need for both sites. Williams concluded that due to the fact that these sites were located in poor visibility, there was potential for more widespread archaeological remains within the survey area.

3.1.1 AHIMS site analyses

A search of the NSW OEH Aboriginal Information Management System (AHIMS) database was conducted on 11 December 2016. The search identified 6 Aboriginal archaeological sites within a 10 kilometres search area, centred on the proposed Project Area (see Table 2). None of these registered sites are located *within* the Project Area (see Figure 4). The mapping coordinates recorded for these sites were checked for consistency with their descriptions and location on maps from Aboriginal heritage reports where available. These descriptions and maps were relied on but notable discrepancies occurred.

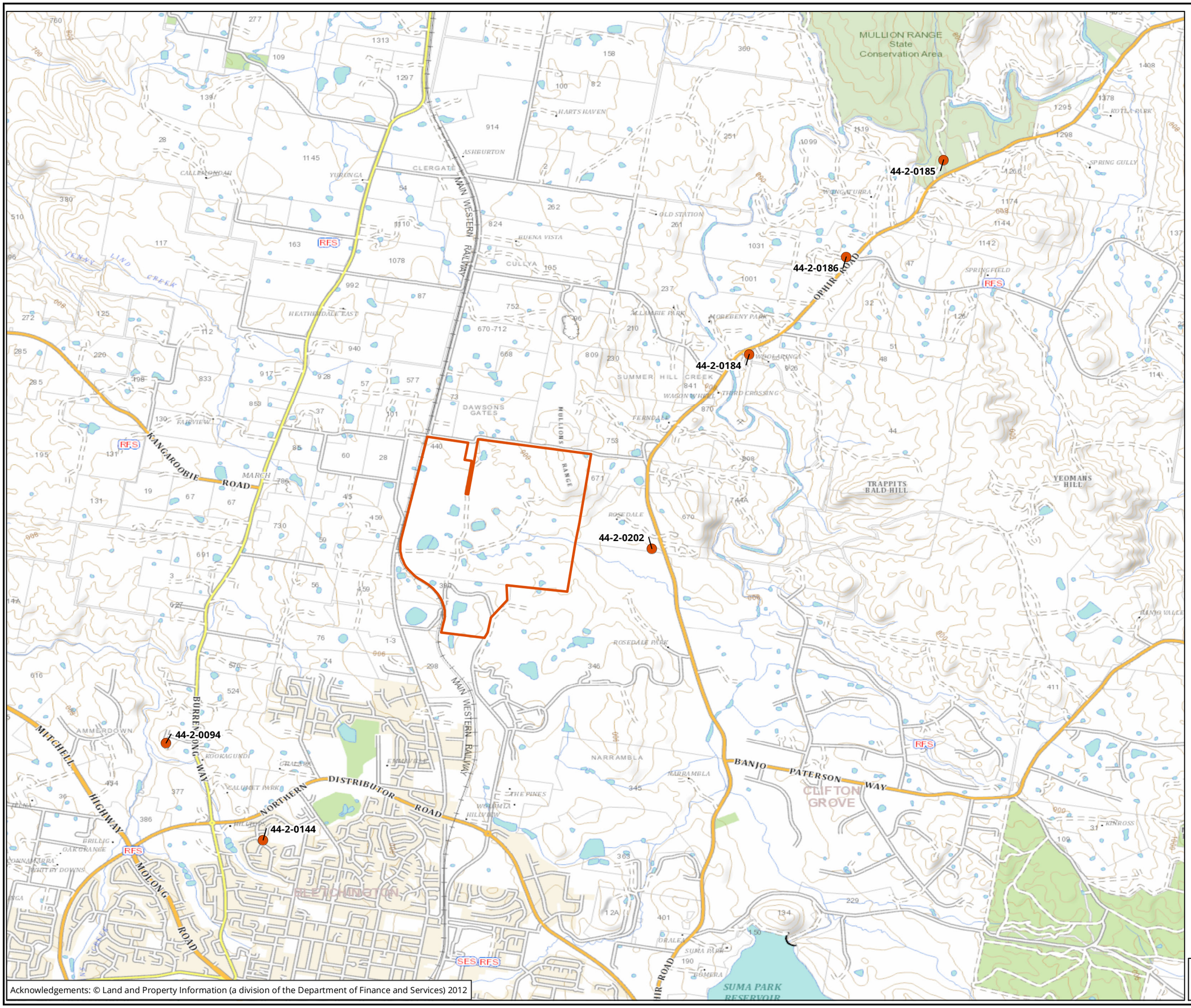
It should be noted that the AHIMS database reflects Aboriginal sites that have been officially recorded and included on the list. Large areas of NSW have not been subject to systematic, archaeological survey; hence AHIMS listings may reflect previous survey patterns and should not be considered a complete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

Table 2 AHIMS search results.

AHIMS site no	Site name	Site status	Site type
44-2-0094	Moulder Hill ST-1;MH/ST-1	Valid	Modified Tree (Carved or Scarred) : -
44-2-0202	MPA PASA2	Valid	Potential Archaeological Deposit (PAD) : 1
44-2-0184	MPA2	Valid	Artefact : 1
44-2-0185	MPA3	Partially Destroyed	Artefact : 1, Potential Archaeological Deposit (PAD) : 1
44-2-0186	MPA4	Destroyed	Artefact : 1
44-2-0144	Burrendong 1	Valid	Artefact : -

Table 3 AHIMS results, site types and frequencies

Site type	Number of occurrences	Frequency (%)
Artefact	3	50
Artefact and PAD	1	17
PAD	1	17
Modified tree (Carved or Scarred)	1	17
TOTAL	**6**	**100**



Legend

- AHIMS Records
- Project Area

Figure 3: AHIMS search results

0 400 800 1,200 1,600 2,000

Metres
Scale: 1:40,000 @ A3
Coordinate System: GCS GDA 1994

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Date: 19 January 2016,
Checked by: apritchard, Generated by: apritchard
Location:P:\21500s\21507\Mapping
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4. Project Area context

A desktop assessment has been undertaken to review existing archaeological studies for the Project Area and surrounding region. This information has synthesised to develop an Aboriginal site prediction model for the Project Area and identify known Aboriginal sites and/or Places recorded in the Project Area. This Desktop Assessment has been prepared in accordance with requirements 1 to 4 of the code.

4.1 Landscape context

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

4.1.1 Topography and geology

The Project Area is located within the South Eastern Highlands Bioregion, which occupies approximately 6.11 percent of NSW. This bioregion is located inland from the coastal bioregion of the Sydney Basin. This bioregion includes most of the ACT into Victoria.

The topography of this bioregion includes the dissected ranges and plateau of the Great Dividing Range. It extends to the Great Escarpment in the east and to the western slopes of the inland drainage basins. The landscape includes undulating to rolling low hills north of Orange ranging from 750-900 metres above sea level. In parts steep and rocky, with slopes 6 -10 percent. Slopes are from 50 - 100 metres long, averaging 450 metres. Local relief average 40 metres, ranging from 20-60 metres. The drainage channels are fixed and widely spaced from 650-1000 metres apart. The Mullions Range is located within the north-east of the Project Area and reaches a hight of approximately 900 metres above sea level.

The Project Area is located within the Oakdale geological formation (Oco), which is dominated by Mafic volcanic sandstone, basalt, siltstone, black shale, chert, breccia and conglomerate (see Figure 4). It is important to understand the geological formation of the area in order to understand the raw materials that would have been available for the production of stone tool. If raw materials are recorded within an area that are not characteristic of the local geological formation, this gives a good insight into local trade of raw material within the wider area.

4.1.2 Soil landscapes

The main soil landscape within the Project Area is North Orange (see Figure 5). There is also four other soil landscapes in the wider region that are associated with Summer Hill Creek, which is the main creek east of the Project Area. A summary of the North Orange soils is provided in Table 4.

Table 4 Soil landscapes within the Project Area (Kovac, Murphy & Lawrie 1989)

Soil landscape	Description
North Orange (no)	Red Earths (Gn2.11 and Gn2.14) on upper slops and shallow lithosols on crests and sideslopes. Yellow earths (Gn2.34 and Gn2.24) appear on lower slopes with brown Solodic and yellow Solodic soils (Db1.42, Db2.22, Dy3.41 and Dy3.42) in drainage depressions. Other soils include Non-calcic Brown soils (Dr.2.22 and Dr1.22), Red and Brown Podzolic Soils (Dr2.21, Dr2.11 AND Db1.41), gravely earths (Gn2.14, Dn2.4 and Gn2.7) and yellow Solonetzic soils (Dy3.43).

4.1.3 Hydrology

The Project area is also located within the Macquarie – Castlereagh catchment area, which covers an area of 91,985 kilometres squared. The Macquarie–Castlereagh region varies from steep terrain in the east to open plains in the west where the Ramsar-listed (An area that has been designated under Article 2 of the Ramsar Convention under the EPBC Act) Macquarie Marshes are located. Within this catchment area there are several distributary rivers and creeks that enter the Macquarie River, including Turner River and Summer Hill Creek. Summer Hill Creek is located east of the Project Area and is a tributary of the Macquarie River. A number of wetlands in the bioregion are regarded as nationally important and listed in the Directory of Important Wetlands in Australia.

Within the Project Area itself there are a number of drainage lines and a large drainage area, which all feed into a main creek line within the centre of the Project Area. The main creek line also feeds east into Summer Hill Creek.

4.1.4 Rainfall

Within the South Eastern Highlands Bioregion the mean annual rainfall is 460 – 1883 millimetres, with a minimum monthly average of 23 – 98 millimetres. The closest active weather station to the Project Area is the Orange Agricultural Institute (station 063254, established 1966). Orange has a maximum mean rainfall of 95.6 millimetres and a minimum mean of 53.1 millimetres (BOM 2015). This information can help us assess the likelihood of water in the area, which will affect the location and type of cultural material. During the fieldwork both dry and wet weather was experienced during the survey.

4.1.5 Temperature and weather conditions

This bioregion is dominated by a temperate climate characterised by warm summers and no dry season. Significant areas in the north and south of the bioregion are at higher elevations in a montane climate zone, where summers are much milder.

The township of Orange (station 063254), has an annual average maximum temperature of 26.4°C and an average minimum temperature of 1.5°C (BOM 2015). Temperature and weather condition in the areas allow a better understanding the natural environmental conditions and how these would have effect on previous Aboriginal subsistence patterns.

4.1.6 Vegetation

The area surrounding the Project Area supports natural and modified vegetation communities. The term *modified* is used to describe land where the original natural vegetation cover has been cleared and replaced with agricultural land uses. The state of vegetation in these modified areas varies considerably from recently cropped areas to regenerating native vegetation. Although significant areas of natural vegetation cover the Project Area, most plant communities have been disturbed or degraded as a result of altered water regimes, physical disturbance from earthworks, livestock and pest animal grazing, weed invasion and forestry activities. Despite extensive land clearance in the region since the 1830s, environments containing important plant communities remain throughout the Central West. By looking at these environments on a regional scale it can give some indication of the landscapes of the Central West as they appeared and the ways in which they have changed since then (Kass 2003).

Within the wider bioregion there are a number of different vegetation communities which have been summerised in Table 5. The Project Area also has some initial vegetation mapping, which shows that there are pockets of Blakely's red gum (*Eucalyptus blakelyi*) and Yellow box (*Eucalyptus melliodora*) open woodlands of the tablelands. Vegetation was also an important resource for hunting and foraging as well as for constructing tools and other utilities.

Table 5 Vegetation within the bioregion

Landscape	Vegetation
Lower areas	Yellow box *Eucalyptus melliodora*, Red box *Eucalyptus polyanthemos* and Blakely's red gum *Eucalyptus blakelyi*, with areas of white box *Eucalyptus albens*. Grey gum *Eucalyptus punctata* and Blaxland's stringybark *Eucalyptus blaxlandii.*
Associations dominate hills in the west of the bioregion	Red stringybark *Eucalyptus macrorhyncha*, broad-leaved peppermint *Eucalyptus dives* and white gum *Eucalyptus rossii.*
Main streams	River oak *Casuarina cunninghamiana.*
Higher areas	Brown barrel, mountain gum *Eucalyptus dalrympleana*, narrow-leaved peppermint *Eucalyptus radiate* and ribbon gum *Eucalyptus viminalis.*
Rocky outcrop	Patches of black cypress pine *Callitris endlicheri.*
Cold plateaus	Pen woodlands of snow gum and black sallee *Eucalyptus stellulata.*

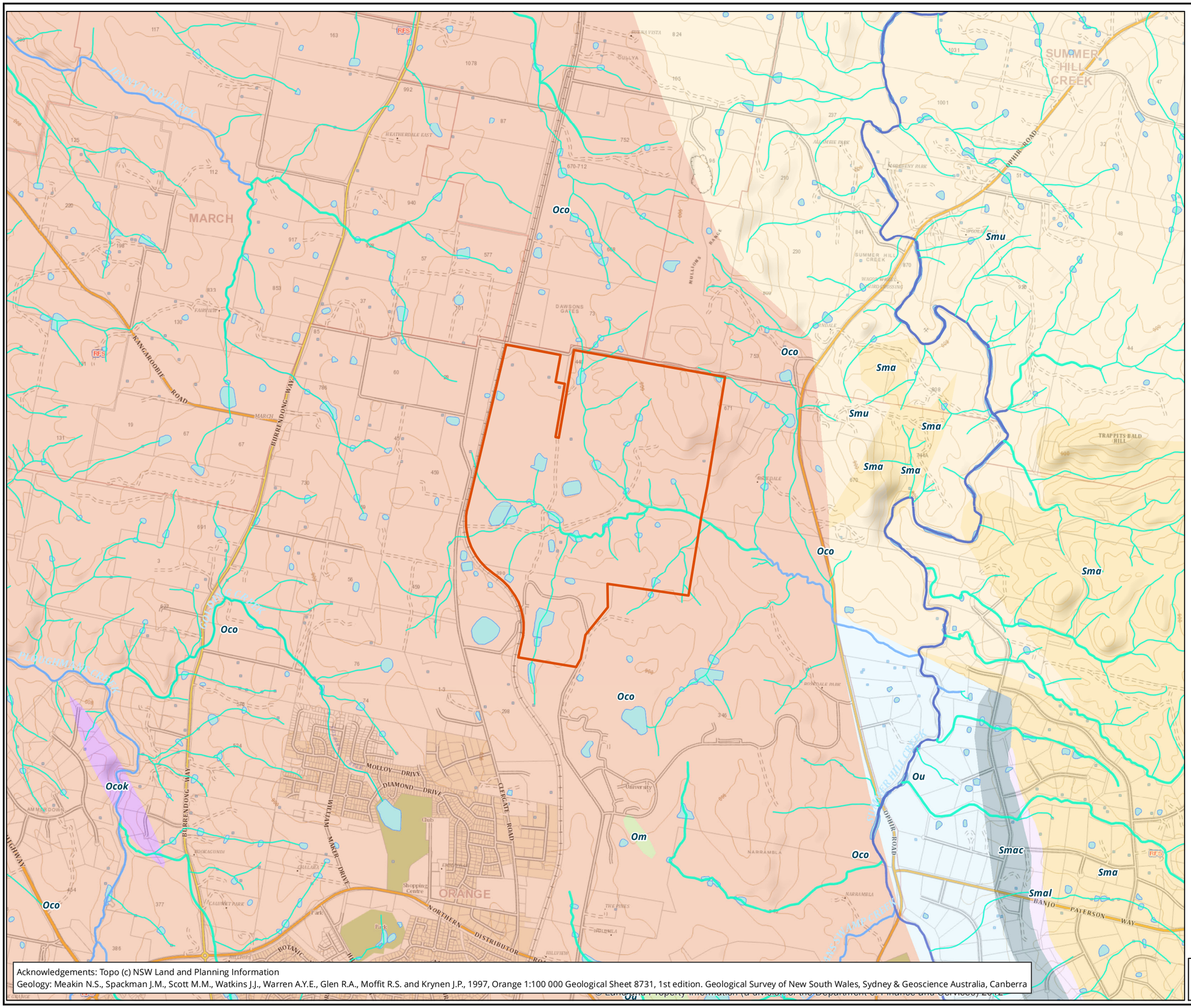
4.1.7 Landscape resources

Resources in the vicinity of the Project Area would have provided adequate sources of nutrition for subsistence activities; however these resources would be largely tied to seasonal variations and the flow of the nearby rivers. The Wiradjuri people relied on staple food resources provided by the major rivers in their country – the Macquarie, Lachlan and Murrumbidgee Rivers. In the dry season the food from the rivers was supplemented with meat (kangaroo and emus) and vegetables – fruit, nuts, yam daises, wattle seeds and orchid tubers (Niche 2014).

A selection of resources has been compiled into Table 6 to give an indication of the resources available to local Aboriginal groups. Notably, the majority of the food sources mentioned in Table 6 are located within or in close proximity to rivers and lakes. This has partially to do with the greater availability of resources in these environments, particularly in the summer months, but it is also tied to early ethnographic observations made by explorers and surveyors.

Table 6 Landscape resources available to local Aboriginal groups

Plant / Animal	Aboriginal use
Emus / emu eggs	Food source (Allen 1974; Mitchell 1835)
Kangaroo	Food source (Mitchell 1835)
Fish species	Food source, fat from these animals could also be used in medicine (Martin 2010). Fish and crayfish were taken from the rivers from September to May.
Freshwater snail	Food source (Martin 2010)
Marsh clubrush	Food source (Martin 2010)
Possum	Possums and larger grazing animals were hunted throughout the year. (Mitchell 1835)
Red / grey kangaroo	Food source, also used to make bags to hold seeds or water (Allen 1974), bone was used for bone points, and the teeth for fish hooks (Martin 2010)
River mussel/ Lake mussel	Food source (Martin 2010; Mitchell 1835)
Snakes and lizards	Food source (Martin 2010)
Wattle seeds fruit, nuts, yam daises, wattle seeds and orchid tubers	Food source (Niche 2014).
Waterfowl / other aquatic birds	Food source available in summer months in Riverine environments (Allen 1974)
Bracken fern	Food source (NTSCORP 2012)
Yabbies	Food source (NTSCORP 2012)



Legend

- Project Area

1:100,000 geological units

- Oco, Oakdale Formation
- Ocok, Oakdale Formation
- Om
- Ou
- Sma, Anson Formation
- Smac, Anson Formation
- Smal, Anson Formation
- Smu, Mullions Range Volcanics

Figure 4: Geology

0 280 560 840 1,120 1,400

Metres
Scale: 1:25,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

N

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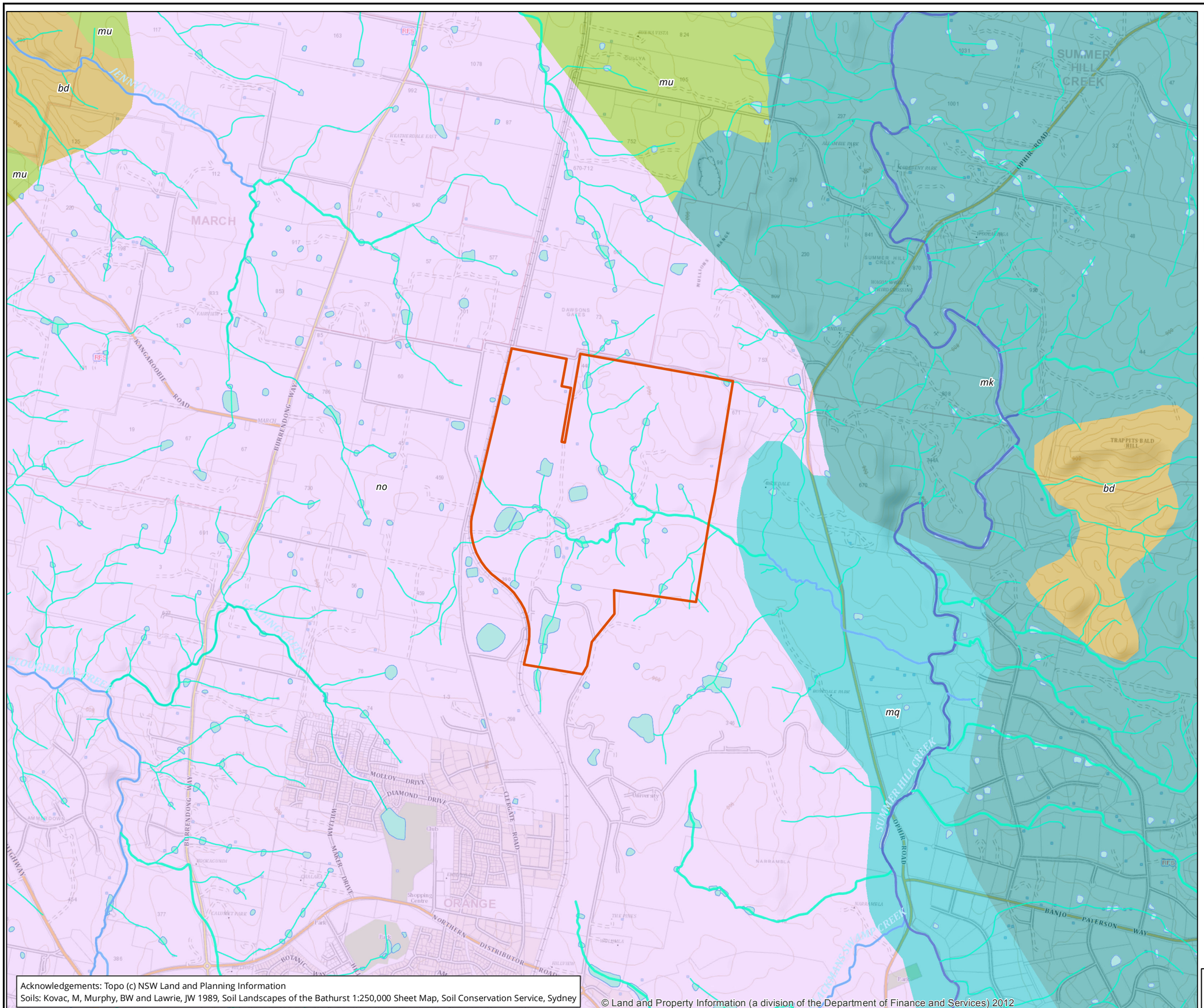
Matter: 21507,
Date: 19 January 2016,
Checked by: SAS, Drawn by: ANP, Last edited by: apritchard
Location:P:\21500s\21507\Mapping\21507_ACH_F4_Geology.mxd

Acknowledgements: Topo (c) NSW Land and Planning Information
Geology: Meakin N.S., Spackman J.M., Scott M.M., Watkins J.J., Warren A.Y.E., Glen R.A., Moffit R.S. and Krynen J.P., 1997, Orange 1:100 000 Geological Sheet 8731, 1st edition. Geological Survey of New South Wales, Sydney & Geoscience Australia, Canberra



Legend

- Project Area

Soil landscape units (1:250,000)

- BURRENDONG, SHALLOW SOILS
- MACQUARIE, ALLUVIAL SOILS
- MOOKERAWA, SOLOTHS
- MULLION CREEK, SOLOTHS
- NORTH ORANGE, RED EARTHS

Acknowledgements: Topo (c) NSW Land and Planning Information
Soils: Kovac, M, Murphy, BW and Lawrie, JW 1989, Soil Landscapes of the Bathurst 1:250,000 Sheet Map, Soil Conservation Service, Sydney

Figure 5: 1:250,000 soil landscapes near the Project Area

0 280 560 840 1,120 1,400

Metres
Scale: 1:25,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

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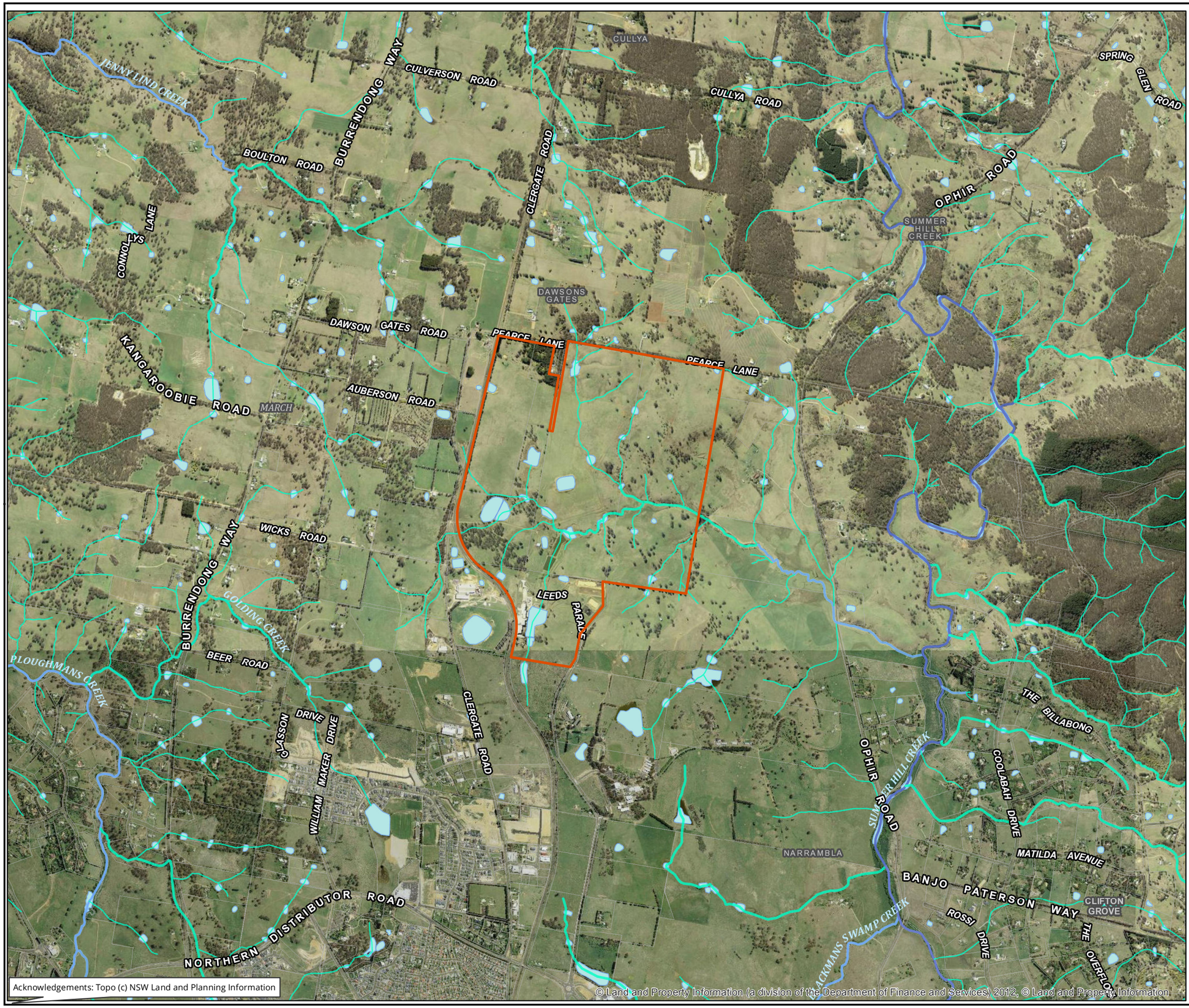

Legend

Project Area

Figure 6: Hydrology

0 250 500 750 1,000 1,250

Metres

Scale: 1:25,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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4.1.8 Post settlement land use and history

Ethnohistory

The Project Area falls within in an area identified by Tindale (1974) as being within the boundaries of the Wiradjuri linguistic group. The Wiradjuri linguistic group covers a large portion of the central west. It was closely related to the Ngiyampaa language to the west and Gamilaraay to the north. Linguists refer to the three languages as the Wiradjuri group. A distinctive feature of the group was that they began with the term for "no" ("wira") and concluded with the term for "having" ("djuri"). The Wiradjuri language was the predominate language spoken in the areas around Dubbo and Mudgee in the north, close to Albury in the south, from Bathurst in the east and as far west as Hay. It is not known if Wiradjuri was always the superordinate language name in the area or whether it had come to be used predominantly during the early period of European settlement. Tindale (1974) suggests that the Jeithi dialect of the south-west Wiradjuri may have been displaced to the area during this time. The language is no longer fluently spoken.

Owing to the disturbance of Aboriginal culture by the arrival and colonisation of Australia by Europeans in the 18th and 19th centuries, the actual boundaries of these groups are difficult to identify with great confidence. Martin (2006) studied ethnographic sources from early European observers in an attempt to define these boundaries.

The spiritual beliefs of the Wiradjuri were organised around sacred sites associated with mythical *jin*, which could be associated with a particular animal or plant. A persons *jin* was inherited from their mother, along with the responsibly of maintain the sacred sites associated within it. Individuals learn the stories and songs associated with their *jin* and were not allowed to eat or damage them. There are also other stories connected to specific *jins* movements in the landscape as well as other mythological figures included Biami, his emu wife Goobeorangalnaba and the giant serpent Kurrea (NTSCORP 2012).

An analysis of the early ethnographic literature for the Orange district suggests that day to day, small groups of approximately 20-40 closely related people occupied local creeks and river valleys. They would move around in these small groups, using the river flats, open land and waterways with some regularity through the seasons, as indicated by the archaeological material that has accumulated in these areas. Traditionally, Wiradjuri people travelled to the alpine regions of the South Eastern Highlands and Australian Alps for the annual summer feast of bogong moths (Flood 1980).

The first explorers to enter the region also documented the Wiradjuri people. John Oxley expedition left Bathurst on 20 April 1817 and headed west, following the major waterways. Oxley described the environmental conditions as

> *'... the flats covered with acacia pendula; the last three miles were rather more elevated: the soil in general a lose, red, sandy loam, with small cypress, box, and acacia trees; a few acres in patches had been burned, occasionally relieving to the eye from the otherwise barren scrubby appearance of the country. We passed through two or three small eucalyptus scrubs, and upon getting out of one, having gone thirteen miles and a quarter, we fortunately happened to fall in a native well, containing a few gallons of water sufficient for our own supply; whilst the open level land which the scrub led to having been burnt, we hoped would afford succulent herbage sufficient for the horses, and prevent them from suffering from want of water...'* (Oxley 1817).

Oxley's party encountered Aboriginal people in the Trundle area, north-west of Orange:

> *'... the country became more open; the grass had been burnt, and marks of the mogo or stone hatchet on the trees, made by the wandering natives of these deserts in search of food, gave us renewed hopes of soon coming to water.' '...several transitory encampments of the natives were found, but none that had been inhabited within*

these four or six months; by all of them found abundance of the pearl muscle-shell so common on the Lachlan." (Oxley 1917)

Sir Thomas Mitchell was another explorer who followed Oxley's path into the central west in the 1835. In Goobang Valley Mitchell encountered a number of local Aboriginal people, which was descried as follows;

'...at length the sound of natives' hatches was heard, and one came forward to meet me. We learned from him we were on BURANBILL Creek, and that its course was SW towards Clare, or Lachlan River...' (Mitchell 1935).

Mitchel also encountered a chief, possibly in ceremonial dressing, and described his dress in his diary as;

' ...emu feathers being mixed with the wild locks of his hair... One large feather decked the brow of the chief, which with his nose, was tinged with yellow ochre... to this personage the others paid the greatest deference and it is worthy to remark that they always refused to tell his names, or that of several others...' (Mitchell 1935).

Mitchell also described in his diary the diet and fishing practices of the Aboriginal people:

'... the principle food of these various tribes consisted of opossum, kangaroo and emu. Fishing was left entirely to the 'gins', was effectually, yet simply preformed by a moveable dame of long twisted dry grass, through which water only could pass... The 'gins' further used to gather fresh water muscles by lifting the shell out of the mud with their toes...' (Mitchell 1935).

A distinctive feature of Wiradjuri country was clusters of carved trees, which marked burials and initiation sites. The trees were decorated with geometric and figurative designs. One example is at Yuranigh's grave (Yuranigh's was a guide for Sir Thomas Mitchell) on Gamboola Station near Molong, which was marked by five carved trees (NTSCORP 2012) (see Plate 1).

Plate 1 Example of carved tree (SLNSW: SPF/1150)

Distinctive ceremonies were conducted for the burial of important individuals. William Govett, surveyor, observed an Aboriginal funeral near Goulburn in 1836. He wrote:

> *' ...I was struck with the peculiarity of the noise... I soon perceived before me three native black women, and rode up to them. They were sitting around a mound of earth, with their heads depressed and nearly touching one another... They were each of them striking their heads with a tomahawk, holding the instrument in the right hand, and wounding particularly the upper part of the back of the head... They weep this way, wailing and cutting their heads, until they become perfectly exhausted, and can shed tears no longer... The trees all round the tomb were marked in various peculiar ways, some with zigzags and stripes, and pieces of bark otherwise cut...'* (Briggs and Jackson 2011: 8.)

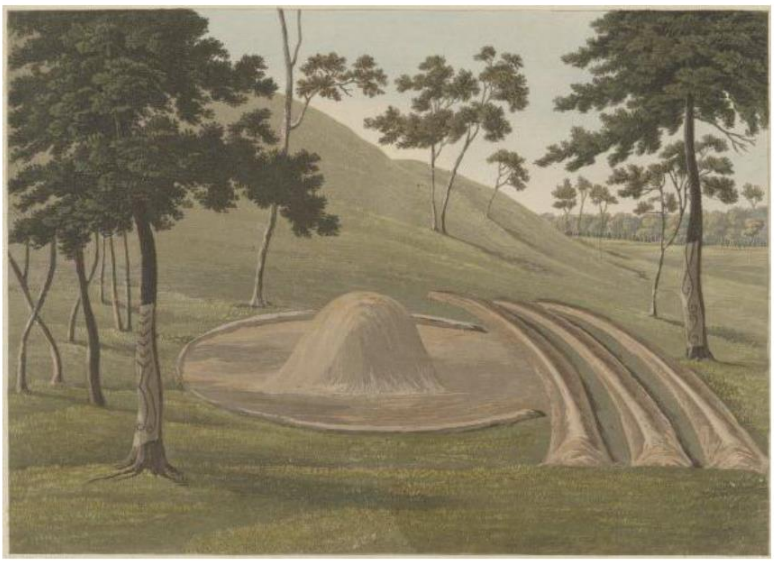

Plate 2 Example of mound burial (National Library of Australia: nla.pic-an8955101)

The initial relations between Aboriginal and European settlers were initially peaceful until paternalism expanded and damaged the local environment. From 1822, the Wiradjuri, led by a man named Windradyne, attacked a number of pastoral stations in an attempt to gain control of the area. Martial law was subsequently declared by Governor Brisbane in May of 1823 (Read 1988: 8-11). Following the period of martial law the earliest distribution of blankets to Aboriginal people in Bathurst is recorded in 1826. In all, 40 Aboriginal people were given blankets, 28 from "Binjung" and 12 from "Boohgan" (Aborigines, Returns of Aborigines, 1833-36, SRANSW 4/6666B.3.).

The Aboriginal population of Orange was also devastated by a smallpox outbrak in 1830 and 1831. The Wiradjuri in the district blamed the disease on Caption Sturt who has recently passed through the Wellington Valley. The impact of smallpox, which the Wellington and Lachlan River Wiradjuri called the "Thunna Thunna", was devastating and it has was estimated by doctors at that to have killed between one in three and one in six of all Aboriginal people in the areas to which it spread.

Traditional Aboriginal life in the bioregion is considered to have ended by 1850 (HO and DUAP 1996). The *Sydney Morning Herald* reported in 1856 that the Aboriginal people in the south of the bioregion were extinct but the census indicated 166 Aborigines (likely to have been Ngarigo) around Cooma and 319 near Bombala (most probably Bidawal) (Pearson 1984: 63-68; Grant and Rudder 2005; Howitt 1904: 108. Mathews 1895, 1897 & 1898; NTSCORP, 2012).

Post settlement history

The European settlement of the Central West reflects the broader movement of people throughout NSW. In 1813 Surveyor George Evans crossed the Blue Mountains and entered the Central Tablelands, which begun an era of official exploration. Two years later, Governor Macquarie proclaimed a Government Stock Established, staffed by soldiers and convicts, at the present site of Bathurst (Griffin 2004).

A number of commercial industries contributed in the increase in settlement in the region. The identification and mining of earth materials has been an important industry within the Central West since the 1840s. Settlers were attracted to the area by mining during both the nineteenth and early twentieth centuries. Within Australia the mineral Copper was first mined in NSW and in 1845 a number of copper mines were in operation in the Central West. Copper was discovered in Carcoar in the 1840s and in 1851 gold was discovered in Bathurst.

Gold was discovered in 1851 in Orange at the junction of Lewis Ponds and Summer Hill Creek. By the end of the month there were several hundred people panning for gold at Ophir along Summer Hill Creek. This was the beginning of a gold rush. This had the effect of tripling the population of Orange in a matter of months.

Agriculture was also a large industry that increased settlement in the region, with farmers from east NSW, Victoria and South Australia moving into the area. This industry also brought in a seasonal migration with works associated with the yearly harvest, planting or searing. There are the number of heritage listed farming homesteads and planting throughout the region.

The earliest public enterprise in the Central West was the building of a road over the Blue Mountains, to assist in the movement of settlers. In many areas of NSW the settlement of an area predates the building of major roadways. However, for the Central West the settlement could only occur once this infrastructure was built. The railway line reached Bathurst on the 4 April 1876. The construction of the railway altered settlement patterns.

A review of the contextual history in conjunction with the Thematic History of the Central West has identified a number of historical themes which relates to the occupational history of the Project Area. This is summarised in Table 7.

Table 7 Identified historical themes for the Project Area (Kass 2003)

Australian Theme	New South Wales Theme
Peopling Australia	- Migration - Convict
Developing local, regional and national economies	- Agriculture - Commerce - Environment - Exploration - Forestry - Health - Mining - Transport
Educating	- Education
Governing	- Defence - Government and Administration - Law and order
Developing Australia's Cultural Life	- Domestic life - Leisure - Religion - Sport
Marking the phases of life	- Birth and Death

5. Predictive model

A model has been formulated to predict the type and character of Aboriginal cultural heritage sites likely to exist(ed) throughout the Project Area and where they are more likely to be located.

This model is based on the regional and local distribution of sites as recorded in the AHIMS register and regional and local studies focused on site distribution. The key factors required to build the predictive model include:

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

Based on this information, a predictive model has been developed, indicating the site types most likely to be encountered during the survey and subsequent sub-surface investigations across the present Project Area (Table 11).

The concept of site prediction is certainly not new; the more it is possible to explain what processes took place to create a site, the more this knowledge can be used to say where other sites are likely to occur. Witter argues that 'sites are near water' approach is not prediction in a scientific sense but should be referred to as forecasting (Witter 1992: 279). A predictive model generalises the distribution of Aboriginal heritage sites by looking at the environmental elements, vegetation, physiographic features and soils. There factors influence the human interaction with the environment. It is also important to assess biasing factors (Witter 1992:258).

5.1 Wider region

In 2012 NTSCORP undertook a review of the registered AHIMS Aboriginal sites within the wider Orange area (see Chart 1). The review determined that Open camp sites, consisting of stone artefacts and hearths, were the most common site type found in the area. These site types are most commonly located in close proximity to reliable water sources and were found along ridges and slopes overlooking the creek, but not on the flat. These sites were believed not to have been located on the flats due to the poor drainage and cold temperatures in the low lying region. The second most common site types in the area were carved or scarred trees. As mentioned above, a distinctive feature of the Wiradjuri country was clusters of carved trees which marked burials of important people and initiations sites. The trees were richly decorated with geometric and figurative designs.

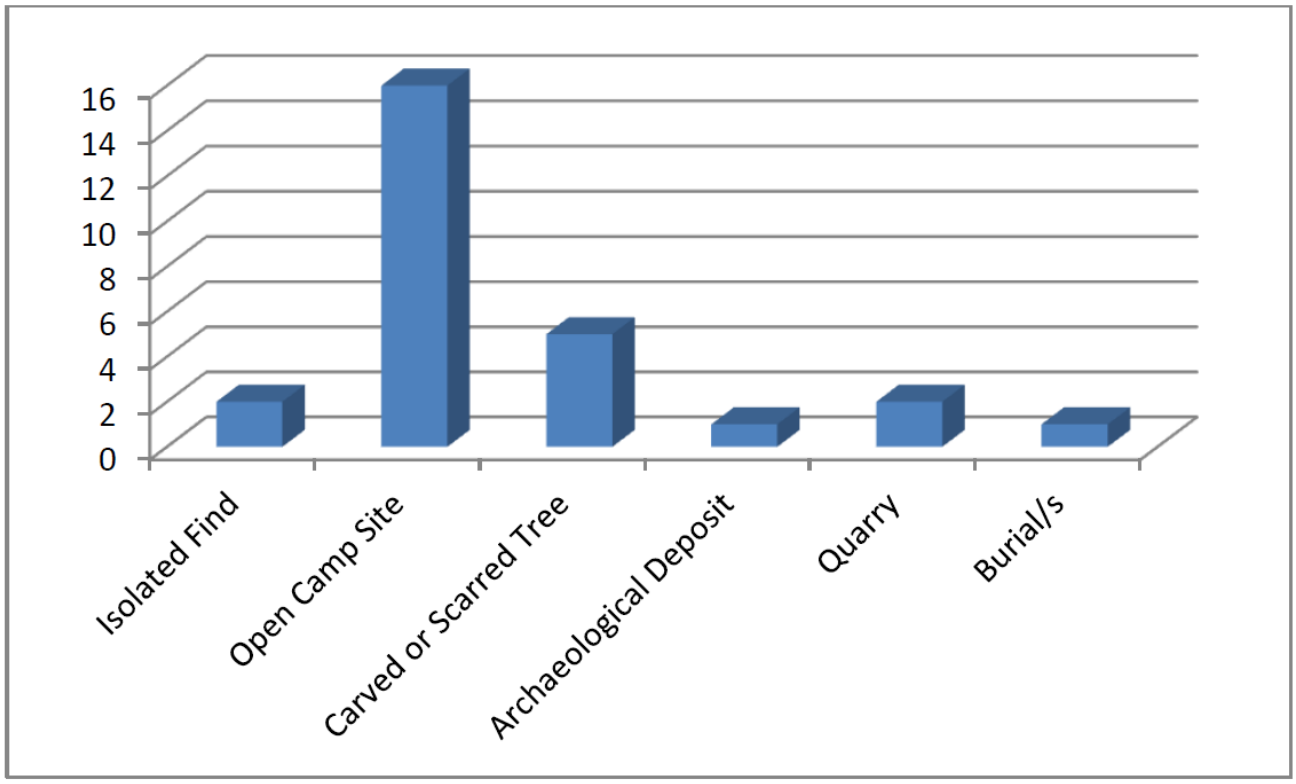

Chart 1 AHIMS site types in the wider Orange region (NTSCORP, 2012)

5.2 Local region

5.2.1 Analysis of Aboriginal occupation

AHIMS

A total of 6 previously recorded AHIMS sites are located in close proximity to the Project Area.

Table 8 Summary of the AHIMS site types recorded within the local area

Site types	Number of sites	Percentage (%)
Artefact scatters	4	67
PAD	2	33.3
Modified tree	1	17
Total	6	100

5.2.2 Local soils

There are a number of different soil landscapes within the local area. Three of these have previously recorded AHIMS sites. The highest number of sites has been recorded within the Mookerwa soil landscape, which is associated with low rolling hills, with some steep rocky slopes. Both artefact scatters and a PAD have been recorded in this landscape. The North Orange soil landscape, which is within the Project Area, contains the second highest number of sites, a modified tree and an artefact scatter. This landscape is also associated with low rolling hills. The third landscape to record sites was the Macquarie landscape, which is associated with alluvial plains and terraces. This landscape is surrounding the Summer Hill Creek and the site is recorded as a PAD (see Chart 2).

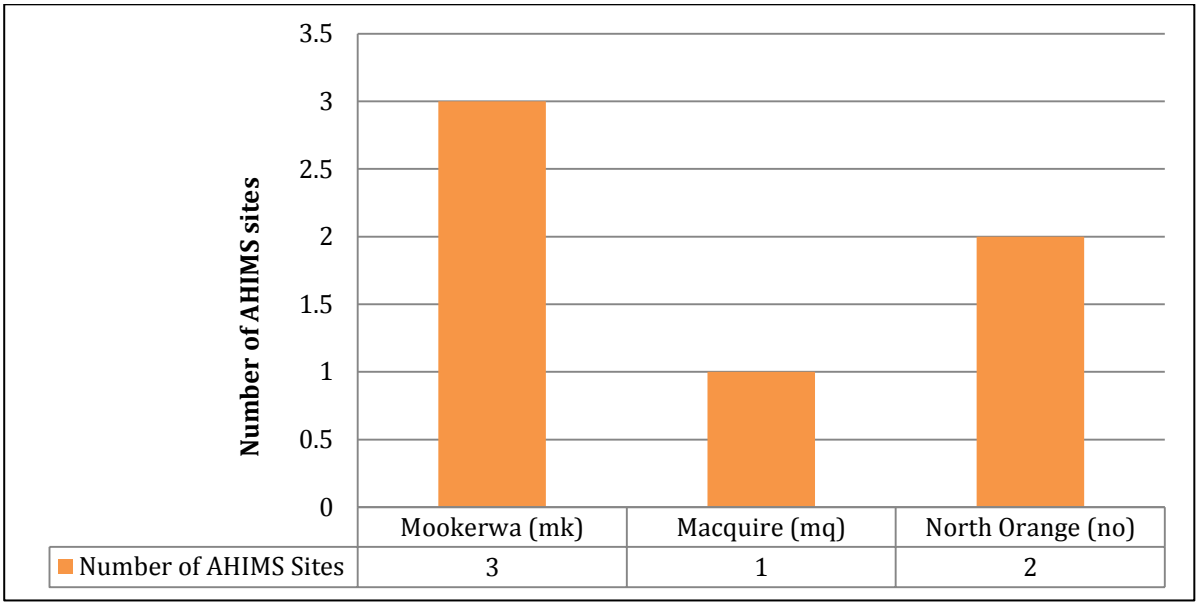

Chart 2 Figure displaying the number of recorded AHIMS sites within the soil landscape in the local region.

5.2.3 Local geology

There are two main geological formations within the local area, which are the Mullions Range Volcanics (Smu) and Oakdale formation (Oco). The Project Area is located within the Oco formation. The Smu formation is characterised by Rhyolite, tuffaceous mudstone, rhyolite breccia, volcanic conglomerate, dacite and limestone. The Oco formation is characterised by Mafic volcanic sandstone, basalt, siltstone, black shale, chert, breccia and conglomerate.

There have been an equal number of previously recorded sites in these two geological formations. The main site types recorded within the Smu formation have been artefact scatters and PAD, and within the Oco artefact scatters, PADs and modified trees (Chart 2).

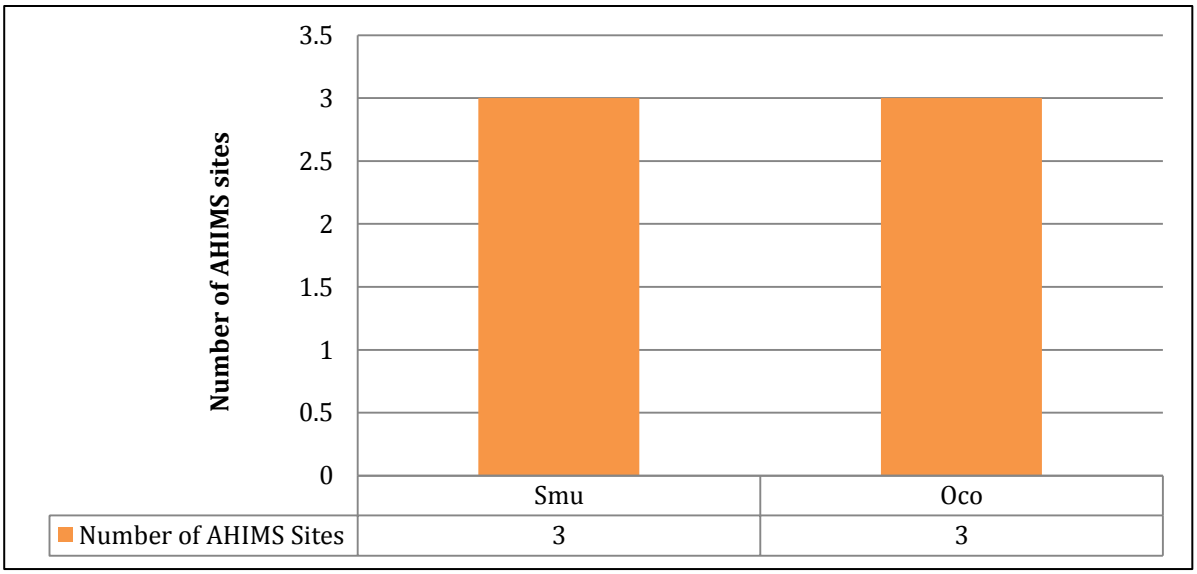

Chart 3 Figure displaying the number of recorded AHIMS sites located within the geological formation in the local region.

5.2.4 Local hydrology

Distance to water

Within the local area the average distance that sites are recorded from permanent water sources is approximately 1 kilometre to 1.5 kilometres. The average to ephemeral water source is approximately 400 metres to 500 metres. From this data it is evident that PADs have been previously recorded in areas close to both permanent and ephemeral water sources. Most site types are generally closer to ephemeral waters sources, except modified trees. This data could be affected by the possible underrepresentation of certain site types in the local area (see Table 9).

Table 9: Summary of the site types and their associated distances to water

Site type	Permanent water source (m)			Ephemeral water source (m)		
	Max	Min	Average	Max	Min	Average
Artefact Scatter (4)	1719	447	1056	1000	242	595
PAD (2)	714	250	1607	664	242	453
Modified Tree (1)		180			756	

5.3 Aboriginal site prediction statements

The definition of the grading of potential is described in Table 10 followed by an assessment using this grading system based upon the above analysis of regional and local site distribution and density. From this assessment a prediction of site types which may occur in the Project Area can be made. The results of the predictive model are presented in Table 11.

Table 10 Definitions of the predictive model

Potential rating	Description
High	Those aboriginal sites types give this rating have been recorded in both the regional and local landscape. However, there numbers are not as numerous. This being said the landscape conditions within the focus area will be aligned with those generally associated with this site type. Although it may be unlikely to locate this site type, due to their overall moderated numbers, this location would be where you would ultimately find them.
Medium	Sites are known to occur in the regional and local landscape but not in high numbers. The landscape conditions are not precisely aligned however the site may infrequently occur in certain conditions.
Low	The site types given this rating have been recorded regionally, but not locally and not in substantial numbers. The site is generally considered unlikely to occur within the landform conditions present.

Table 11 Aboriginal site prediction statements

Site type	Site description	Potential
Stone artefact scatters and isolated artefacts	Artefact scatter sites can range from high-density concentrations of flaked stone and ground stone artefacts to sparse, low-density 'background' scatters and isolated finds.	High: This site type is the most common site (67 %) recorded within the local area and the wider area. This site type has been recorded within both the Mookerwa and North Orange soil landscapes associated with low rolling hills. The North Orange soil landscape is located within the Project Area. On average this site type will be recorded approximately 1 kilometre from a permanent water source and 595 metres from an ephemeral water source. This site type has a high percentage of being recorded in association with one other site types.
Potential Archaeological Deposits (PADs)	Potential sub surface deposits of cultural material.	High: This site type is also the second most common site (33.3 %) recorded within the local area. This site type has been recorded within both the Mookerwa and Macquarie Landscapes, which are associated with low rolling hills and the alluvial plains and terrace of Summer Hill Creek. On average this site type will be recorded approximately 1.6 kilometres from a permanent water source and 453 metres from an ephemeral water source.
Modified trees	Trees with cultural modifications.	Medium: Modified trees have been recorded in wider area, although only one has been noted in the local area. This modified tree is located within the North Orange soil landscape, which is also located within the Project Area. It was also recorded closer to a permanent water source, compared to an ephemeral.

Site type	Site description	Potential
Stone quarries	Raw stone material procurement sites.	Medium: The geology within the Project Area could produce an outcrop, which could have been quarried.
Aboriginal resource and gathering locations	Areas of high natural resource density which Aboriginal people may have collected resource. Areas may contain medicinal plants etc.	Medium: The Project Area contains many natural resources used by Aboriginal people so it is possible that Aboriginal people may consider areas within the Project Area as resource and gathering locations.
Burials	Aboriginal burial sites.	Low: Aboriginal burial sites are generally situated within deep, soft sediments, caves or hollow trees. Areas of deep sandy deposits will have the potential for Aboriginal burials. The soil profiles associated with the Project Area are not commonly associated with burials.
Axe grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	Low: The geology of the Project Area lacks suitable horizontal rock outcrops for axe-grinding grooves. Therefore there is low potential for axe grinding grooves to occur in the Project Area.
Shell middens	Deposits of shells accumulated over either singular large resource gathering events or over longer periods of time.	Low: This site type is not often recorded within the local area.
Rock shelters with art and / or deposit	Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground characterised by cliff lines and escarpments. These naturally formed features may contain rock art, stone artefacts or midden deposits and may also be associated with grinding grooves.	Low: The sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space exist, which are not present in the Project Area.
Earth mounds	Earth mounds are large mounds (or scatters if deflated) of material associated with cooking. They may contain heat retainers, shell, bone, artefacts and human remains.	Low: This site type is not often recorded within the local area.
Aboriginal ceremony and dreaming sites	Such sites are often intangible places and features and are identified through oral histories, ethnohistoric data, or Aboriginal informants.	Low: There are currently no recorded mythological stories for the Project Area.

Site type	Site description	Potential
Post - contact sites	These are sites relating to the shared history of Aboriginal and non-Aboriginal people of an area and may include places such as missions, massacre sites, post-contact camp sites and buildings associated with post-contact Aboriginal use.	Low: There are no post-contact sites previously recorded in the Project Area and historical sources do not identify any.
Aboriginal places	Aboriginal places may not contain any "archaeological" indicators of a site, but are nonetheless important to Aboriginal people. They may be places of cultural, spiritual or historic significance. Often they are places tied to community history and may include natural features (such as swimming and fishing holes), places where Aboriginal political events commenced or particular buildings.	Low: There are currently no recorded Aboriginal historical associations for the Project Area.

6. Field survey

A field survey of the Project Area was undertaken from 5 January to 8 January, 2015. The field survey sampling strategy, methodology and a discussion of results are provided below.

6.1 Archaeological survey aims

The principle aims of the survey were:

- To undertake a systematic survey of the Project Area targeting areas with the potential for Aboriginal heritage.
- Identify and record Aboriginal archaeological sites visible on the ground surface.
- Identify and record areas of potential archaeological deposits (PADs).

6.2 Archaeological survey methodology

The survey methods were intended to assess and understand the landforms and to determine whether any archaeological material from Aboriginal occupation or land use exists within the Project Area. These are detailed below.

6.2.1 Sampling strategy

The archaeological survey was conducted on foot with a field team of two members. Recording during the survey followed the archaeological survey requirements of the Code (DECCW 2010) and industry best practice methodology.

The 290 hectare Project Area was targeted during the survey. All landforms present within the Project Area, including ridgelines and their associated slopes, were targeted, including each occurrence of a specific landform type that will potentially be impacted. Those areas with a higher potential for Aboriginal heritage, including areas around permanent and ephemeral water sources, were also targeted. This included areas along the unnamed main creek line in the centre of the Project Area

Recording during the survey followed the archaeological survey requirements of the Code and industry best practice methodology. Information that was recorded during the survey includes:

- Aboriginal objects or sites present within the Project Area during the survey.
- Landform elements, distinguishable areas of land approximately 40 metres across or with 20 metre radius (Speight 1998).
- Ground surface visibility (GSV) and areas of exposure.
- Survey coverage.
- Any resources that may have potentially have been exploited by Aboriginal people.
- Photographs of the site indicating landform.
- Observable past and present disturbances to the landscape from human or animal activities.
- Aboriginal artefacts, culturally modified trees or any other Aboriginal sites.

Where possible, identification of natural soil deposits within the Project Area was undertaken. Photography and recording techniques were incorporated into the survey including representative photographs of the survey unit, landform, vegetation cover, ground surface visibility, disturbances and the recording of soil information where possible. Any potential Aboriginal objects observed during the survey were documented and photographed. Survey transects, the location of Aboriginal cultural heritage and relevant points of interest were recorded using a hand-held Global Positioning System (GPS) and the Map Grid of Australia (94) coordinate system.

6.3 Constraints to the survey

With any archaeological survey there are several factors that influence the effectiveness (the likelihood of finding sites) of the survey. The factor that contributed most to the effectiveness of the survey within the Project Area was the poor ground surface visibility.

6.4 Visibility

In most archaeological reports and guidelines visibility refers to GSV, and is usually a percentage estimate of the ground surface that is visible and allowing for the detection of (usually stone) artefacts that may be present on the ground surface (NSW NPWS 1997).

Within the disturbed areas associated with the fence lines, dams and the eroding creek bank there was a good level of visibility, approximately 50 percent. The majority of the Project Area, however, had a lower level of visibility, approximately ten percent, due to the low-lying vegetation (Plate 3).

Overall the GSV within the Project Area was considered poor.

6.5 Exposure

Exposure refers to the geomorphic conditions of the local landform being surveyed, and attempts to describe the relationship between those conditions and the likelihood the prevailing conditions provide for the exposure of (buried) archaeological materials. Exposure is different to visibility in that it is in part a summation of geomorphic processes, rather than a simple observation of the ground surface (Burke and Smith 2004: 79, NSW NPWS 1997).

Overall, the Project Area displayed areas of exposure that were investigated. The exposure areas were associated with fence lines and gate, modern dams, drainage lines and the main creek line. Often these exposures were the result of water erosion or where livestock has congregated (Plate 4, Plate 5 and Plate 6).

6.6 Disturbance

Disturbance in the Project Area is associated with natural and human agents. Natural agents generally affect small areas and include the burrowing and scratching in soil by animals, such as wombats, foxes, rabbits and wallabies. The Project Area is currently being used to hold live stock, and as mentioned above, there is substantial disturbance to the soils. Disturbances associated with recent human activities are also prevalent in the Project Area. The area has been subject to activities related to farming practices including vegetation clearance, large scale earth works associated with the creation of the dams, and the construction of the current fencing and stock grazing. The alteration of the natural water flow within the Project Area has resulted in large areas of erosion, particularly in relation to the main creek lines banks. There are also areas

throughout the Project Area where modern rubbish has also been dumped or buried and Environment Protection Authority monitoring stations have been dug (see Plate 7)

Plate 3 Example of poor visibility throughout the Project Area (scale = 2 metres)

Plate 4 Example of exposed area near a fence line and gate (scale = 2 metres)

Plate 5 Example of exposed area near a dam (scale = 2 metres)

Plate 6 Example of exposed area within a drainage line (scale = 2 metres)

Plate 7 Example of disturbance within the Project Area (scale = 2 metres)

7. Survey results

7.1 Archaeological survey results

Archaeological survey was conducted from 5 January to 8 January 2015 with one team of two Biosis archaeologists. A total of 24 transects were undertaken throughout the different landforms with the pedestrian transects being undertaken approximately two metres apart (see Figure 8 and Figure 7).

This follows the methodology set out in Burke and Smith (2004: 65) which states that a single person can only effectively visually survey an area of two linear metres. 20 Aboriginal sites were identified in the Project Area. The results from the field surveys have been summarised in Table 12.

Table 12 Sites located and recorded during the survey

Site no.	Site name	Site description
1	OA01	Isolated Artefact
2	OA02	Isolated Artefact
3	OA03	Artefact Scatter; Potential archaeological deposit
4	OA04	Artefact Scatter; Potential archaeological deposit
5	OA05	Artefact Scatter; Potential archaeological deposit
6	OA06	Artefact Scatter; Potential archaeological deposit
7	OA07	Isolated Artefact
8	OA08	Scar tree
9	OA09	Isolated Artefact
10	OA10	Isolated Artefact
11	OA11	Artefact Scatter; Potential archaeological deposit
12	OA12	Artefact Scatter; Potential archaeological deposit
13	OA13	Isolated Artefact; Potential archaeological deposit
14	OA14	Quarry
15	PAD 01	Potential archaeological deposit
16	PAD 02	Potential archaeological deposit
17	PAD 03	Potential archaeological deposit
18	PAD 04	Potential archaeological deposit
19	PAD 05	Potential archaeological deposit
20	PAD 06	Potential archaeological deposit

Table 13 Survey coverage

Survey unit	Landform	Survey unit area (m²)	Visibility %	Exposure %	Effective coverage area (m²)	Effective coverage %
1	Slope	1086	4	10	4.344	0.4
2	Slope (690) and ridge (656)	1346	4	10	5.384	0.4
3	Slope (652) and open depression (138)	790	5	20	7.9	1
4	Slope (254) and open depression (166)	420	50	40	84	20
5	Slope (344) and sloping drainage plain (414)	758	5	5	1.895	0.25
6	Ridge	942	5	10	4.71	0.5
7	Slope (350), ridge (124) and sloping drainage plain (172)	646	5	30	9.69	1.5
8	Slope	196	10	20	3.92	2
9	Slope	342	5	5	0.855	0.25
10	Slope	922	5	5	2.305	0.25
11	Slope	420	5	5	1.05	0.25
12	Slope (174) and ridge (646)	820	5	5	2.05	0.25
13	Slope	1148	5	5	2.87	0.25
14	Slope	830	5	5	2.075	0.25
15	Ridge	360	5	5	0.9	0.25
16	Slope (880) and open depression (144)	1024	10	20	20.48	2
17	Slope	2000	5	5	5	0.25
18	Slope (4100) and ridge (600)	4700	50	40	940	20
19	Ridge (62) and open depression (960)	1022	10	20	20.44	2
20	Slope	1956	5	10	9.78	0.5
21	Slope	3962	5	10	19.81	0.5
22	Slope (2164) and ridge (796)	2960	5	10	1.48	0.05
23	Slope (2438) and ridge (166)	2604	5	10	13.02	0.5
24	Slope	1296	5	10	6.48	0.5

Table 14 Landform summary

Landform	Landform area (m²)	Area effectively surveyed (m²)	% of landform effectively surveyed	Number of Aboriginal sites	Number of artefacts or features
Ridges	274,077	29.16	0.01	2	6
Slopes	2035000	105	0.005	14	73 +
Sloping drainage plain	187,930	3.25	0.0017	0	0
Open depressions (creek lines and associated drainage lines)	402,824	25	0.006	3	7

Plate 8 Example of a Ridge landform (scale = 2 metres)

Plate 9 Slopes and sloping drainage area

Plate 10 Open depressions (scale = 2 metres)

Legend

- Project Area
- Cadastre
- Survey Tracks

Disturbance

- High
- Medium

Landforms

- Drainage Line
- Highly Modified Drainage Line
- Ridge
- Slope
- Sloping Flat Draingae Area

Figure 7: The survey effort

0 90 180 270 360 450

Metres
Scale: 1:9,000 @ A3
Coordinate System: GDA 1994 MGA Zone 55

N

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Biosis Pty Ltd

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

Matter: 21507,
Date: 19 January 2016,
Checked by: SAS, Drawn by: ANP, Last edited by: apritchard
Location:P:\21500s\21507\Mapping\21507_ACH_F7_SurveyEffort.mxd

Legend

- Project Area
- 2m contour
- Cadastre
- Aboriginal Archaeological Site
- PAD

Figure 8: Overview of the survey results within the Project Area

0 90 180 270 360 450

Metres

Scale: 1:9,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

N

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Matter: 21507,
Date: 19 January 2016,
Checked by: SAS, Drawn by: ANP, Last edited by: apritchard
Location:P:\21500s\21507\Mapping\21507_ACH_F8_NewSites.mxd

7.2 Site descriptions

7.2.1 OA01

Site location

Site OA01 is located 207 metres north-east of Clergate Road, within the southern portion of the Project Area. The site is also located in close association with site OA11, which is 508 metres to the north-east (see Table 15 and Figure 1).

Table 15 Grid reference site OA01

Easting	Northing
696528	6320890
696542	6320893
696546	6320878
696531	6320875

Site environment

The site is located on an upper slope above the main drainage line, 128 metres to the east. Site OA01 is also located approximately 2.7 kilometres from Summer Hill Creek.

There is some disturbance within the area, with a vehicle track and fence line dissecting the site. The site has been subjected to considerable livestock disturbance, which has significantly deflated the natural land surface.

Site description

The site consists of a single isolated artefact, a complete quartz flake (see Plate 11). A buffer of approximately 1 metre (north - south) by 1 metre (east - west) was given, creating an area of 1 square metre. The artefact was probably relocated to its current position by taphonomic processes.

Plate 11 View north of site OA01 (scale = 2 metres)

7.2.2 OA02

Site location

Site OA02 is located approximately 1 kilometres east of the Clergate Road, within the north-western portion of the Project Area. The site is also located in close association with site OA03, which is approximately 650 meters to the east (see Table 16 and Figure 1).

Table 16 Grid reference site OA02

Easting	Northing
696414	6322282
696484	6322279
696483	6322241
696414	6322247

Site environment

The site is located on the upper slopes of a ridgeline overlooking the large flat draining area in the northern of the Project Area. Site OA02 is located in close proximity to a number of permanent and temporary water sources within the landscape. Approximately 3.5 kilometres south east of the site is the main drainage channel and approximately 3 kilometres north-west of Summer Hill Creek (see Figure 6).

There is also evidence of recent disturbances with evidence of modern rubbish in the area indicating that this are could have been the location of previous dwelling. There has also been recent foresting activity in close proximity to the site.

Site description

The site consists of a single isolated artefact, a quartz single platform core (see Plate 12). A buffer of approximately 1 metre (north - south) by 1 metre (east - west) was given, creating an area of 1 square metre.

Plate 12 View north west of site OA02 (scale = 2 metres)

7.2.3 OA03

Site location

Site OA03 is located approximately 770 metres north-east of Clergate Road, within the northern portion of the Project Area. Site OA03 is located approximately 635 metres to the west and site OA13 is located 317 metres to the south-west (see Table 17 and Figure 1).

Table 17 Grid reference site OA03

Easting	Northing
697099	6322253
697197	6322296
697213	6322218
697138	6322166

Site environment

The site is situated along the top and upper slopes of a ridgeline, which stretches in a south-west to north-east direction. This ridgeline overlooks a small drainage line.

Site OA03 is also located in close proximity to a number of other permanent and temporary water sources. 803 metres south-east of the site is the main creek line and approximately 2.1 kilometres south-east is the Summer Hill Creek (see Figure 6).

There is some disturbance within the northern portion of the site, with a modern vehicle track and fence line dissecting the site. There has been no direct impact to the site.

Site description

The site consists of an artefact scatter and PAD, measuring 126 metres (north - south) by115 metres (east - west), with an area of 10, 994 square metres.

A total of 6 artefacts were recorded within the boundaries of the site. The surface artefact scatter recorded consisted of a complete flake (n = 1, 17 %), distal flake fragments (n = 2, 33.3 %), a medial flake fragment (n = 1, 17 %) and single plaform cores (n = 2, 33.3 %). The only lithology recorded was quartz (n = 6, 100 %).

The main area of artefact concentration is located along the ridgeline, although some artefacts were noted along the upper slopes. The site has also been classified as a potential archaeological deposit due to the ridgelines location over looking a drainage line and its soil makeup.

Plate 13 View south-west of site OA03 (scale = 2 metres)

7.2.4 OA04

Site location

Site OA04 is located 930 kilometres east of Clergate Road, within the central portion of the Project Area. The site is also located in close association with site OA14, which is 63 metres to the north, site OA05 74 metres to the south-east and AHIMS site 44-2-0202 approximately 1.2 kilometres to the east (see Table 18 and Figure 1).

Table 18 Grind reference site OA04

Easting	Northing
697028	6321577
697057	6321624
697156	6321512
697139	6321499

Site environment

The site is located on the banks of the eroded drainage line, which feeds into the main creek line within the Project Area. This site is located along the same drainage lines as a number of other sites within the landscape. This site is also located approximately 2.1 kilometres from Summer Hill Creek (see Figure 6).

There is some disturbance in the surrounding area, with a modern vehicle track dissecting the site and a modern dam having been constructed. There is also evidence of water erosion, which is probably due to the construction of the dam altering the natural course of the water. Although there is disturbance, there has been no direct impact to the cultural material.

Site description

The site consists of an artefacts scatter and PAD, measuring 218 metres (north - south) by 130 metres (east - west), with an area of 5,325 square metres (see Plate 14).

A total of 3 artefacts were recorded within the boundaries of the site. The surface artefact scatter recorded consisted of a single platform core (n = 1, 33.3 %) and grinding stones (n = 2, 67 %). The only lithology recorded was quartzite (n = 3, 100 %) (see Plate 15). Artefacts were noted eroding out of a subsurface deposit on the southern side of the drainage line, indicating a potential archaeological deposit.

Plate 14 View south-east of site OA04 (scale = 2 metres)

Plate 15 View of an artefact within site OA04 (scale = 9 centimetres)

7.2.5 OA05

Site location

Site OA05 is located approximately 1.1 kilometres east of Clergate Road, within the central portion of the Project Area. The site is also located in close association with site OA06 and OA12, which are approximately 10 metres to the north and east respectively. AHIMS site 44-2-020 is also located approximately 1.1 kilometres to the east (see Table 19 and Figure 1)

Table 19 Grid reference site OA05

Easting	Northing
697171	6321459
697259	6321405
697357	6321354
697459	6321328
697552	6321339
697556	6321326
697454	6321294
697324	6321310
697226	6321305
697226	6321278
697207	6321269
697160	6321303
697196	6321352

Site environment

The site is located on a spur created from the conjunction of the large drainage line and the main creek line. The northern boundary of the site is the drainage line and the southern boundary in the main creek line. The site is also located approximately 1.7 kilometres west of Summer Hill Creek.

There is some disturbance within the area. Within the creek bed there is a dumped vehicle and other modern items. There is also evidence of some natural erosion occurring, which has probably been caused by altering the natural water flow by the institution of dams. Although there is disturbance, there has been no direct impact to the cultural material.

Site description

The site consists of an artefact scatter and PAD, measuring approximately 180 metres (north - south) by 392 metres (east - west), with an area of 23,665 square metres (see Plate 16).

A total of 15 artefacts were recorded within the boundaries of the site. A quartz knapping event was noted eroding out of the creek. Within this assemblage more than 10 artefacts were noted including complete flakes, medial flake fragments and a multiple platform core (see Plate 17).

The artefacts within the surface artefact scatter which were recorded consisted of a multiple platform core (n = 9, 60 %) and a distal flake fragment (n = 4, 27 %). The lithologies noted included quartz and mud stone.

The main area of artefact concentration is located within the eroding creek bank. It was observed that the artefacts are eroding out of this creek bank, indicating a subsurface deposit (see Plate 18).

Plate 16 View east of site OA05 including rubbish (scale = 2 metres)

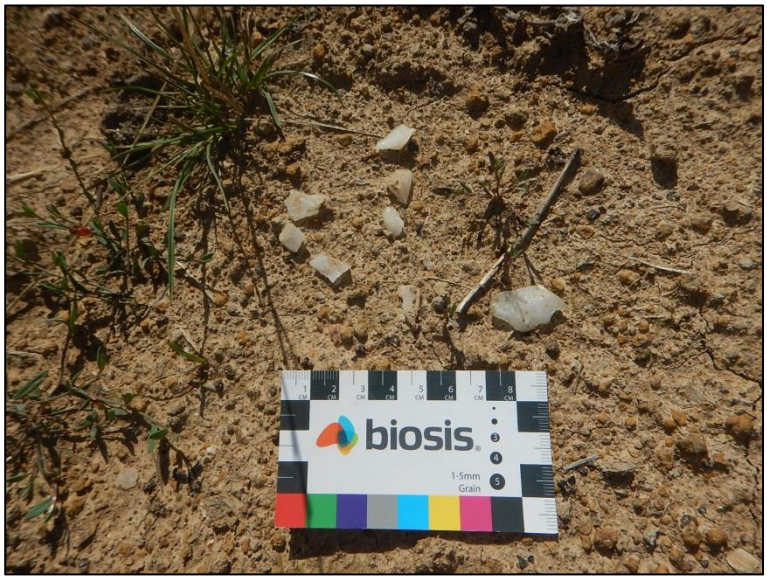


Plate 17 View of quartz knapping event within site OA05 (scale = 9 centimetres)

Plate 18 View of subsurface deposit within site OA05 (scale = 9 centimetres)

7.2.6 OA06

Site location

Site OA06 is located 1.3 kilometres east of Clergate Road, within the central portion of the Project Area. The site is located adjacent and approximately 10 metres north of site OA05 and 1.1 kilometres west of site AHIMS site 44-2-0202 (see Table 20 and Figure 1).

Table 20 Grid reference site OA06

Easting	Northing
697313	6321386
697371	6321399
697387	6321396
697390	6321363
697353	6321361

Site environment

The site is located on the northern creek bank of the main creek line. A large drainage line forms the eastern boundary of the site. The site is also located 1.7 kilometres west of Summer Hill Creek (see Figure 6). There is some disturbance within the area. Within the creek bed there is a dumped vehicle and other modern items. There is also evidence of some natural erosion occurring, which has probably been caused by altering the natural water flow by the institution of dams. Although there is disturbance, there has been no direct impact to the cultural material.

Site description

The site consists of an artefact scatter and a PAD, measuring 34 metres (north - south) by 73 metres (east - west), with an area of 1,812 square metres.

A total of 2 artefacts were recorded within the boundaries of the site. The surface artefact scatter recorded consisted of a complete flake (n = 1, 50 %) and a distal flake fragment (n = 2, 50 %). The lithologies recorded were quartz (n = 1, 50 %) and basalt (n = 1, 50 %) (see Plate 19). The basalt complete flake showed evidence of retouch, with one lateral side being backed. The artefacts were recorded in the eastern portion of the site, in close association with the large drainage line, which forms its boundary.

It was observed that the artefacts are eroding out of this creek bank, indicating a subsurface deposit. The site is also located adjacent to site OA05, which is located in a similar landform and has a clearly identified subsurface deposit.

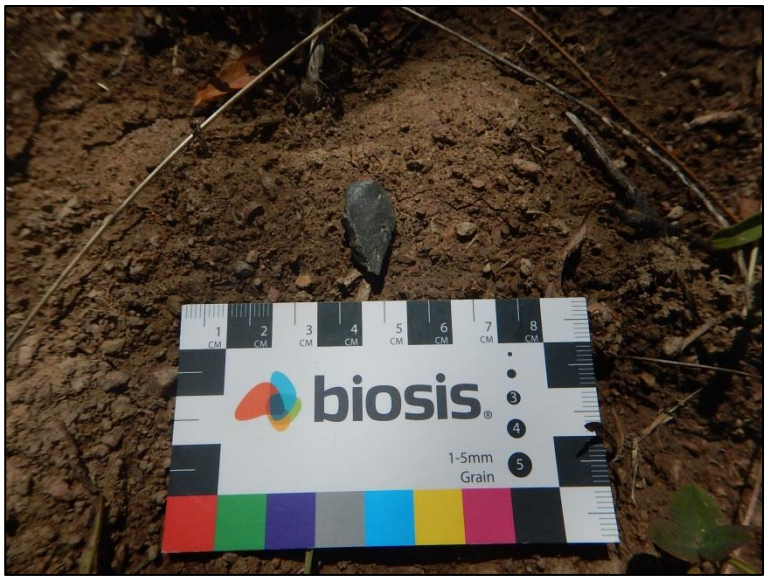


Plate 19 Close up of site OA06 (scale = 9 centimetres)

7.2.7 OA07

Site location

Site OA07 is located approximately 2 kilometres south-east of Clergate Road, within the central northern portion of the Project Area. The site is also located in close association with site OA08, which is approximately 120 metres to the south-east (see Figure 1).

Table 21 Grind reference site OA07

Easting	Northing
697229	6321788
697244	6321782
697235	6321767
697222	6321775

Site environment

The site is an area of dirt spill associated with the construction of a modern dam. The dam has been constructed on a small drainage line, which runs into the larger creek line in the south (see Figure 6). There is also evidence of recent disturbances with the construction of a dam within the site.

Site description

The site consists of a single isolated artefact, a basalt proximal flake fragment (see Plate 20). A buffer of approximately 1 metre (north - south) by 1 metre (east - west) was given, creating an area of 1 square metre. The artefact was probably relocated to its current position by taphonomic processes.

Plate 20 View south-east of site OA07 (scale = 2 metres)

7.2.8 OA08

Site location

Site OA08 is located approximately 1.2 kilometres south-east of Clergate Road, within the central northern portion of the Project Area. The site is also located in close association with site OA07, which is approximately 120 metres to the north-west (see Table 22 and Figure 1).

Table 22 Grid reference site OA08

Easting	Northing
697250	6321729
697260	6321730
697261	6321717
697251	6321717

Site environment

The site is located along the sloped eastern boundary of a small drainage line, which runs south and joins the main creek line. The site is also located in an area identified to have mature vegetation.

There is some disturbance in the wider area with a modern fence line passing close to the site. However, this disturbance has had no effect on the site. The drainage line has also been disturbed with the construction of a modern dam, which has altered the natural flow of the water.

Site description

The site consists of a single modified tree, which contains one scar. A buffer of 1 metre (north - south) by 1 metre (east - west) was given, creating an area of 1 square metre. The tree itself is a large; approximately 20 metres high mature *eucalyptus spp*.

The scar is located at the base of the tree on the southern face. The scar measures approximately 40 centimetres in height, 5 centimetres in depth and 10 centimetres in width. No other cultural material was located in relation to the tree.

Plate 21 View north of the modified tree within site OA08 (scale = 2 metres)

Plate 22 Close up of the width of the scar within site OA08 (scale = 30 centimetres)

Plate 23 View of depth of the scar within site OA08 (scale = 20 centimetres)

7.2.9 OA09

Site location

Site OA09 is located approximately 2.6 kilometres east of Clergate Road, within the south-eastern portion of the Project Area. The site is located in close association with site OA11, which is approximately 400 metres to the north-west and site OA10 approximately 300 metres to the south-east (see Table 23 and Figure 1).

Table 23 Grid reference site OA09

Easting	Northing
697281	6321147
697295	6321137
697313	6321144
697311	6321132
697293	6321127
697278	6321139

Site environment

The site is located in an area of exposure created by the creation of a modern dam. The exposure is located on the middle slope overlooking the main creek line, which is approximately 345 metres to the north.

The main disturbance in the area is the modern dam, which is altering the natural flow of water into the main creek line. To the south of the site on the ridge a large basalt outcrop was noted.

Site description

The site consists of a single isolated artefact. The sites measures approximately 21 metres (north - south) by 39 metres (east - west), with an area of 395 square metres (see Plate 24). The isolated artefact consisted of a basalt proximal flake fragment (see Plate 25 and Plate 26). The remanding area was investigated but no other cultural material was located.

Plate 24 View east of site OA09 (scale = 2 metres)

Plate 25 Close up the dorsal surface of the artefact within site OA09 (scale = 9 centimetres)

Plate 26 Close up of the ventral surface of the artefact within site OA09 (scale = 9 centimetres)

7.2.10 OA10

Site location

Site OA10 is located approximately 1.4 kilometres east of Clergate Road, within the south-eastern portion of the Project Area. The site is located in close association with site OA09, which is approximately 300 metres to the north-west. Sites OA11 and OA05 are also located approximately 335 metres to the north-west (see Table 24 and Figure 1).

Table 24 Grid reference site OA10

Easting	Northing
697380	6320984
697403	6320983
697404	6320954
697380	6320955

Site environment

The site is located in an area of exposure created by a gate along a fence line. The continued foot traffic through this area has created the exposure. The exposure is located on the upper slope overlooking the second main drainage line in the south-east of the Project Area, which joins the main creek line, which is approximately 355 metres to the north. .The main disturbance in the area is the fence line. The site is also located within close proximity to an area identified as having mature vegetation.

Site description

The site consists of a single isolated artefact, a multiple platform core (see Plate 27). A buffer of approximately 1 metre (north - south) by 1 metre (east - west) was given, creating an area of 1 square metre.

Plate 27 View west of site OA10 (scale = 2 metres)

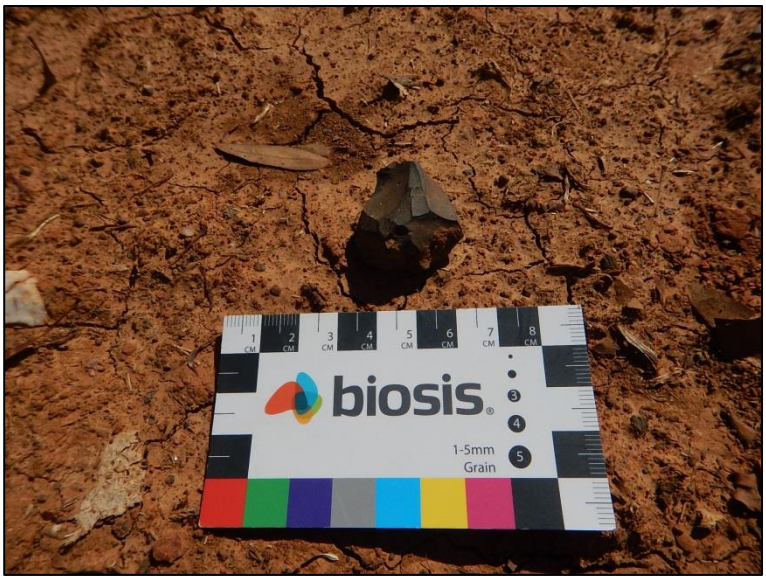


Plate 28 Close up of artefact within site OA10 (scale = 9 centimetres)

7.2.11 OA11

Site location

Site OA11 is located approximately 3 kilometres east of Clergate Road, within the central portion of the Project Area. The site is located adjacent to site OA12, which is approximately 30 metres to the south and is 112 metres south-west of site OA05 (see Table 24 and Figure 1).

Table 25 Grid reference site OA11

Easting	Northing
697038	6321137
697054	6321147
697067	6321196
697086	6321204
697105	6321228
697126	6321218
697092	6321198
697092	6321146
697082	6321112

Site environment

The site is located on a flat terrace above the main creek line on the southern bank. There is a high level of disturbance associated with this site. Due to the construction of the modern dams along the main creek line, the natural water flow has been changed. The change in water flow has now created the erosion of the creek bank, which has revealed the cultural material. There is also a machine dug trench, or drainage line which dissects the site in the eastern portion. Within the north-eastern portion there is also evidence of the burial of modern rubbish material. Although there is a large amount of disturbance in the area a good portion of the area has remained intact and no harm has been caused to the cultural material itself.

Site description

The site consists of an artefact scatter and PAD, measuring approximately120 metres (north - south) by 95 metres (east - west), with an area of 3,509 square metres (see Plate 29).

A total of 65 artefacts were recorded within the boundaries of the site. The surface artefact scatter recorded consisted of distal flake fragments (n = 19, 29 %), complete flakes (n = 18, 28 %), proximal flake fragments (n = 7, 11 %), debris (n = 7, 11 %), medial flake fragments (n = 5, 8 %), multiple platform cores (n = 4, 6 %), single platform cores (n = 2, 3 %), longitudinal flake fragments (n = 2, 3 %) and a grinding stone (n = 1,1.5%). The lithologies noted included basalt (n = 41, 63 %), quartz (n = 10, 15 %), silcrete (n = 10, 15 %), rhyolite (n = 3, 5 %) and sand stone (n = 1, 1.5 %)

The main area of artefact concentration is located along the eroding terrace near the creek bank, although some artefacts were noted along the terrace further from the creek bank

The site has also been classified as a potential archaeological deposit due to the evidence of artefacts eroding out of a subsurface layer.

Plate 29 View north-east within site OA11 (scale = 2 metres)

Plate 30 Close up of ventral surface of an artefact within site OA11 (scale = 9 centimetres)

7.2.12 OA12

Site location

Site OA12 is located approximately 3 kilometres east of Clergate Road, within the central portion of the Project Area. The site is located adjacent to site OA11, which is approximately 30 metres to the south across the creek line (see Table 24 and Figure 1).

Table 26 Grid reference site OA12

Easting	Northing
696729	6321190
697088	6321293
697096	6321270
697079	6321240
697043	6321227
697043	6321154
697008	6321145
696985	6321170
696967	6321152
696893	6321165
696880	6321203
696797	6321161

Site environment

The site is located on a flat terrace above the main creek line on the northern bank. There is a high level of disturbance associated with this site. Due to the construction of the modern dams along the main creek line, the natural water flow has been changed. The change in water flow has now created the erosion of the creek bank, which has revealed the cultural material. Although there is a large amount of disturbance in the area a good portion of the area has remained intact and no harm has been caused to the cultural material itself.

Site description

The site consists of an artefact scatter and PAD, measuring 131 metres (north - south) by 366 metres (east - west), with an area of 17,480 square metres (see Plate 29).

A total of 2 artefacts were recorded within the boundaries of the site. The surface artefact scatter recorded consisted of a complete flake (n = 1, 50 %) and a distal flake fragment (n = 1, 50 %). The lithologies noted included quartz (n = 1, 50 %) and crystal quartz (n = 1, 50%).

The main area of artefact concentration is located along the eroding terrace near the creek bank. The site has also been classified as a potential archaeological deposit due to the evidence of artefacts eroding out of a subsurface layer.

Plate 31 Close up of an artefact within site OA12 (scale = 9 centimetres)

7.2.13 OA13

Site location

Site OA13 is located approximately 820 metres east of Clergate Road, within the central north portion of the Project Area. The site is located in close association with site OA04, which is 251 metres to the south (see Table 24 and Figure 1).

Table 27 Grid reference site OA13

Easting	Northing
697026	6321888
697041	6321880
697040	6321852
697041	6321830
697034	6321826
697019	6321835
697015	6321858

Site environment

The site is located within an area of erosion on a lower slope and base of a small drainage line, which commences in the upper ridges in the north portion of the Project Area. This smaller drainage line drains into the large drainage line, which ends in the main creek line further south.

There is some notable disturbance in the area including the large erosion area within the drainage line. There have also been a number of contour banks, which have been excavated into the lower slopes. Together this altering of the natural water flow has resulted in the large areas of erosion. Although there is this disturbance there has been no harm to the cultural material.

Site description

The site consists of a single isolated artefact and a PAD, measuring approximately 60 metres (north - south) by 32 metres (east - west), with an area of 1,240 square metres (see Plate 27). The isolated artefact consisted of a quartz medial flake fragment (see Plate 32). The artefact was located on the western area of erosion.

It was observed that the artefact eroded out of a possible subsurface deposit, indicating a potential archaeological deposit. Osteological remains were also recorded within the deposit at a depth of approximately 2 metres.

Plate 32 View north-west within site OA13 (scale = 2 metres)

7.2.14 OA14

Site location

Site OA14 is located 916 metres east of Clergate Road, within the central portion of the Project Area. Sites OA07 and OA08 are also located approximately 160 metres to the north east (see Table 24 and Figure 1).

Table 28 Grid reference site OA14

Easting	Northing
697083	6321695
697092	6321690
697079	6321670
697070	6321679

Site environment

The site is located on quartz outcrop, which is on an upper slope within an area of exposure. The site is located 96 metres north of the large drainage line, which runs into the main creek line. The smaller drainage line is also located 91 metres to the east of the site. There is some disturbance in the area, with a cattle / vehicle track dissecting the site. There has also been a modern dam constructed to the south of the site, which has altered the natural flow of water in the wider area.

Site description

The site consists of a quartsz quarry and associated artefact scatter. Due to time constraints the artefacts were not recorded in detail but complete flakes, flake fragments and debris was noted (see Plate 27). A buffer of approximately 1 metre (north - south) by 1 metre (east - west) was given, creating an area of 1 square metre.

Plate 33 View east of site OA14 (scale = 2 metres)

7.2.15 PAD 01

Site location

PAD 01 is located adjacent to Clergate Road . The site is located in the south west portion of the Project Area. The site is located adjacent to PAD 02 and 568 metres north- west of site OA01 (see Table 29 and Figure 1).

Table 29 Grid reference PAD 01

Easting	Northing
696275	6321406
696215	6321320
696200	6321221
696065	6321220
696071	6321324
696126	6321562
696187	6321475

Site environment

The site is located on a low lying ridge and associated steady sloped area. A small drainage line forms the northern boundary, a vehicle track the southern and the disturbed dam area in the east. This area has no evidence of disturbance, except the dam.

Although there has been this large scale disturbance in that area, the location of the site has remained intact. The ridges slopes would have stretched to the original water course, before the modern changes to the natural water flow.

Site description

The site consists of a PAD, measuring approximately 330 metres (north - south) by 212 metres (east - west), with an area of 38,951square metres (see Plate 34).

This area has been classified as a PAD because of the areas connection to the original water course and that cultural material has been located in similar landforms within the Project Area. The soil within this area is also classified as good for the preservation of cultural material.

Plate 34 View north of PAD 01 (scale = 2 metres)

7.2.16 PAD 02

Site location

PAD 02 is located adjacent to Clergate Road. The site is located in the south west portion of the Project Area. The site is located adjacent to PAD 01 and approximately 1.3 killometres west of site OA13 (see Table 30 and Figure 1).

Table 30 Grid reference PAD 02

Easting	Northing
696200	6321832
696290	6321875
696416	6321880
696530	6321817
696424	6321403
696281	6321413
696139	6321557

Site environment

The site is located on a low lying ridge and its associated steady sloped area. A small drainage line forms the southern boundary and a disturbed dam area in the east. This area within the site has little evidence of disturbance, except the dam and an EPA monitoring station.

Although there has been this large scale disturbance in that area, the location of the site has remained intact. The ridges slopes would have stretched to the original water course, before the modern changes to the natural water flow.

Site description

The site consists of a PAD, measuring 464 metres (north - south) by 340 kilometres (east - west), with an area of 136, 049 square kilometres (see Plate 34).

This area has been classified as a PAD because of the areas connection to the original water course and that cultural material has been located in similar landforms within the Project Area. The soil within this area is also classified as good for the preservation of cultural material.

Plate 35 View west of site PAD 02 (scale = 2 metres)

7.2.17 PAD 03

Site location

PAD 03 is located 418 metres east of Clergate Road, within the north western portion of the Project Area. The site is located 34 metres east of site OA02 and 278 metres west of site OA03 (see Table 31and Figure 1).

Table 31 Grid reference PAD 03

Easting	Northing
696486	6322138
696481	6322206
696523	6322232
696787	6322151
696823	6322095
696703	6322022

Site environment

The site is located on a ridge and its associated steady sloped area. A property boundary forms the northern boundary and the flat drainage area the remainder. The area within the site has little evidence of disturbance, although there has been large scale disturbance in close proximity. A large section of vegetation has been recently cleared in association with the property. The ridges slopes would have stretched to the original water course, before the modern changes to the natural water flow.

Site description

The site consists of a PAD, measuring 367 metres (north - south) by 150 metres (east - west), with an area of 9,515 square metres.

This area has been classified as a PAD because it overlooks the sloping marsh drainage area, which leads into the main creek line. Cultural material has been located in similar landforms within the Project Area. The soil within this area is also classified as good for the preservation of cultural material.

7.2.18 PAD 04

Site location

PAD 04 is located approximately 1 kilometre east of Clergate Road and 411 metres south of Pearce Lane, within the northern portion of the Project Area. The site is located 156 metres south of site OA02 and approximately 150 metres north-east of site OA13 (seeTable 32 and Figure 1).

Table 32 Grid reference PAD 04

Easting	Northing
697024	6322041
697141	6322040
697157	6321988
697049	6321971
697022	6321999

Site environment

The site is located on a ridge and its associated steady sloped area. The area within the site has little evidence of disturbance. The Pad is located 94 metres to the west of a large drainage line that leads into the main creek line.

Site description

The site consists of a PAD, measuring 86 metres (north - south) by 137 metres (east - west), with an area of 9515 square metres.

This area has been classified as a PAD because it overlooks the sloping marsh drainage area and is on close association to a large drainage line, which leads into the main creek line. Cultural material has been located in similar landforms, in a close proximity within the Project Area. The soil within this area is also classified as good for the preservation of cultural material and was notably different then in other areas.

7.2.19 PAD 05

Site location

PAD 04 is located 1.2 kilometres east of Clergate Road and 770 metres south of Pearce Lane, within the central portion of the Project Area. The site is located 84 metres east of site OA04 and 91 metres north of site OA05 (see Table 33 and Figure 1).

Table 33 Grid reference PAD 05

Easting	Northing
697250	6321633
697296	6321624
697304	6321544
697236	6321489
697225	6321492
697229	6321576

Site environment

The site is located on a ridge and its associated steady sloped area overlooking the main creek line and the large drainage channel. This area has little evidence of disturbance and is at an elevation that would have allowed decent views of the immediate area.

Site description

The site consists of a PAD, measuring 142 metres (north - south) by 87 metres (east - west), with an area of 9000 square metres.

This area has been classified as a PAD because it overlooks the main creek line and cultural material has been located in similar landforms within the Project Area. The soil within this area is also classified as good for the preservation of cultural material.

7.2.20 PAD 06

Site location

PAD 04 is located approximately 1.6 kilometres east of Clergate Road and 1.3 killometres south of Pearce Lane, within the south eastern portion of the Project Area. The site is located 164 metres south-east of site OA10 and 243 metres south-east of site OA09 (see Table 34 and Figure 1).

Table 34 Grid reference PAD 06

Easting	Northing
697522	6320991
697543	6321071
697574	6321096
697599	6321078
697597	6321045
697568	6321005

Site environment

The site is located on a terrace area on the western bank of a small creek line, which feeds into the main creek in the north. The small creek line forms the eastern boundary. This area within the site has little evidence of disturbance, except natural erosion processes associated with the creek.

Site description

The site consists of a PAD, measuring 108 metres (north - south) by 63 metres (east - west), with an area of 4,757 square metres.

This area has been classified as a PAD because of its topography and its close association with the small creek line, which leads into the main creek line. Cultural material has been located in similar landforms within the Project Area along the main creek line. The soil within this area is also classified as good for the preservation of cultural material.

8. Analysis and discussion

8.1 Overview of aboriginal heritage sites

Twenty new Aboriginal heritage sites have been identified within the Project Area. Table 35 outlines the stone artefacts recorded during the Aboriginal cultural heritage assessment of the Project Area.

Table 35 Aboriginal archaeological and heritage sites in the Project Area

Site name and AHIMS number	Features	Landform	No. of artefacts
OA01	Isolated Artefact	Slope	1
OA02	Isolated Artefact	Slope	1
OA03	Artefact Scatter; Potential archaeological deposit	Ridge and slope	6
OA04	Artefact Scatter; Potential archaeological deposit	Open depression / Terrace	3
OA05	Artefact Scatter; Potential archaeological deposit	Open depression / Terrace	2
OA06	Artefact Scatter; Potential archaeological deposit	Open depression / Terrace	2
OA07	Isolated Artefact	Drainage line	1
OA08	Scar tree	Drainage line	-
OA09	Isolated Artefact	Ridge and slope	1
OA10	Isolated Artefact	Ridge and slope	1
OA11	Artefact Scatter; Potential archaeological deposit	Open depression / Terrace	65
OA12	Artefact Scatter; Potential archaeological deposit	Open depression / Terrace	2
OA13	Isolated Artefact; Potential archaeological deposit	Slope	1
OA14	Quarry	Slope	/
PAD 01	Potential archaeological deposit	Slope	-
PAD 02	Potential archaeological deposit	Ridge and slope	-
PAD 03	Potential archaeological deposit	Ridge and slope	-
PAD 04	Potential archaeological deposit	Ridge and slope	-
PAD 05	Potential archaeological deposit	Ridge and slope	-
PAD 06	Potential archaeological deposit	Open depression / Terrace	-

Stone artefact analysis

The following analysis has been undertaken for the surface assemblage of the twenty Aboriginal heritage sites located in the Project Area. A total of 86 stone artefacts were identified and recorded on the surface. More were noted but due to time constraints were not recorded in detail. The section will be updated once cultural heritage works are complete.

The artefact analysis addresses a series of themes including:

- Stone raw material procurement
- Stone reduction technology
- Spatial distribution.

Stone artefacts were recorded in the field during the field survey. Artefacts were individually analysed and recorded including all relevant artefact attributes; this enabled a comprehensive typological, technological and metrical analysis of the assemblage to be undertaken. Analysis was undertaken using of a standard digital Vernier caliper and a 10 x hand lense. All measurements were recorded in millimetres to one decimal place.

8.1.1 Surface stone artefact analysis

A total of 86 surface artefacts were recorded in 20 individual Aboriginal heritage sites. The highest density of artefacts were recorded within site OA11 (n = 65, 76 %), a terrace on the southern side of the main creek line. Table 35 shows the number of artefacts recorded from each Aboriginal heritage site.

The analysis of the surface survey has been undertaken as one whole assemblage rather than analysis of each site. In an attempt to determine past land use of the Project Area as a whole, it was determined an analysis of stone artefacts would be most appropriate.

Stone procurement

The cortex (weathered exterior of a rock) provides information about the origin of stone sources. Artefacts with a rough cortex were acquired from a primary source, such as an *in situ* outcrop. Artefacts with a smooth or water-rolled cortex originate from a secondary source, such as a river cobble from a waterway. The amount of cortex on an artefact often indicates the distance artefacts were transported from the source (Hiscock and Mitchell 1993: 12-17).

A high percentage of cortex on an artefact indicates that the source of stone was nearby; while artefacts with less cortex, or no cortex, were transported further from the source. As cores are transported away from the source they are typically highly reduced and the flakes from these cores are smaller.

The basalt artefacts recorded in the Project Area are indicative of being transported a distance from the raw material source with 92 percent (n = 78) of artefacts having 0 percent cortex, while on only 1 percent (n = 1) of artefacts had 50 – 70 percent cortex (see Chart 4). The quartz artefacts also recorded a low percentage of cortex, however quartz , quartzite and silcrete rarely exhibit a well developed cortex.

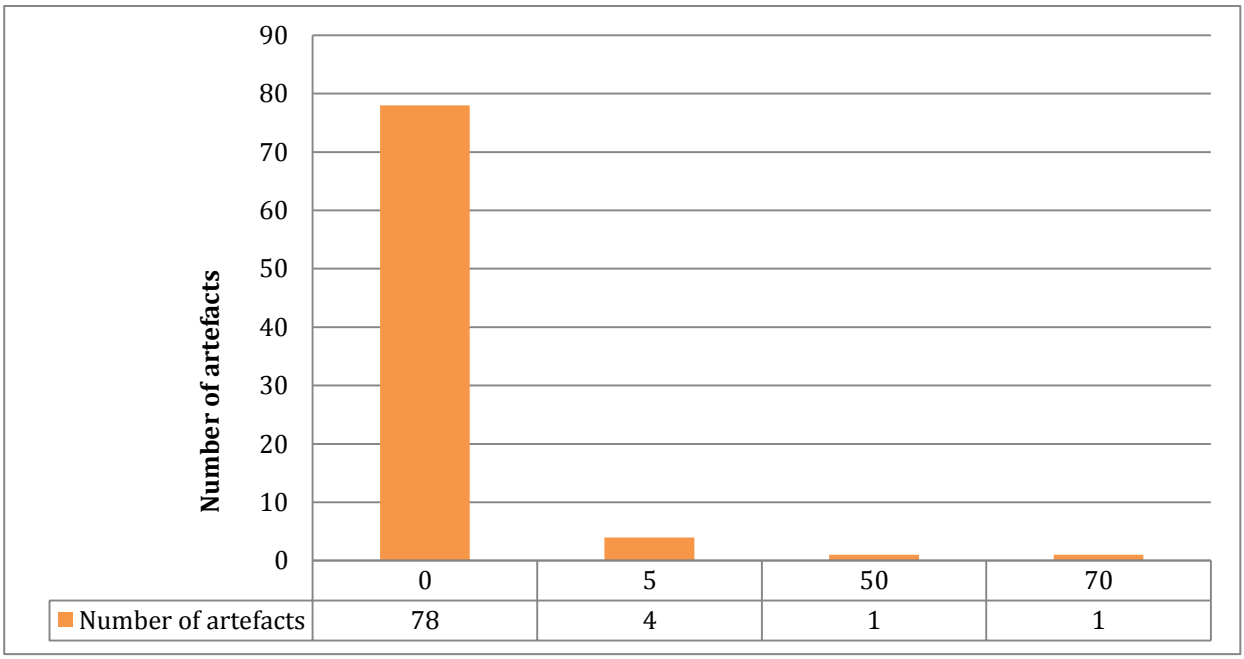


Chart 4 Percentage of cortex on stone artefacts

Eight raw material types were found in the surface survey. The predominant raw material type is basalt (n = 43, 50 %). Less common raw material types include quartz (n = 25, 29 %), silcrete (n = 9, 11 %), rhyolite (n = 3, 3.5 %), quartzite (n = 3, 3.5 %), mud stone (n = 1, 1.2 %), sandstone (n = 1, 1.2 %), and one piece of crystal quartz (n = 1, 1.2 %) (see Table 36 and Chart 5). Site OA11 contains the highest variety of raw materials (n = 5), when compared to the other sites in the Project Area and predominantly basalt.

Rhyolite sources are more common in the Mullions Range Volcanics (Smu) geological formation, which is located just outside of the Project Area. Within the Project Area the geological formation of Oakdale is characterised by both sandstone and basalt. The immediate availability of raw material types in the area could have resulted in the assemblage recorded. Rhyolite, for example, was only located in one site, OA11.

Table 36 Raw material in the surface assemblage

Raw material	Number	Frequency (%)
Basalt	43	50
Quartz	25	29
Silcrete	9	11
Rhyolite	3	3.5
Quartzite	3	3.5
Mud Stone	1	1.2
Sandstone	1	1.2
Crystal Quartz	1	1.2
Total	**86**	**100**

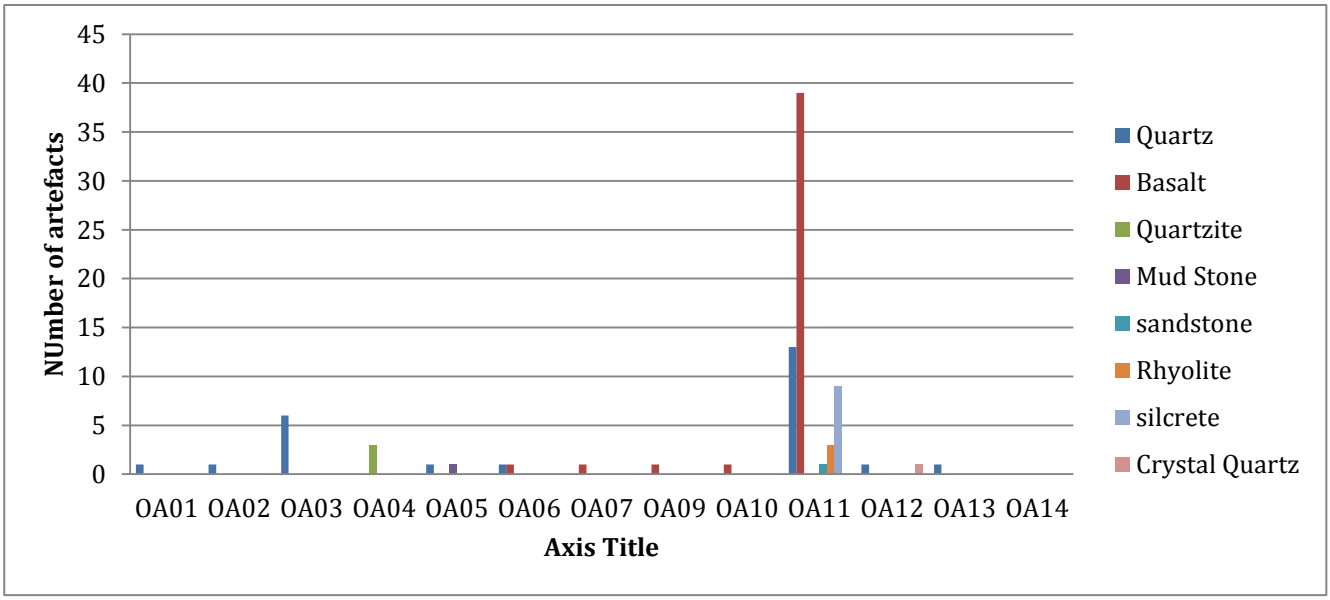


Chart 5 Raw material numbers within the sites

Assemblage composition

The surface assemblage is dominated by distal flake fragments (n = 25, 29 %) (see Table 37). Complete flakes made up 24.4 per cent (n = 20) of the assemblage. Medial flakes accounted for 7 percent (n = 10) of the assemblage, while proximal flake fragments made up 7 per cent (n = 6) of the assemblage. Only a minimal number longitudinally split flakes were recorded (n = 2, 2.2 %). A total of 12 cores were recorded, with 7 percent (n = 6) being single platform cores and 7 percent (n = 6) being multiple platform cores. The majority of tools were made on complete flakes (n=20, 86 %). Other stone artefacts recorded include grindstones (n = 3, 3.5 %), and debris (n = 7, 8 %).

Table 37 Distribution of artefacts by site

Type	OA01	OA02	OA03	OA04	OA05	OA06	OA07	OA09	OA10	OA11	OA12	OA13	OA14	Total
Complete Flake	1		1			1				17	1			21
Proximal Fragment							1	1		8				10
Medial Fragment			1							4		1		6
Distal Fragment			2		1	1				20	1			25
Longitudinally split flake										2				2
Single platform core		1	2	1						2				6
Multi platform core					1				1	4				6
Debris										7				7

Type	OA01	OA02	OA03	OA04	OA05	OA06	OA07	OA09	OA10	OA11	OA12	OA13	OA14	Total
Grind stone				2						1				3
TOTAL	**1**	**1**	**6**	**3**	**2**	**2**	**1**	**1**	**1**	**65**	**2**	**1**	**/**	**86**

Tools

A total of 4 tools were recorded from site OA11 and one from OA06. A scraper, blade, bladelette and geometric microlith were the tool types recorded within OA11 and a backed flake from OA06. The most dominant tool types in the assemblage were blades and bladeletts. The assemblage from site OA11 showed evidence of blade flaking technology being utilised. A number of the artefacts were at least twice as long as they were wide and had parallel or subparallel sides and at least two ridges on the dorsal side. There was one occurrence of possible usewear recorded in the assemblage.

8.1.2 Summary of stone artefact analysis

The stone artefact analysis provides some understanding of the raw material procurement, tool manufacture and occupational patterns in the Project Area particularly as no previous comprehensive archaeological investigations have occurred.

The surface stone assemblage was analysed as a whole assemblage rather than separate assemblages from each of the 20 Aboriginal heritage sites identified during the surface survey. The purpose of this method of analysis was to understand the Project Area as whole, rather than each site individually.

The surface assemblage consisted of 86 stone artefacts of which the majority were basalt (n = 43, 50 %) and distal flake fragments (n = 25, 29 %). The weathering of the surface artefacts indicates multiple, repeated occupations of the Project Area. There is also evidence of tools such as scrapers, blades, bladeletts and geometric microliths. A majority of the tools were noted within one site OA11. The variety and type of tools located during the surface survey, such as scrapers, are indicative of occupation locations.

The variety of cores in the surface assemblage reflects all stages of core reduction. Single platform cores with one flake removed were observed as were completely reduced cores. The majority of cores observed in the surface assemblage were in the later stages of reduction, again indicating that the knapping process was taking place far away from the raw material source.

8.2 Discussion of results

The stone artefact analysis aimed to inform the knowledge of Aboriginal lifeways in the Project Area, specifically by assessing the procurement of raw material, stone reduction technologies and spatial distribution. No distinct patterns were observed in the stone reduction technologies from a majority of the sites, this is most likely due to the small and varied sample recorded in the surface assemblages; for a detailed analysis of stone reduction technologies a larger sample of surface artefacts would be necessary. Site OA11 did indicate the use of blade reduction technology, with the production of blades and bladeletts.

As discussed above, the procurement of raw material for purpose of creating stone tools can be assessed by analysing the surface stone artefact assemblages. The stone artefacts generally show later stages of reduction, this indicates that the stone tool making process happened away from the raw material source. The surface assemblage showed that the patterning of Aboriginal heritage sites in the Project Area was similar to that of the wider region but not the local area.

The dominant site types in the Project Area are artefact scatters and PADs. Stone artefacts are more resilient to the natural environment than most other site types as they exist in the landscape for a much longer period of time and therefore are the most commonly recorded Aboriginal heritage site type.

As well as the type of sites located in an area, the location of those sites relative to the natural environment is important to understanding the lifeways of past Aboriginal people. The footprint the Project Area covers numerous landforms and provides a representative sample of the landscape, ideal for the analysis of spatial relationships between sites and landscape elements. The general pattern indicates that the majority of sites are located in areas that have abundant resources and are close to the main creek line.

Site integrity is influenced by both natural processes and human land use practices. Alluvial terraces and flats have the least site integrity due to repeated flooding events that redistribute sediments both spatially and stratigraphically. Human land use practices have an influence on the site integrity. Past agricultural and pastoral activities cause spatial and stratigraphic movements of artefacts, and significant land modifications, such as deep excavations cause the destruction and removal of cultural material. Vegetation clearance and pastoral activities would have caused spatial, as well as stratigraphical movements of cultural material due to cattle trampling and removal of big trees. Erosion that would have been most likely extensive after the land clearance would have caused post depositional displacement of artefacts.

The archaeological assessment located and recorded 20 Aboriginal sites within the Project Area. If these sites can not be avoided by the proposed development, then an AHIP must be sort under Part 6 of the *Parks and Wildlife Act 1974.* The Project Area is suitable for rezoning once all conditions under the relevant legislation have been meet.

9. Recommendations

The following management recommendations have been developed relevant to the Project Area and influenced by:

- Predicted impacts to Aboriginal cultural heritage
- The planning approvals framework
- Current best conservation practise, widely considered to include:
  - Ethos of the Australia ICOMOS Burra Charter.
  - The *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010).

Prior to any impacts occurring within the Project Area, the following is recommended:

Recommendation 1: Further archaeological assessment

Areas identified as having a Potential Archaeological Deposit (PAD) (OA03, OA04, OA05, OA06, OA11, OA12, OA13, PAD 01, PAD 02, PAD03, PAD 04, PAD05 and PAD 06) should be avoided wherever possible. If impact to these areas cannot be avoided subsurface investigations (test excavations), undertaken in accordance with the code, will be required prior to the commencement of works. Consultation with Aboriginal stakeholders according to the Aboriginal cultural heritage consultation requirements for proponents 2010 (DECCW 2010) ('the consultation requirements') will be required for the development to proceed.

Recommendation 2: Application for an Aboriginal Heritage Impact Permit (AHIP) for the entire Project Area

If the proposed works cannot avoid harm to OA01, OA02, OA03, OA04, OA05, OA06, OA07, OA08, OA09, OA10, OA11, OA12, OA13, OA14, PAD 01, PAD 02, PAD03, PAD 04, PAD05 and PAD 06 it is recommended that an application be made to the Office of Environment and Heritage (OEH) for an area based Aboriginal Heritage Impact Permit (AHIP) for the entirety of the Project Area. The AHIP should include the following conditions:

- Impact can occur to the Aboriginal cultural heritage sites OA01, OA02, OA03, OA04, OA05, OA06, OA07, OA08, OA09, OA10, OA11, OA12, OA13, OA14, PAD 01, PAD 02, PAD03, PAD 04, PAD05 and PAD 06. All of the sites occur within the proposed works area.
- The isolated artefacts (Sites OA01, OA02, OA07, OA09 and OA10) should be relocated prior to ground disturbance and moved outside of the impact area, but within their original landscape context.
- At sites OA03, OA04, OA05, OA06, OA11, OA12, OA13 and OA14, the surface artefacts should be relocated prior to ground disturbance and moved outside of the impact area, but within their original landscape context. Any subsurface archaeological material located within the impact area, with the exception of human remains, can be destroyed.
- Impact within the limits of the area based destruction AHIP for any further Aboriginal objects encountered during construction unless human remains are involved.

For information about AHIPs and their preparation, see below.

Advice preparing AHIPs

An AHIP is required for any activities likely to have an impact on Aboriginal objects or Places or cause land to be disturbed for the purposes of discovering an Aboriginal object. The OEH issues AHIPs under Part 6 of the National Parks and Wildlife Act 1974 (NPW Act).

AHIPs should be prepared by a qualified archaeologist and lodged with the OEH. Once the application is lodged processing time can take between 8-12 weeks. It should be noted that there will be an application fee levied by the OEH for the processing of AHIPs, which is dependent on the estimated total cost of the development project.

Where there are multiple sites within one project area an application for an AHIP to cover the entire project area is recommended.

Recommendation 3: Discovery of Aboriginal ancestral remains

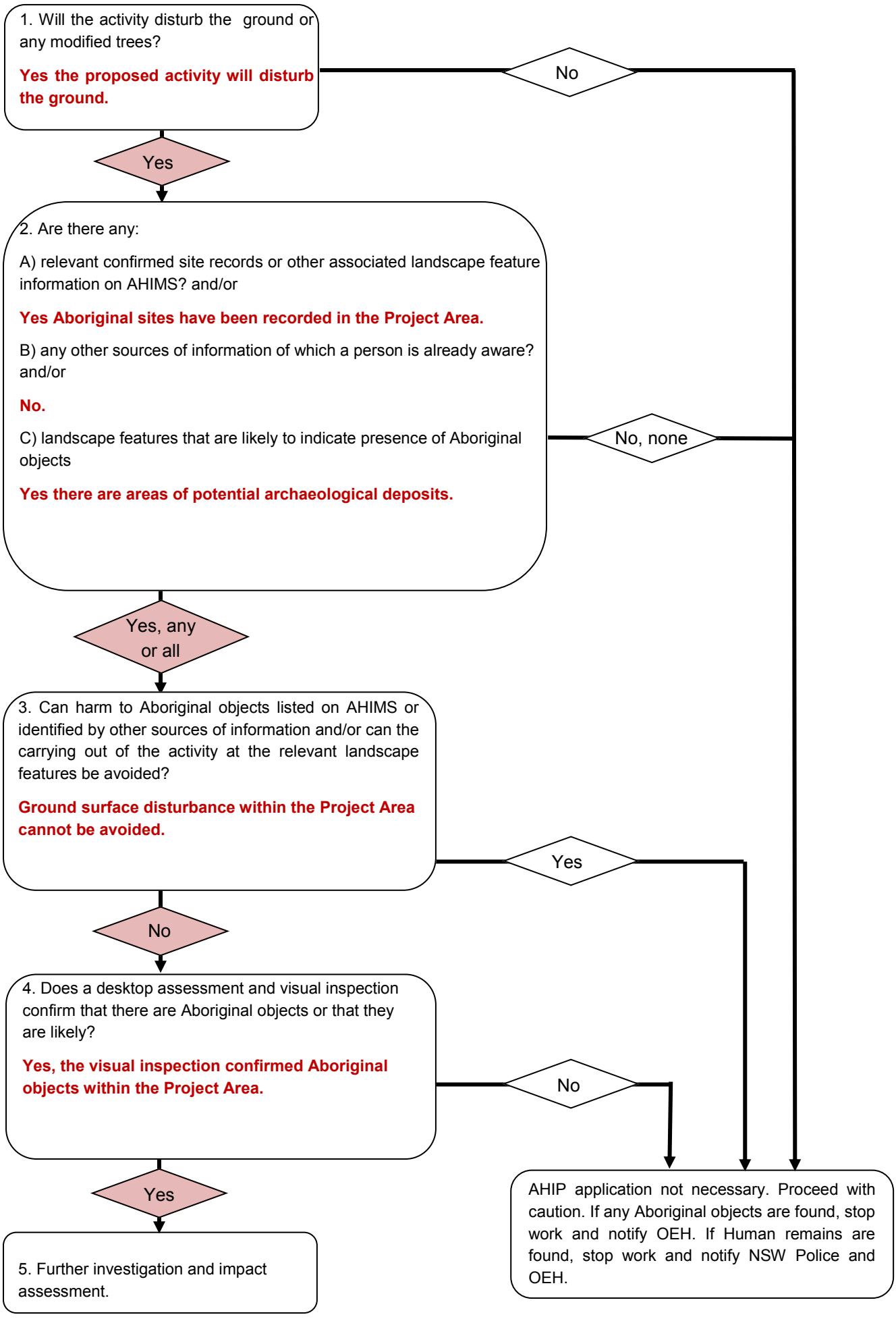
Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. If any suspected human remains are discovered during any activity you must:

- Immediately cease all work in the vicinity and not further move or disturb the remains.
- Notify the Coroners Office and NSW Police immediately. Following this, contact OEH's Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location. The find must also be reported to the Aboriginal parties.
- Not recommence work at that location unless authorised in writing by OEH.

Recommendation 4: Discovery of Unanticipated Historical Relics

Relics are historical archaeological resources of local or State significance and are protected in NSW under the *Heritage Act 1977*. Relics cannot be disturbed except with a permit or exception/exemption notification. Should unanticipated relics be discovered during the course of the project, work in the vicinity must cease and an archaeologist contacted to make a preliminary assessment of the find. The Heritage Council will require notification if the find is assessed as a relic.

Figure 9 Due Diligence Flow Chart



References

Appleton, 2005. Aboriginal Heritage Assessment of the proposed Hub Regional Resource Processing Facility. Report prepared for R.W. Corkery and Co. Pty Ltd on behalf of Orange City Council.

Allen, J. 1974. The Bagundji of the Darling Basin: Cereal Gatherers in an Uncertain Environment. *World Archaeology* 5(3): 309 – 322.

Australia ICOMOS 2013. *Australia ICOMOS Charter for the Conservation of Places of Cultural Significance (the Burra Charter), revised edition*. Australia ICOMOS, Canberra.

BOM 2015. *Weather station data for Hay, NSW*. Bureau of Metrology. Accessed 14/01/2016: http://www.bom.gov.au/climate/data/stations/

Burke, H. & C. Smith 2004. *The Archaeologists Field Handbook*. Allen & Unwin, NSW.

Briggs R. & M. Jackson. 2011. *Carved Trees: Aboriginal cultures of western NSW*. State Library of NSW, Sydney.

DECCW 2010. Aboriginal cultural heritage consultation requirements for proponents *2010.* NSW Department of Environment, Climate Change and Water, Sydney.

DECCW 2010. *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. NSW Department of Environment, Climate Change and Water, Sydney NSW.

Flood, J. 1980. *The Moth Hunter; Aboriginal Prehistory of the Australian Alps*. Canberra Australian Institute of Aboriginal Studies. Canberra.

Grant, S. & J. Rudder. 2005. *A First Wiradjuri Dictionary: Wiradjuri to English, English to Wiradjuri and Categories of Things*. Restoration House, O'Connor ACT.

Griffin Pty Ltd & NSW NPWS 2004. *Maynggu Ganai Historic Site, Wellington Valley,1823-1844: Draft Conservation Management Plan*.

Heritage Concepts. 2003. Aboriginal and Historic Archaeological & Cultural Assessment for 'Area B' Local Environment Study. Report to Parsons Brinckerhoff.

Hiscock, P. & S. Mitchell. 1993. Stone artefact quarries and reduction sires in Australia: towards a type profile. Canberra: Australian Government Publishing Service.

Holdaway S. & N. Stern 2008*. A Record in Stone: The study of Australia's flaked stone artefacts*, Museum Victoria, Vic.

Howitt, A.W. 1904 [1996]. *The Native Tribes of South-east Australia*. Facsimile edition published by Aboriginal Studies Press, Canberra.

Kass, T. 2003. A thematic History of the Central West: Comprising the NSW Historical Regions of Lachlan and Central Tablelands. (NSW Heritage Office: Parramatta).

Kovac, M., B. Murphy. & J. Lawrie 1989. *Soil Landscapes of the Bathurst 1:250,000 Sheet map*, Soil Conservation Service of NSW, Sydney

Kelton J. 1994. *An Archaeological Survey of Moulder Hill Residential Sub- Division, March Rd, North – West of Orange, NSW.* A report to Cabonne Shire Council.

Kelton J. 1996. *An Aboriginal Archaeological Survey for the proposed Long Point Rd Orange to Mudgee Link, Central West NSW*. A report to Cabonne Shire Council.

Martin, S. 2006. Inscribing the Plains: Constructed Conceptualised and Socialised Landscapes of the Hay Plain, South-eastern Australia. Unpublished PhD. University of New England, Armidale.

Martin, S. 2010. Archaeological Research, Characterisation and Predictive Modelling Project. Part of the Recording of Aboriginal Use and Values on the Lowbidgee and Lower Lachlan Rivers Wetlands Under the NSW Rivers Environmental Restoration Program (RERP). Report to Department of Environment Climate Change and Water.

Marquis-Kyle, P. & Walker M. 2003. *The illustrated Burra Charter: good practice for heritage places, Australian ICOMOS*. Burwood, Victoria.

Mathews, R.H. 1895. "Kamilaroi class system of the Australian Aborigines". *Journal of the Royal Geographical Society of Queensland*. Vol. 10.

Mathews, R.H. 1897. "Totemic divisions of the Australian tribes". *Journal of the Proceedings of the Royal Society of NSW*. Vol. 31.

Mathews, R.H. 1898. "Aboriginal initiation ceremonies". *Science of Man*. Vol. 4, No. 9.

Mitchell, T. 1835. *Journal of an Expedition into the Interior of Tropical Australia.*

NPWS 1997. Aboriginal Cultural Heritage: Standards and Guidelines Kit. National Parks and Wildlife Services, Department of Environment, Climate Change and Water, NSW.

NSW Archaeology 2015. Summer Hill Estate, NSW: Brief Summary of Aboriginal Heritage. New South Wales Archaeology Pty Ltd. Report prepared for Geolyse Pty Ltd.

NTSCORP 2012. Orange Aboriginal Heritage Report. Report prepared for Orange City Council.

Hanson 2012. Aboriginal Cultural Heritage Management Plan for the East Guyong Quarry. Report prepared for R.W. Corkery & CO. PTY. LTD.

Hughes, S. & D. Johnson, 1995. *An archaeological survey of areas between Forbes and Lake Cowal*. A report to North Limited. Australian Archaeological Survey Consultants.

Oakley B. 2002. *Orange Dams Water supply Augmentation: Suma Park and Spring Creek Reservoirs. Orange*.

Oxley, J. 1817. *Journals of Two Expeditions in the interior New South Wales.*

Ozark, 2009. Aboriginal Heritage Assessment of the Euchareena Road Resource Recovery Centre. Ozark Environmental and Heritage Management Pty Limited. Report prepared for Orange City Council.

Ozark, 2014a. Aboriginal Archaeological Assessment: Golden Down / Highland Property Subdivision. Report prepared for Peter Basha Planning & Development Pty Limited on behalf of Highland Property and Development Co Pty Ltd and Golden Down Estate Pty Ltd.

Ozark, 2014b. Aboriginal Archaeological Assessment: Proposed Rezoning of "Tambaroora". Report prepared for Fenlor Group Pty Ltd on behalf on Landorange Partnership.

Pardoe, 2013. Cowal Gold Mine Extension Modification Aboriginal Cultural Heritage Assessment. Report prepared for Barrick (Cowal) Limited. Colin Pardoe Bio-Anthropology and Archaeology.

Pearson M. 1979. *Aboriginal sites in the Bathurst-Orange development area: A pilot survey*. Report to NPWS.

Pearson M.1981. *Seen through different eyes: changing land use and settlement patterns in the Upper Macquarie River region of NSW from prehistoric times to 1860*. PhD Thesis, Department of Prehistory and Anthropology, Australian National University, Canberra.

Pearson, M.1984. Bathurst Plains and beyond: European colonisation and Aboriginal resistance. *Aboriginal History* 8 (1-2), Canberra.

Read, P. 1988. *A Hundred Years War: The Wiradjuri People and the State*. Australian National University Press, Canberra.

Tindale, N. 1974. *Aboriginal tribes of Australia: their terrain, environmental controls, distribution, limits, and proper names*. Australian National University Press, Canberra.

Williams, D. 2014a. Aboriginal Heritage Due Diligence Assessment, Proposed Water Infrastructure, South Orange, NSW. Report prepared for Geolyse Pty Ltd.

Williams, D. 2014b. Aboriginal Heritage Due Diligence Assessment: Southern Feeder Road, Stage 1, Orange, NSW. Report prepared for Geolyse Pty Ltd.

Williams, D. 2015. Aboriginal Cultural Heritage Assessment Report: Proposed Services Infrastructure, South Orange Urban Release Area, NSW. Access Archaeology & Heritage. Report prepared for Geolyse Pty Ltd.

Appendices

Appendix 1 - AHIMS results

THE FOLLOWING APPENDIX IS NOT TO BE MADE PUBLIC

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 21507

Client Service ID : 203656

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
44-2-0094	Moulder Hill ST-1;MH/ST-1;	AGD	55	693900	6318700	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	103106
	Contact	**Recorders**	Central West Archaeological and Heritage Services Pty Ltd					**Permits**		
44-2-0202	MPA PASA2	GDA	55	698527	6321317	Open site	Valid	Potential Archaeological Deposit (PAD) : 1		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Mr.Adrian Cressey					**Permits**		
44-2-0184	MPA2	GDA	55	699066	6322931	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Mr.Adrian Cressey					**Permits**		
44-2-0185	MPA3	GDA	55	701184	6325155	Open site	Partially Destroyed	Artefact : 1, Potential Archaeological Deposit (PAD) : 1		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Mr.Adrian Cressey,Mr.NICHOLAS HARR					**Permits**		
44-2-0186	MPA4	GDA	55	700218	6324125	Open site	Destroyed	Artefact : 1		
	Contact	**Recorders**	Navin Officer Heritage Consultants Pty Ltd,Mr.Adrian Cressey,Mr.NICHOLAS HARR					**Permits**		
44-2-0144	Burrendong 1	AGD	55	694600	6318044	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mr.John Appleton					**Permits**		

Report generated by AHIMS Web Service on 11/12/2015 for Belinda Wilson for the following area at Datum :GDA, Zone : 55, Eastings : 692000 - 703000, Northings : 6318000 - 6325000 with a Buffer of 200 meters. Additional Info : due dil;igence. Number of Aboriginal sites and Aboriginal objects found is 6

Appendix 2 - Site data

Table 38 OA01

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
1	Complete flake	Quartz	0	Crushed	10	7	Feather	-	-	15	15	7	1		-

Table 39 OA02

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
1	Single Platform Core	Quartz	0	-	-	-	-	-	-	20	23	11	4	-	

Table 40 OA03

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
1	Single Platform Core	Quartz	0	-	-	-	-	-	-	29	33	28	3	-	LFS 29
2	Complete Flake	Quartz	0	Flacked	7	4	Step	-	-	29	18	10	2	-	
3	Distal Flake Fragment	Quartz	0	-	-	-	Feather	-	-	12	15	8/	1	-	
4	Distal Flake Fragment	Quartz	0	-	-	-	Feather	-	-	14	13	2	2	-	
5	Medial Flake Fragment	Quartz	0	-	-	-	-	-	-	13	15	5	2	-	
6	Single Platform Core	Quartz	0	-	-	-	-	-	-	21	18	8	1	-	LFS 19, Bipolar

Table 41 OA04

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
1	Single Platform Core	Quartzite	0	-	-	-	-	-	-	33	73	33	6	-	LFS 30, Unidirectional
2	Grinding Stone	Quartzite	0	-	-	-	-	-	-	77	56	40	-	-	Two grinding surfaces and pitting
3	Grinding Stone	Quartzite	0	-	-	-	-	-	-	93	70	44	-	-	One grinding surface stratifications

Table 42 OA05

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
1	Distal Flake Fragment	Quartz	0	-	-	-	Step	-	-	17	13	4	-	-	
2	Multiple Platform Core	Mud Stone	0	-	-	-	-	-	-	36	43	31	10 +	-	Multidirectional

Table 43 OA06

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
1	Complete Flake	Basalt	0	Flacked	5	5-	Retouched	Step	Left Lateral Margin	24	13	6	1	Retouched Flake	-
2	Distal Flake Fragment	Quartz	0	-	-	-	-	-	-	17	13	4	-	-	

Table 44 OA07

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
1	Proximal Flake Fragment	Basalt	0	Flacked	12	5	-	-	-	15	23	5	3	-	-

Table 45 OA09

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
1	Proximal Flake Fragment	Basalt	0	Flacked	8	9	-	-	-	33	17	9	2	-	Weathered

Table 46 OA10

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
1	Multiple Platform Core	Basalt	0	-	-	-	--	-	-	29	5	14	-	-	Multidirectional. LFS 21

Table 47 OA11

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
1	Grinding Stone	Sand Stone	0	-	-	-	-	-	-	115	102	32	-	-	One grinding surface
2	Complete Flake	Rhyolite	0	Faceted	19	7	Step	-	-	31	22	6	2	-	
3	Proximal Flake Fragment	Basalt	0	Flacked	10	1	Broken	-	-	10	15	3	3	-	
4	Medial Flake Fragment	Quartz	0	-	-	-	-	-	-	11	14	4	2	-	
5	Multiple Platform Core	Rhyolite	0	-	-	-	-	-	-	30	26	12	10	-	LFS 29, Multidirectional
6	Distal Flake Fragment	Rhyolite	0	-	-	-	Feather	-	-	17	27	6	2	-	
7	Complete Flake Fragment	Basalt	0	Flacked	18	6	Feather	-	-	14	25	3	3	-	
8	Proximal Flake Fragment	Quartz	0	Flacked	14	4	Broken	-	-	12	23	4	2	-	
9	Distal Flake Fragment	Basalt	0	-	-	-	Hinged	-	-	12	11	2	2	-	
10	Distal Flake Fragment	Basalt	0	-	-	-	Hinged	-	-	11	8	4	2	-	
11	Medial Flake Fragment	Basalt	0	-	-	-	-	-	-	9	12	4	2	-	
12	Multiple Platform Core	Silcrete	0	-	-	-	-	-	-	65	45	28	-	-	LFS 35, Multidirectional
13	Complete Flake	Quartz	0	Flacked	26	9	Feather	-	-	21	37	11	3	-	
14	Complete Flake	Basalt	0	Flacked	17	8	Feather	-	-	32	22	6	4	-	
15	Distal Flake Fragment	Basalt	0	-	-	-	Feather	-	-	10	9	2	1	-	
16	Distal Flake Fragment	Quartz	0	-	-	-	Feather	-	-	16	22	5	3	-	
17	Complete Flake	Basalt	0	Focal	4	1	Feather	-	-	15	12	2	3	-	
18	Complete Flake	Basalt	0	Flacked	7	3	Feather	-	-	11	8	3	2	-	
19	Distal Flake Fragment	Basalt	0	-	-	-	Feather	-	-	7	10	1	2	-	
20	Proximal Flake Fragment	Basalt	50	Flacked	21	9	-	-	-	20	23	8	1	-	
21	Complete Flake	Quartz	0	Flacked	6	3	Step	-	-	19	15	7	2	-	
22	Complete Flake	Basalt	0	Flacked	16	3	Hinged	-	-	12	17	3	6	-	
23	Medial Flake Fragment	Basalt	70	-	-	-	-	Step	Right Lateral Margin	41	30	16	6	Scraper	

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
24	Distal Flake Fragment	Basalt	0	-	-	-	Hinged	-	-	16	25	3	2	-	Refits to artefact 26. Part of Knapping event.
25	Complete Flake	Basalt	0	Flacked	20	7	Feather	-	-	23	29	6	2	-	Part of Knapping event.
26	Lateral Flake Fragment	Basalt	0	-	-	-	Hinged	-	-	23	15	2	-	-	Refits to artefact 24. Part of Knapping event.
27	Proximal Flake Fragment	Basalt	0	Gull Winged	13	7	-	-	-	18	31	7	3	-	Part of Knapping event.
28	Distal Flake Fragment	Basalt	5	-	-	-	Feather	-	-	16	16	2	1	-	Part of Knapping event.
29	Complete Flake	Silcrete	0	Flacked	12	3	Feather	-	-	11	15	3	4	-	Part of Knapping event.
30	Proximal Flake Fragment	Quartz	0	Flacked	14	4	-	-	-	16	24	4	3	-	
31	Complete Flake	Basalt	0	Flacked	13	3	Step	-	-	14	13	6	3	-	
32	Complete Flake	Basalt	0	Flacked	5	2	Feather	-	-	38	11	3	4	Bladelett	
33	Proximal Flake Fragment	Basalt	0	Flacked	5	3	-	-	-	17	12	6	5	-	
34	Distal Flake Fragment	Basalt	0	-	-	-	Feather	-	-	17	10	4	2	-	
35	Complete Flake	Silcrete	0	Crushed	4	2	Feather	-	-	8	7	1	2	-	
36	Multiple Platform Core	Basalt	0	-	-	-	-	-	-	11	18	18	-	-	Total Exhausted Core, LFS 10
37	Complete Flake Fragment	Basalt	0	Retouched	-	-	Retouched	Scalar	Right Lateral Margin	10	9	4	1	Geometric Microlith	
38	Distal Flake Fragment	Basalt	5	-	-	-	Feather	-	-	26	37	7	6	-	
39	Distal Flake Fragment	Basalt	0	-	-	-	Feather	-	-	11	15	3	1	-	
40	Distal Flake Fragment	Basalt	0	-	-	-	Feather	-	-	8	5	2	1	-	
41	Single Platform Core	Basalt	0	-	-	-	-	-	-	34	22	11	10	-	LFS 22, Unidirectional
42	Complete Flake	Quartz	0	Flacked	12	4	Feather	-	-	16	24	6	4	-	
43	Complete Flake	Quartz	0	Flacked	10	6	Feather	-	-	23	19	7	4	-	
44	Distal Flake Fragment	Basalt	0	-	-	-	Feather	-	-	13	15	2	4	-	Weathered
45	Distal Flake Fragment	Basalt	0	-	-	-	Broken	-	-	36	25	5	4		Weathered
46	Medial Flake Fragment	Basalt	0	-	-	-	-	-	-	8	11	2	2	-	Weathered

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
47	Complete Flake	Basalt	0	Flacked	7	3	Feather	-	-	20	12	2	3	-	Weathered
48	Distal Flake Fragment	Quartz	0	-	-	-	Feather	-	-	5	12	1	-	-	
49	Longitudinal Flake Fragment	Basalt	0	Flacked	4	4	Hinged	-	-	16	13	4	4	-	Weathered. Refit to artefact 51.
50	Distal Flake Fragment	Basalt	5	-	-	-	Feather	-	-	49	22	10	2	Blade	
51	Proximal Flake Fragment	Basalt	0	Faceted	13	4	-	-	-	13	15	15	-	-	Refit to artefact 49.
52	Debris	Silcrete	-	-	-	-	-	-	-	18	-	-	-	-	
53	Debris	Silcrete	-	-	-	-	-	-	-	15	-	-	-	-	
54	Debris	Silcrete	-	-	-	-	-	-	-	10	-	-	-	-	
55	Debris	Silcrete	-	-	-	-	-	-	-	9	-	-	-	-	
56	Single Platform Core	Basalt	0	-	-	-	-	-		34	29	14			Unidirectional. LFS 23.
57	Distal Flake Fragment	Basalt	0	-	-	-	Feather	-	-	18	17	15	2	-	
58	Debris	Silcrete	-	-	-	-	-	-	-	14	-	-	-	-	
59	Debris	Silcrete	-	-	-	-	-	-	-	13	-	-	-	-	
60	Debris	Silcrete	-	-	-	-	-	-	-	12	-	-	-	-	
61	Distal Flake Fragment	Basalt	0	-	-	-	Feather	-	-	10	12	13	2	-	
62	Distal Flake Fragment	Basalt	0	-	-	-	Feather	-	-	12	11	4	2	-	
63	Medial Flake Fragment	Basalt	0	-	-	-	-	-	-	12	13	3	2	-	
64	Complete Flake	Quartz	0	Flacked	32	23	Feather	-	-	121	134	47	-		Also a multiple platform core LFS 45.
65	Multiple Platform Core	Basalt	0	-	-	-	-	-	-	42	35	23	-	-	Weathered. Multidirectional LFS 36

Table 48 OA12

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
1	Complete Flake	Crystal Quartz	5	Flacked	25	9	Feather	-	-	16	27	96	2	-	
2	Distal Flake Fragment	Quartz	0	-	-	-	Feather	-	-	10	19	6	2	-	

Table 49 OA13

ID No.	Type	Raw material	Cortex (%)	Platform type	Platform length (mm)	Platform width (mm)	Termination	Retouch type	Retouch location	Length (mm)	Width (mm)	Thickness (mm)	Flake scars	Tool type	Comment
1	Medial Flake Fragment	Quartz	0	-	-	-	-	-	-	15	10	4	-	-	