Australian Government

BUILDING OUR FUTURE

NSW GOVERNMENT

M12 Motorway Environmental Impact Statement

Appendix I Aboriginal Cultural Heritage Assessment Report

Roads and Maritime Services | October 2019

Contents

Tables

Figures

Executive Summary

Background

Roads and Maritime Services (Roads and Maritime) is seeking approval under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to construct and operate the M12 Motorway project to provide direct access between the Western Sydney Airport at Badgerys Creek and Sydney's motorway network (the project). The project has been determined to be a controlled action under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) (EPBC 2018/8286) for significant impact to threatened species and communities (Section 18 and Section 18A of the EPBC Act). As such, the project requires assessment and approval from the Commonwealth Government.

The M12 Motorway would run between the M7 Motorway at Cecil Hills and The Northern Road at Luddenham for a distance of about 16 kilometres and would be opened to traffic prior to opening of the Western Sydney Airport.

Purpose of this report

This report has been prepared to support the environmental impact statement (EIS) for the M12 Motorway project (the project). The EIS has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) for the project (SSI 9364) and to enable the NSW Minister for Planning and Public Spaces and the Commonwealth Minister of the Environment to make a determination on whether the project can proceed. The report presents an assessment of the construction and operational activities for the project that have the potential to impact Aboriginal cultural heritage.

This Aboriginal Cultural Heritage Assessment Report (ACHAR) also documents consultation with Aboriginal communities about the project in accordance with the NSW Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime Services (Roads and Maritime) 2011) and to fulfil the requirements of the SEARs for the project.

Steps in the consultation process included:

- Newspaper advertisements invited Aboriginal persons with relevant cultural knowledge to participate in the project. Respondents were listed as Registered Aboriginal Parties (RAPs)
- Representatives of Deerubbin and Gandangara Local Aboriginal Land Councils (LALC) participated in archaeological surveys of the detailed investigation area between July and October 2017 and provided comments on the Aboriginal cultural heritage values of the detailed investigation area
- RAPs took part in the first Aboriginal Focus Group (AFG) meeting held on 17 January 2018 and reviewed the draft methodology for the archaeological investigations undertaken for the project (see Annexure B). A draft archaeological survey report was provided to the RAPs for comment in December 2017 prior to the first AFG
- RAP site officers took part in a survey and archaeological test excavation program undertaken between February and June 2018
- A second AFG meeting was held on 7 August 2018 where the results of the test excavations and fieldwork were discussed
- An Indigenous design firm, Balarinji, also consulted RAPs for the purpose of developing community-endorsed Aboriginal design principles for the project. Balarinji participated in the second AFG in a consultation process which paralleled that undertaken for this assessment
- A third AFG meeting was held on 27 February 2019 where the results of the test excavations, the recommendation for salvage and the cultural values and significance assessment were discussed.

Knowledge holders are people who possess cultural or traditional knowledge. These individuals were identified by the RAPs and Balarinji and are people in the community who can provide information about cultural or traditional life, ceremonial sites, contact history and the impact of European land management practices on their lands and culture.

Overview of potential impacts

Archaeological potential

An initial desktop assessment identified 24 registered site records in the detailed investigation area. However, further interrogation of the locations described in the site cards reduced this to 15 registered sites within the detailed investigation area, comprising 14 stone artefact scatters and a Potential Archaeological Deposit (PAD). Eight of the 15 registered sites are located in the construction footprint. In addition, predictive modelling based on desktop assessments and previous archaeological reports identified 14 areas of PAD within the construction footprint.

Following archaeological survey, an additional site was identified within the construction footprint.

During test excavations, two of the 14 PADs were sub-divided based on differences in landform, soils and archaeological characteristics. Therefore, a total of 17 PADs have been considered within the detailed investigation area and investigated as part of the test excavation program.

Three areas associated with recorded sites have also been identified by the RAPs during field work as having high Aboriginal cultural heritage significance including:

- A small knoll immediately to the west of Badgerys Creek
- A large area on a rise and floodplain between Badgerys Creek and South Creek
- A prominent ridgeline overlooking the M7 motorway.

A total of 1404 stone artefacts were recovered during test excavations, along with a piece of ochre pencil and numerous stone manuports. The archaeological test excavation demonstrated the presence of Aboriginal flaked stone artefacts at 16 of the 17 PADs, demonstrating wide distribution of Aboriginal occupation across creek valleys and confirming their legal status as ‘Aboriginal sites’.

Following test excavations, a final number of 19 Aboriginal sites are located within the construction footprint. These 19 sites incorporate the three areas identified as having high Aboriginal cultural heritage significance. An additional seven Aboriginal sites are located outside of the construction area but within the detailed investigation area.

The sub-surface distribution of stone artefacts is very likely to extend beyond the areas sampled by the transect lines of test pits. The archaeological analysis revealed substantial variations in the distribution of cultural materials which are likely to reflect different cultural, subsistence and technological activities. Therefore, the term “Aboriginal site” in conventional use does not adequately describe the scale of the archaeological evidence found across 17 kilometres of creek valley landforms and the term ‘site complexes’ has been used instead to describe sites that occur in close proximity and appear to be associated with a specific landform feature, either creek or a ridgeline. Based on test excavations, five groups of sites (‘site complexes’) have been identified within the detailed investigation area.

Construction impacts

Impacts to Aboriginal cultural heritage during project construction are expected to result from ground disturbance works. It is assumed that all Aboriginal objects and any portion of the site boundary within the construction footprint would be subject to direct harm. The impacts to each site as a result of the project are discussed in **Section 8.3**. The three areas with high Aboriginal cultural significance and high cultural values areas located next to, or within, the project construction footprint are also expected to be impacted by the project.

Management measures have been developed with the aim of protecting Aboriginal sites from impacts or minimising the impacts on those sites occurring within the construction footprint, where feasible.

No additional Aboriginal sites are expected to be impacted as a result of project operation.

Summary of environmental management measures

Specific environmental management measures have been developed for each of the Aboriginal heritage items identified within the construction footprint. General requirements relating to the management and mitigation measures apply to:

- Impacts identified in **Chapter 8**
- Cultural values and assessed significance of each Aboriginal site
- Degree of impact to each Aboriginal site
- Need to address intergenerational equity in the experience of Aboriginal heritage
- Need to protect sites not impacted by the project but under the care of the proponent
- Need to mitigate the loss and disturbance of impacted Aboriginal sites.

Management of Aboriginal sites would include protection and salvage measures, development of a curation policy for salvaged Aboriginal objects and procedures for unexpected discovery of Aboriginal objects. Site specific management measures would be described in an Construction Cultural Heritage Management Plan (CCHMP) that would form part of the Construction Environmental Management Plan (CEMP) that would be developed for the project.

Conclusions

All of the Aboriginal sites in the construction footprint, including the three areas identified to be of high cultural and archaeological significance, would be significantly impacted by the project. This report outlines management measures for Aboriginal sites that may be impacted by the project, including protective measures to ensure that sites on the periphery of the construction footprint are not inadvertently impacted. These measures include protective fencing for 13 sites, salvage collection for nine sites and salvage excavations for eight sites to mitigate the irreversible loss of cultural value and scientific content.

Abbreviations and acronyms

AAR	Archaeological Assessment Report
ACHAR	Aboriginal Cultural Heritage Assessment Report
AFG	Aboriginal Focus Group
AHIMS	Aboriginal heritage information management system
AHIP	Aboriginal Heritage Impact Permit
BCE	Badgerys Creek East
BCW	Badgerys Creek West
BWB	Badgerys Creek West B
Code	Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW
CCE	Cosgroves Creek East
CCW	Cosgroves Creek West
CHR	Cecil Hills Ridge
CHRP	Cecil Hills Ridge PAD
DECCW	Department of Environment, Climate Change and Water NSW
DPIE	Department of Planning, Industry and Environment
EESG	Environment, Energy and Science Group of the Department of Planning, Industry and Environment
EIS	Environmental impact statement
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environment Protection and Biodiversity Act 1999
GTP	Geotechnical test pit
Jacobs	Jacobs Group (Australia) Pty Ltd
JAJV	Jacobs Arcadis Joint Venture
KCE	Kemps Creek East
KCW	Kemps Creek West
KNW	Kemps Creek North West
LALC	Local Aboriginal Land Council
NPW	National Parks and Wildlife Act 1974
NSW	New South Wales

OEH	Office of Environment and Heritage
PACHCI	Procedure for Aboriginal cultural heritage consultation and investigation
PAD	Potential archaeological deposit
RAP	Registered Aboriginal Party
RR	Range Road
SCE	South Creek East
SCW	South Creek west
SEARS	Secretary's environmental assessment requirements
SSI	State Significant Infrastructure
TfNSW	Transport for NSW
The project	M12 Motorway
TP	Test pit
TNR	The Northern Road

1. Introduction

1.1 Background

Roads and Maritime Services (Roads and Maritime) is seeking approval under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to construct and operate the M12 Motorway project to provide direct access between the Western Sydney Airport at Badgerys Creek and Sydney's motorway network (the project). In addition, the project has been determined to be a controlled action under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) (EPBC 2018/8286) for significant impact to threatened species and communities (Section 18 and Section 18A of the EPBC Act). As such, the project requires assessment and approval from the Commonwealth Government.

The M12 Motorway would run between the M7 Motorway at Cecil Hills and The Northern Road at Luddenham for a distance of about 16 kilometres and would be opened to traffic prior to opening of the Western Sydney Airport. The project would commence about 30 kilometres west of the Sydney central business district, at its connection with the M7 Motorway. The project traverses the local government areas of Fairfield, Liverpool and Penrith. The suburbs of Cecil Park and Cecil Hills are found to the east of the M12 Motorway, with Luddenham to the west.

The project is predominately located in greenfield areas. The topography in and around the project comprises rolling hills and small valleys between generally north–south ridge lines. The existing land uses are semi-rural residential, recreational, agricultural, commercial and industrial. The main residential areas are Kemps Creek, Mount Vernon and Cecil Hills.

The project is required to support the opening of the Western Sydney Airport by connecting Sydney's motorway network to the airport. The project would also serve and facilitate the growth and development of the Western Sydney which is expected to undergo significant development and land use change over the coming decades. The motorway would provide increased road capacity and reduce congestion and travel times in the future and would also improve the movement of freight in and through western Sydney.

The project location is shown in **Figure 1-1** in relation to its regional context.

1.2 Project overview

The project would include the following key features:

- A new dual-carriageway motorway between the M7 Motorway and The Northern Road with two lanes in each direction with a central median allowing future expansion to six lanes
- Motorway access via three interchanges/intersections:
  - A motorway-to-motorway interchange at the M7 Motorway and associated works (extending about four kilometres within the existing M7 Motorway corridor)
  - A grade separated interchange referred to as the Western Sydney Airport interchange, including a dual-carriageway four lane airport access road (two lanes in each direction for about 1.5 kilometres) connecting with the Western Sydney Airport Main Access Road
  - A signalised intersection at The Northern Road with provision for grade separation in the future
- Bridge structures across Ropes Creek, Kemps Creek, South Creek, Badgerys Creek and Cosgroves Creek
- Bridge structure across the M12 Motorway into Western Sydney Parklands to maintain access to the existing water tower and mobile telephone/other service towers on the ridgeline in the vicinity of Cecil Hills, to the west of the M7 Motorway
- Bridge structures at interchanges and at Clifton Avenue, Elizabeth Drive, Luddenham Road and other local roads to maintain local access and connectivity
- Inclusion of active transport (pedestrian and cyclist) facilities through provision of pedestrian bridges and an off-road shared user path including connections to existing and future shared user path networks
- Modifications to the local road network, as required, to facilitate connections across and around the M12 Motorway including:
  - Realignment of Elizabeth Drive at the Western Sydney Airport, with Elizabeth Drive bridging over the airport access road and future passenger rail line to the airport
  - A realignment of Clifton Avenue over the M12 Motorway, with associated adjustments to nearby property access
  - Relocation of Salisbury Avenue cul-de-sac, on the southern side of the M12 Motorway

  - Realignment of Wallgrove Road north of its intersection with Elizabeth Drive to accommodate the M7 Motorway northbound entry ramp
- Adjustment, protection or relocation of existing utilities
- Ancillary facilities to support motorway operations, smart motorways operation in the future and the existing M7 Motorway operation, including gantries, electronic signage and ramp metering
- Other roadside furniture including safety barriers, signage and street lighting
- Adjustments of waterways, where required, including Kemps Creek, South Creek and Badgerys Creek
- Permanent water quality management measures including swales and basins
- Establishment and use of temporary ancillary facilities, temporary construction sedimentation basins, access tracks and haul roads during construction
- Permanent and temporary property adjustments and property access refinements as required.

The key features of the project are shown in **Figure 1-2**.

The project overview presented in this document represents the design outlined in the M12 Motorway EIS. If the project is approved, a further detailed design process would follow, which may include variations to the design. Flexibility has been provided in the design to allow for refinement of the project during detailed design, in response to any submissions received following the exhibition of the environmental impact statement (EIS), or if opportunities arise to further minimise potential environmental impacts.

1.3 Purpose and scope of this report

This report has been prepared to support the EIS for the project. The EIS has been prepared to address the SEARs for the project (SSI 9364) and to enable the NSW Minister for Planning and Public Spaces and the Commonwealth Minister of the Environment to make a determination on whether the project can proceed. The report presents an assessment of the construction and operational activities for the project that have the potential to impact Aboriginal cultural heritage.

The rest of the chapters of this report are set out as follows:

Chapter 2	This chapter outlines the legislative and policy framework relevant to the investigation of Aboriginal heritage in New South Wales.
Chapter 3	This chapter presents the assessment methodology undertaken for this assessment and includes a summary of the Archaeological Assessment Report prepared for the project. Each section describes the desktop archaeological research, fieldwork and analysis that have been conducted in support of this report. While the AAR focuses solely on the archaeological (scientific) investigation, this report covers both cultural and scientific values.
Chapter 4	This chapter presents an overview of the consultation process undertaken with the Aboriginal community in relation to the project. Consultation was undertaken pursuant to Stage 3 of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) (Roads and Maritime 2011).
Chapter 5	This chapter details the background context relied upon as part of this investigation, including environmental information (geology, soils, climate and vegetation) as well as a discussion of ethnographic data.
Chapter 6	This chapter outlines the Aboriginal cultural values relating to the detailed investigation area. This information has been sourced directly from the Registered Aboriginal Parties (RAPs).
Chapter 7	This chapter assesses the heritage significance of the identified Aboriginal sites assessed as part of this report using the NSW heritage significance criteria.
Chapter 8	This chapter assesses the project's direct and indirect impact on identified Aboriginal sites and PADs and their significance. It also assesses the cumulative impacts of the project on Aboriginal sites in the detailed investigation area.
Chapter 9	This chapter discusses the cumulative impacts that have been considered in the impact assessment of the project.
Chapter 10	This chapter discusses a range of proposed environmental management measures to mitigate impact by the project on the Aboriginal sites within the detailed investigation area.

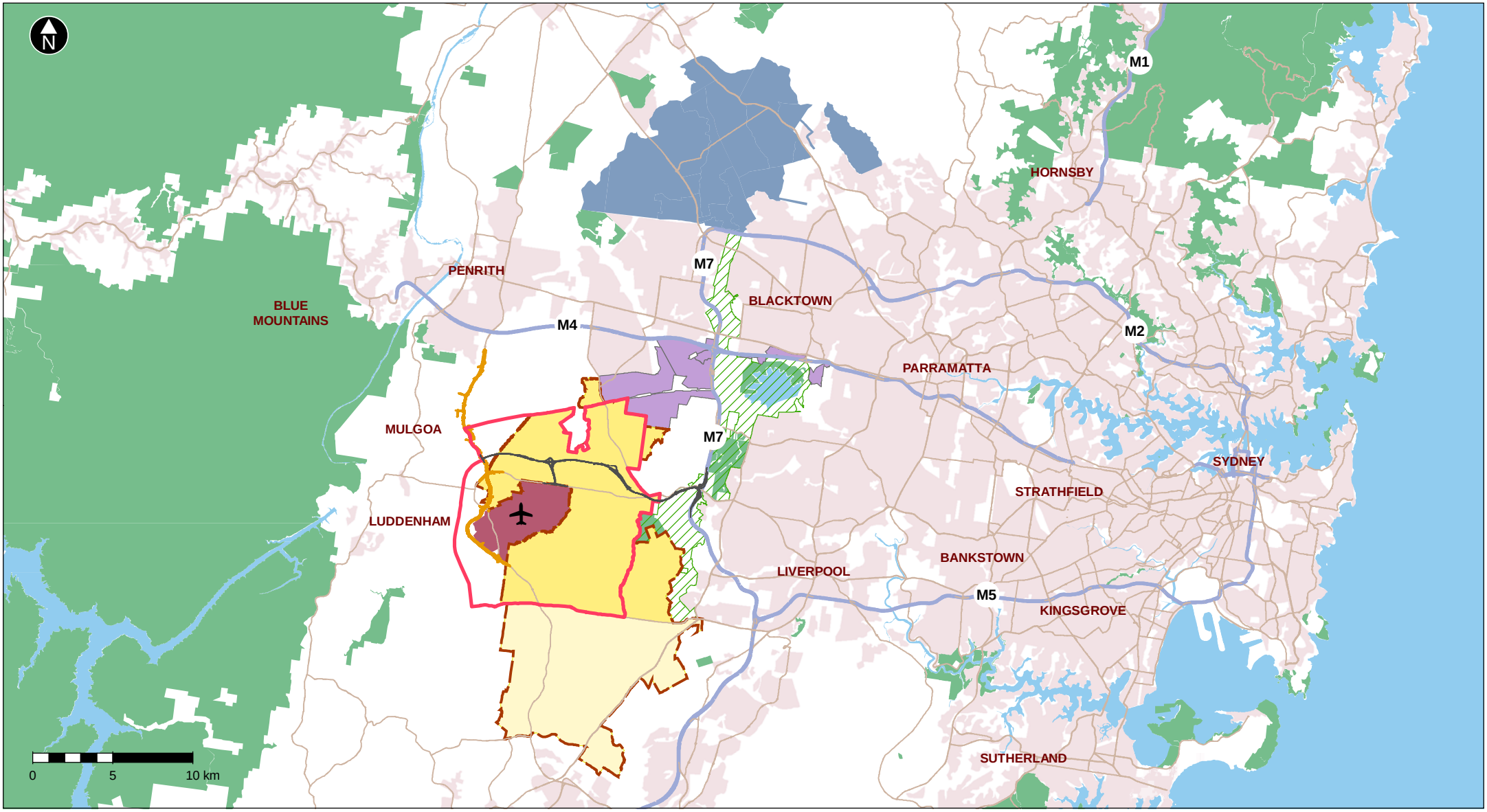

Figure 1-1 Project location (regional context)

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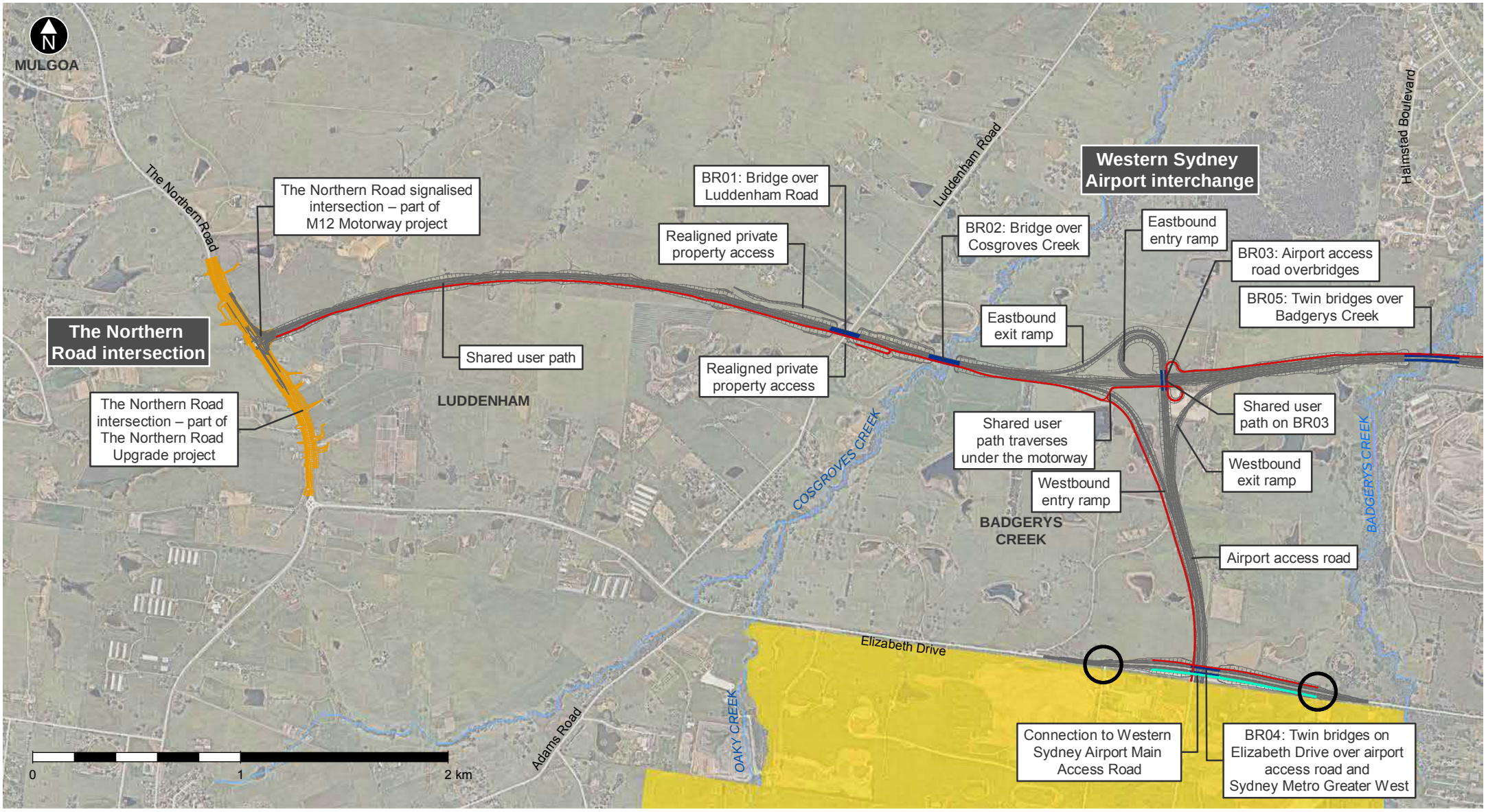

Figure 1-2 Key features of the project

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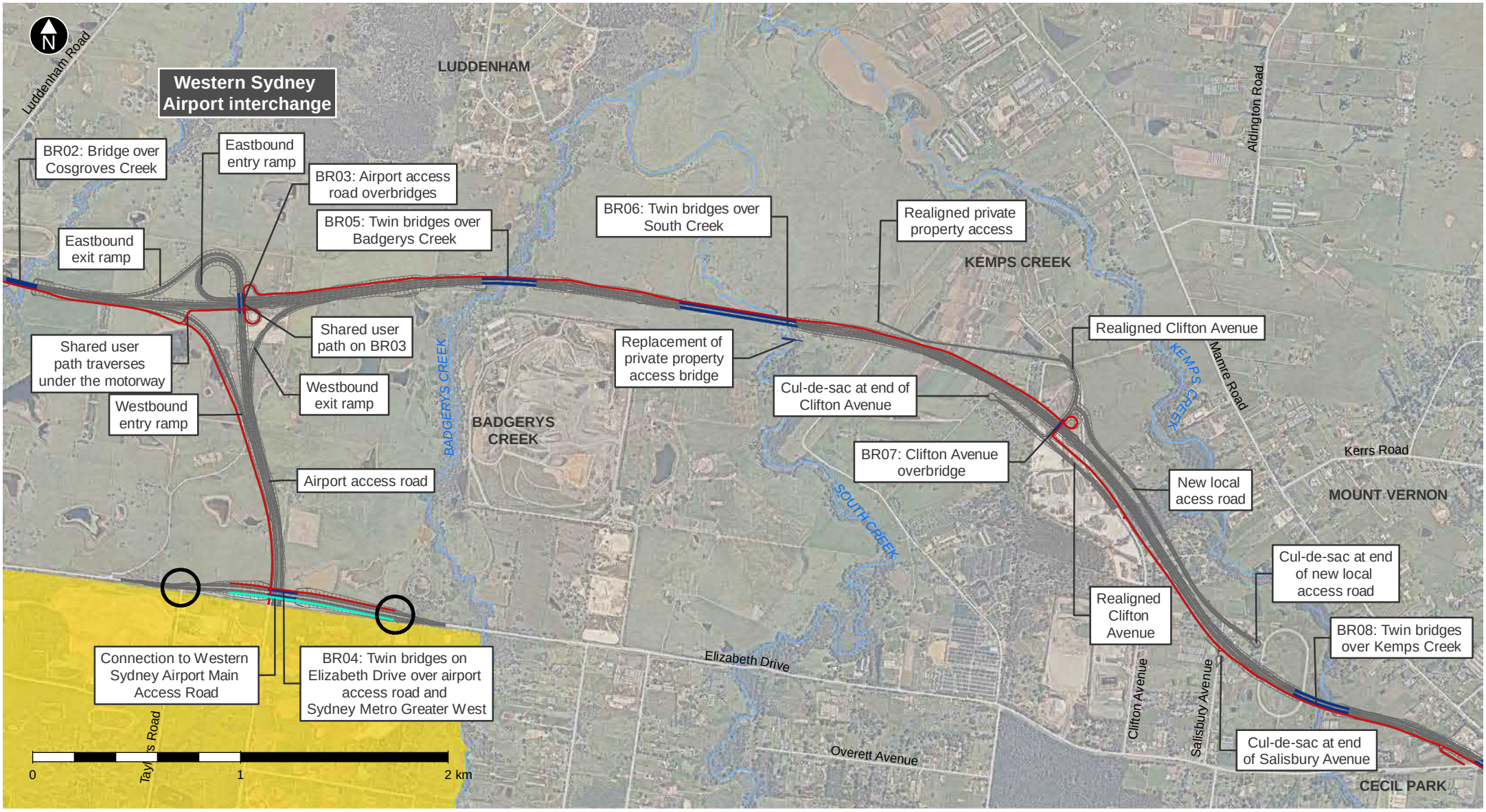


The project

Part of The Northern Road upgrade project

Shared user path

Future shared user path (by others)

Existing roads

Waterways

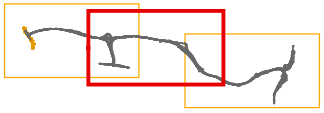
Bridges

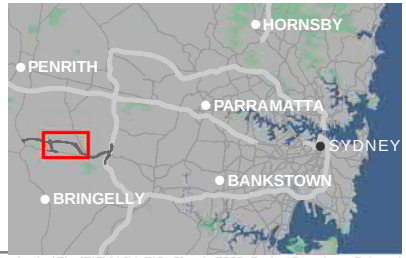
Western Sydney Airport

Note. The roads within this zone are being removed as part of airport construction.

Potential future intersections (by others)

Note: Locations to be confirmed





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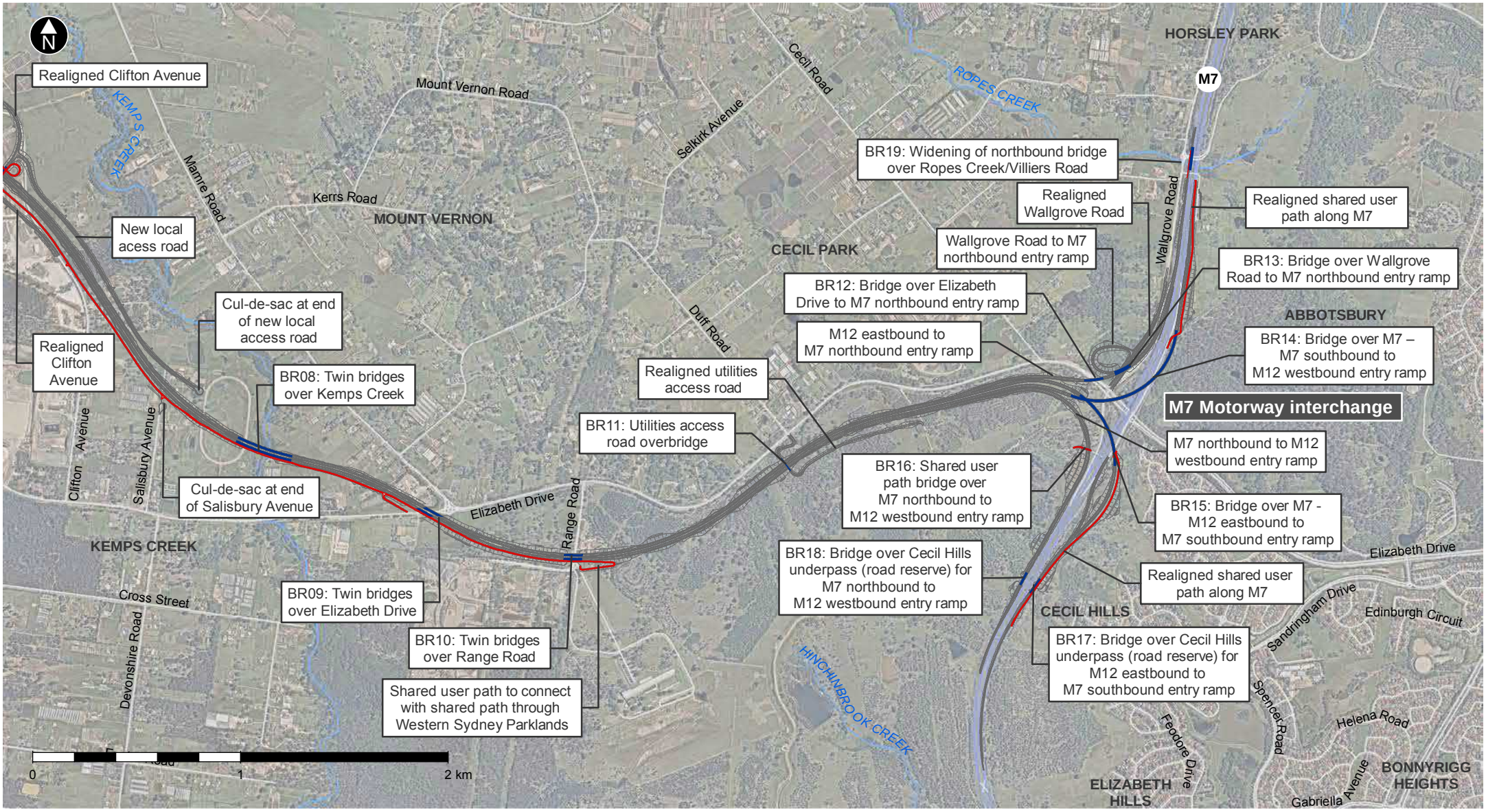

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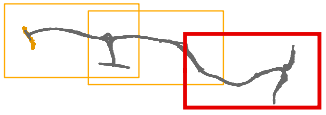

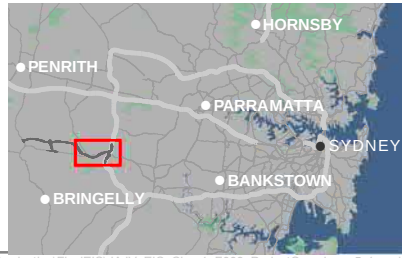

Figure 1-2 Key features of the project

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1.4 Objectives

This Aboriginal Cultural Heritage Assessment Report (ACHAR) incorporates an Aboriginal archaeological assessment and an assessment of Aboriginal cultural heritage values for the study area. This study area relating to the assessment is described in **Section 3.2**.

The objectives of the Aboriginal cultural heritage assessment are to:

- Identify the Aboriginal cultural heritage values within the study area which may include:
  - The sites of known Aboriginal objects within the study area
  - Archaeologically sensitive areas where Aboriginal objects are likely to occur in subsurface deposits
  - Non-tangible Aboriginal heritage values
- Define the extent, character and cultural significance of Aboriginal sites within the study area
- Identify the potential development impacts on Aboriginal cultural heritage values
- Define appropriate management measures on the basis of relevant legislation and significance of the sites identified.

1.5 SEARs

On 30 October 2018, the Secretary of the NSW Department of Planning and Environment issued to Roads and Maritime the SEARs for the M12 Motorway Environmental Impact Statement. The SEARs include the Commonwealth requirements under the Environment Protection and Biodiversity Conservation Act (Commonwealth) (EPBC Act). **Table 1-1** lists those requirements relating specifically to the assessment of the project's potential impacts on Aboriginal cultural heritage, with a reference to the chapter or section of this report where each requirement is addressed.

Table 1-1 SEARs (Aboriginal cultural heritage)

Secretary's requirement	Where addressed in this report
10. Heritage	
1. The Proponent must identify and assess any direct and/or indirect impacts (including cumulative impacts) to the heritage significance of: a) Aboriginal places and objects, as defined under the *National Parks and Wildlife Act 1974* and in accordance with the principles and methods of assessment identified in the current guidelines;	**Chapter 8** and **Chapter 9**
b) Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan;	No Aboriginal Places or sites of Aboriginal heritage significance are gazetted within the detailed investigation area in the Fairfield LEP 2013, Liverpool LEP 2008 and Penrith LEP 2010 (see **Section 3.3**) Appendix J of the EIS.
c) environmental heritage, as defined under the *Heritage Act 1977*; and	Appendix J of the EIS
d) items listed on the National and World Heritage lists.	**Section 3.3** and **Chapter 8**
2. Where impacts to State or locally significant heritage items are identified, the assessment must	
a) include a significance assessment and statement of heritage impact for all heritage items including the Fleurs Radio Telescope Site and the McGarvie-Smith Farm Site (including significance assessment);	**Chapter 7** and Appendix J of the EIS
b) consider impacts to the item of significance caused by, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment (as relevant)	**Chapter 8** and Appendix J of the EIS

Secretary's requirement	Where addressed in this report
c) outline measures to avoid and minimise those impacts in accordance with the current guidelines; and	**Chapter 10** and Appendix J of the EIS
d) be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria).	Appendix J of the EIS
3. Where archaeological investigations of Aboriginal objects are proposed these must be conducted by a suitably qualified archaeologist, in accordance with section 1.6 of the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010c).	**Chapters 7**, **9**, **10** and **Annexure C**
4. Where impacts to Aboriginal objects and/or places are proposed, consultation must be undertaken with Aboriginal people in accordance with the current guidelines.	**Chapter 4** and **Annexure A**

1.6 Authorship

This report was authored by:

- Andrew Costello (Senior Consultant, Jacobs). Andrew holds a Bachelor of Arts (Honours) from the University of Melbourne and has over 14 years of experience as an archaeologist and cultural heritage advisor
- Neville Baker (Director, Baker Archaeology). Neville Baker (Director, Baker Archaeology) Neville holds a Bachelor of Arts (Honours) degree in anthropology and prehistory from the University of Sydney and over 30 years of experience as an archaeologist and over 25 years as a consultant archaeologist
- Gary Dunnett (Senior Archaeologist, Baker Archaeology). Gary has a Bachelor of Arts (Honours) degree in prehistory and historical archaeology from the University of Sydney. He has more than 25 years of experience in State and Commonwealth agencies managing Aboriginal and historic places of State, National and World Heritage status
- Chelsea Jones (Graduate Archaeologist, Jacobs). Chelsea holds a Bachelor of Arts (Honours) from the University of Queensland and has two years of experience as an archaeologist.

The report was reviewed by Dr David Collard (Senior Consultant, Jacobs). David holds a Doctor of Philosophy in Archaeology from the University of Nottingham, a Master of Arts in Archaeology from the University of Melbourne and has over 10 years of experience as an archaeologist and cultural heritage advisor.

2. Policy and planning setting

This chapter describes the State and Commonwealth legislation, policies and guidance documents that are relevant to the Aboriginal cultural heritage assessment for the project, and which have guided the scope of the assessment in compliance with the SEARs.

The following State and Commonwealth legislation is relevant to the Aboriginal cultural heritage assessment:

- NSW legislation:
  - *Environmental Planning and Assessment Act 1979* (EP&A Act)
  - *National Parks and Wildlife Act 1974* (NPW Act)
  - *Native Title Act 1994*
  - *Heritage Act 1977*
  - *Aboriginal Land Rights Act 1983*
- Commonwealth legislation:
  - *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
  - *Environment Protection and Biodiversity Conservation Act 1999*
  - *Native Title Act 1993.*

A summary of these Acts and associated other regulatory documents including relevant guidance documents that govern the project are described in **Table 2-1** and **Table 2-2.**

Table 2-1 Summary of relevant NSW legislation, codes of practice, procedures and guidelines

Reference	Requirements
Environmental Planning and Assessment Act (EP&A Act)	The EP&A Act provides the framework for environmental planning and assessment in NSW. This act includes requirement for impacts or likely impacts upon Aboriginal cultural heritage to be assessed as part of a project's environmental approval. Local environmental plans (LEPs) and development control plans are prepared in accordance with the EP&A Act to provide guidance on the level of environmental assessment required at a local level. The project traverses the local government areas of Fairfield, Liverpool and Penrith. There are no Aboriginal places of significance in the detailed investigation area gazetted in the LEPs. The project is designated SSI and requires environmental assessment in accordance with Part 5, Division 5.2 of this Act. A range of approvals are therefore not required under Part 5, Division 5.2, section 5.23, including relevantly the requirement for a section 90 Aboriginal Heritage Impact Permit (AHIP) under the NPW Act. For a Part 5, Division 5.2 project, any investigative or other activities that are required to comply with the SEARs in connection with the application for approval are also exempt from requiring an AHIP.
National Parks and Wildlife Act 1974 (NPW Act)	The NPW Act provides for the protection of Aboriginal objects and Aboriginal places. Under Section 5 (1) of the NPW Act, an Aboriginal object is defined as: *'any deposit, object or material evidence (not being a handicraft for sale) relating to indigenous and non-European habitation of the area that comprises New South Wales, being habitation both prior to and concurrent with the occupation of that area by persons of European extraction, and includes Aboriginal remains'.* In accordance with Division 5.2 of the EP&A Act, an AHIP is not required for State Significant Infrastructure under Section 90 of the NPW Act. Procedures and regulations that accompany the NPW Act include: • Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (Office of Environment and Heritage (OEH) 2011) • Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales 2010 (Department of Environment, Climate Change and Water (DECCW 2010b)

Reference	Requirements
	• Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (hereafter referred to as 'ACHCRP') (DECCW 2010b) • Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW 2010 (hereafter referred to as the 'Code') (DECCW 2010a). The SEARs for the project require that Aboriginal heritage assessment "shall be undertaken generally consistent with the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) and related guidelines and requirements."
Native Title Act 1994	The *Native Title Act 1994* was introduced to ensure that the laws of NSW are consistent with the Commonwealth *Native Title Act 1993*. Native Title holders or registered Native Title claimants must be consulted in accordance with the NSW *Native Title Act 1994*. The ACHCRP stipulates that where relevant, consultation must be conducted with Native title holders or registered native title claimants in accordance with the NSW *Native Title Act 1994.* The project would not be undertaken in an area covered by any identified Native Title claims.
Heritage Act 1977	The *Heritage Act 1977* (the Heritage Act) is administered by NSW Office of Environment and Heritage and protects the states' natural and cultural heritage. Aboriginal heritage is primarily protected under the NPW Act but may be subject to the provisions of the Heritage Act if the item is listed on the State Heritage Register or subject to an interim heritage order (IHO). The Heritage Act protects items listed on the State Heritage Register (SHR). Where Aboriginal heritage sites or places are listed in the SHR they may be subject to the provisions of the Heritage Act. There are currently no items of Aboriginal heritage significance within the searched area (where the project would be undertaken) that are listed on the State Heritage Register or subject to an IHO.
Aboriginal Land Rights Act 1983	The Aboriginal Land Rights Act 1983 recognises the rights of Aboriginal people in NSW and provides a vehicle for the expression of self-determination and self-governance. The purposes of the Act are to: • Provide land rights for Aboriginal persons in NSW • Provide for representative Local Aboriginal Land Councils (LALCs) in NSW • Vest land in those LALCs • Provide for the acquisition of land, and the management of land and other assets and investments, by or for those LALCs and the allocation of funds to and by those LALCs • Provide for the provision of community benefit schemes by or on behalf of those LALCs. Aboriginal owners must be consulted in accordance with the *Aboriginal Land Rights Act 1983*. The ACHCRP stipulates that where relevant, consultation must be conducted with Aboriginal owners in accordance with the *Aboriginal Land Rights Act (NSW) 1983.* There are currently no known Aboriginal land claims in the detailed investigation area.
National parks & Wildlife Regulation 2009	The National Parks and Wildlife (NPW) Regulation 2009 (cl.80A) assigns the various Codes of Practice for the management of Aboriginal heritage in NSW. Due diligence may be demonstrated by following requirements described in the NPW Regulation or a code of practice adopted or prescribed by the NPW Regulation (s.87(3)). Consultation with the Aboriginal community representatives in accordance with clause 80C of the NPW Regulation 2009.

Reference	Requirements
Procedure for Aboriginal cultural heritage consultation and investigation (Roads and Maritime 2011)	The Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI) (Roads and Maritime 2011) provides guidance on the process of investigation and assessment of Aboriginal heritage values for Roads and Maritime projects, in accordance with relevant legislation and guidance documents. The PACHCI outlines a four-stage process for investigating potential impacts to Aboriginal cultural heritage as a result of Roads and Maritime road planning, development, construction and maintenance activities. While the full PACHCI involves four stages, projects that can avoid impacts to Aboriginal cultural heritage may only be required to complete the first few stages of the procedure. This assessment has been undertaken in accordance with this procedure. This includes a process of community consultation that aims to ensure that the role, function and views of Aboriginal people are respected by Roads and Maritime. The four stages outlined in the procedure are discussed in more detail in **Chapter 4**.
Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011)	This document provides guidelines for the investigation and assessment of Aboriginal cultural heritage under part 6 of the NPW Act to explore the harm of a proposed activity on Aboriginal objects and declared Aboriginal places and to clearly set out which impacts are avoidable and which are not. The document provides: • Guidance on the process for investigation and assessing Aboriginal cultural heritage in NSW • Environment, Energy and Science Group (EESG) of the Department of Planning, Industry and Environment (DPIE) requirements for an ACHAR. This assessment has been undertaken with consideration of the provisions outlined in this document.
Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010a)	The ACHCRP outlines the requirements for consultation with Aboriginal stakeholders during heritage assessment and/or applications for an AHIP as mandated by clause 80C in the *National parks & Wildlife Regulation 2009*. It describes the following four stages with mandatory timeframes: 1. Notification of project proposal and invitation to register interest (14 days for receipt of registrations) 2. Presentation of information about the proposed project 3. Gathering information about cultural significance (28 days for comments) 4. Review of draft cultural heritage assessment report (28 days for comments). This assessment has been undertaken with consideration of the provisions outlined in this document.
Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010b)	This document outlines the requirements for archaeological investigations of Aboriginal objects in NSW for activities that require approval under the EP&A Act. It sets out: • An AHIP is not required for test excavations that comply with the code. • Minimum qualifications for anyone undertaking archaeological investigation under the code in NSW • Assessment steps to be undertaken for all archaeological investigation • Analytical steps to characterise the Aboriginal objects being investigated. This assessment has been undertaken with consideration of the provisions outlined in this document.
Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW, 2010c)	This code of practice sets out a process for individuals and organisations to follow to determine whether an Aboriginal object would be harmed by an activity, whether further investigation is needed, and whether the application to harm requires an AHIP.

Table 2-2 Summary of relevant Commonwealth legislation

Reference	Requirements
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	This Act provides for the protection of Aboriginal cultural property including places, objects and folklore that 'are of particular significance to Aboriginals in accordance with Aboriginal tradition'. The Act may apply to contemporary Aboriginal cultural property as well as ancient sites. The Minister may make a declaration under Section 10 in situations where state or territory laws do not provide adequate protection of heritage places.
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The EPBC Act provides for the protection of the environment, particularly matters of national environmental significance. The Act also aims to recognise the role of Indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity, and to promote the use of Indigenous peoples' knowledge of biodiversity with the involvement of, and in cooperation with, the owners of the knowledge. An independent expert body, the Australian Heritage Council, advises the Minister on the listing and protection of heritage places. In terms of heritage, protected matters include: • Places on the National Heritage List • Places on the Commonwealth Heritage List. There are no Aboriginal heritage items in the detailed investigation area that are registered on the National or Commonwealth lists.
Native Title Act 1993	This Act recognises and protects Native Title in Australia. The National Native Title Tribunal (NNTT) maintains the following registers: • National Native Title Register • Register of Native Title Claim • Unregistered claimant applications • Register of Aboriginal land use agreements. The ACHCRP stipulates that consultation must be conducted with Native Title holders or registered Native Title claimants. The project would not be undertaken in an area covered by any identified Native Title claims.
Australia ICOMOS Charter for Places of Cultural Significance 2013 (Burra Charter) (Australia ICOMOS 2013).	The Burra Charter provides guidance for the conservation and management of places of cultural significance (cultural heritage places). The Charter sets a standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance, including owners, managers and custodians. This Aboriginal cultural heritage assessment addresses Article 1.2 of the Charter which states that *Cultural significance* means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects. Places may have a range of values for different individuals or groups.

3. Assessment methodology

This section summarises the archaeological carried out to inform the cultural heritage assessment. Full details of the archaeological assessment can be found in the Archaeological Assessment Report (AAR) which accompanies this document (see **Annexure C**).

3.1 Overview

The methods to assess impacts to Aboriginal heritage in NSW are set out in the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011). The methods undertaken to assess the projects' potential impacts to Aboriginal cultural heritage include:

- Desktop assessment of the study area, including a search of the Aboriginal Heritage Information Management System (AHIMS), and a review of Aboriginal site data and relevant available reports, undertaken June 2017.
  - Databases and previous archaeological investigations relevant to the study area were reviewed to extract information about the types, distribution and characteristics of Aboriginal cultural materials across the detailed investigation area. The desktop assessment also helped to identify any gaps in the coverage of previous assessments.
  - Baseline data for this assessment was predominately based from data in the M12 Motorway Strategic Route Options analysis (Aurecon 2016).
  - The information that was derived from the review enabled the development of a predictive model of site distributions in the detailed investigation area (see **Section 3.3**).
- Review of relevant landscape characteristics associated with patterning, preservation and discovery of Aboriginal sites, undertaken August 2017 (see **Section 3.4** and **Section 3.7**)
- Archaeological survey of the detailed investigation area (defined in **Section 3.2** below), conducted between July and September 2017 with representatives from the Deerubbin and Gandangara Local Aboriginal Land Councils (see **Section 3.6**)
- Consultation with the Aboriginal community representatives in accordance with ACHCRP, undertaken October 2017 – February 2019 (see **Chapter 4**)
- Archaeological assessment including field inspection and test excavations within the detailed investigation area in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b) undertaken February – June 2018 (see **Section 3.7**)
  - Existing data on the archaeological characteristics of the Cumberland Plain suggest that the distribution of surface exposed sites is poorly correlated with the distribution of Aboriginal objects in subsurface deposits. For this reason, an essential component of the archaeological assessment was a program of subsurface testing to reveal relationships between landforms soils and site distributions. A detailed methodology is provided in **Annexure B** and further described in Section 7.1 and Section 8.2 of **Annexure C**.
- Significance assessment in accordance with *The Australia ICOMOS Burra Charter* (ICOMOS Australia 2013) and the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) (see **Chapter 7**)
- Assessment of impacts to items/areas identified in the desktop assessment and verified through surveys and test excavations and of management measures to minimise impacts. in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (DECCW 2011) (see **Chapter 8**)
- Development of management measures in accordance with relevant legislation and guidelines to assess impacts to Aboriginal cultural heritage, primarily to seek to avoid impacts and/or secondarily to mitigate them (see **Chapter 10**).

3.2 Study area

This assessment has primarily investigated potential Aboriginal cultural heritage values that have the potential to be impacted by the project. The following areas were therefore identified for the purpose of the assessment (as presented on **Figure 3-1**).

In this report:

- Construction footprint: Defined as the zone in which construction activities would take place. The boundaries of this area shifted slightly during the assessment period, to the extent that some sections of the footprint are shown outside of the detailed investigation area as defined in this report. While outside the defined detailed investigation area, these sections of the construction footprint have been considered within the impact assessment.
- Detailed investigation area: Refers to the area where detailed investigations were undertaken as part of the archaeological assessment which covered an area that may be subject to ground disturbance. This area was set prior to confirmation of the design outlined in the M12 Motorway EIS and explains why the construction footprint extends beyond the detailed investigation area in some locations.
- Broader study area: Area surrounding the detailed investigation area (and including the detailed investigation area) that was investigated as part of the desktop assessment, hereafter referred to as the 'study area'. This area was selected to include comparable archaeological situations in similar environmental settings along the greater South Creek catchment and the Mulgoa Creek headwaters.

Some of the desktop investigations included regional studies which are not shown in **Figure 3-1**.

3.3 Desktop Assessment

3.3.1 Heritage register and database search results

A search of three LEPs relevant to the detailed investigation area in June 2017 indicated that no Aboriginal Places or sites of Aboriginal heritage significance are gazetted in the detailed investigation area.

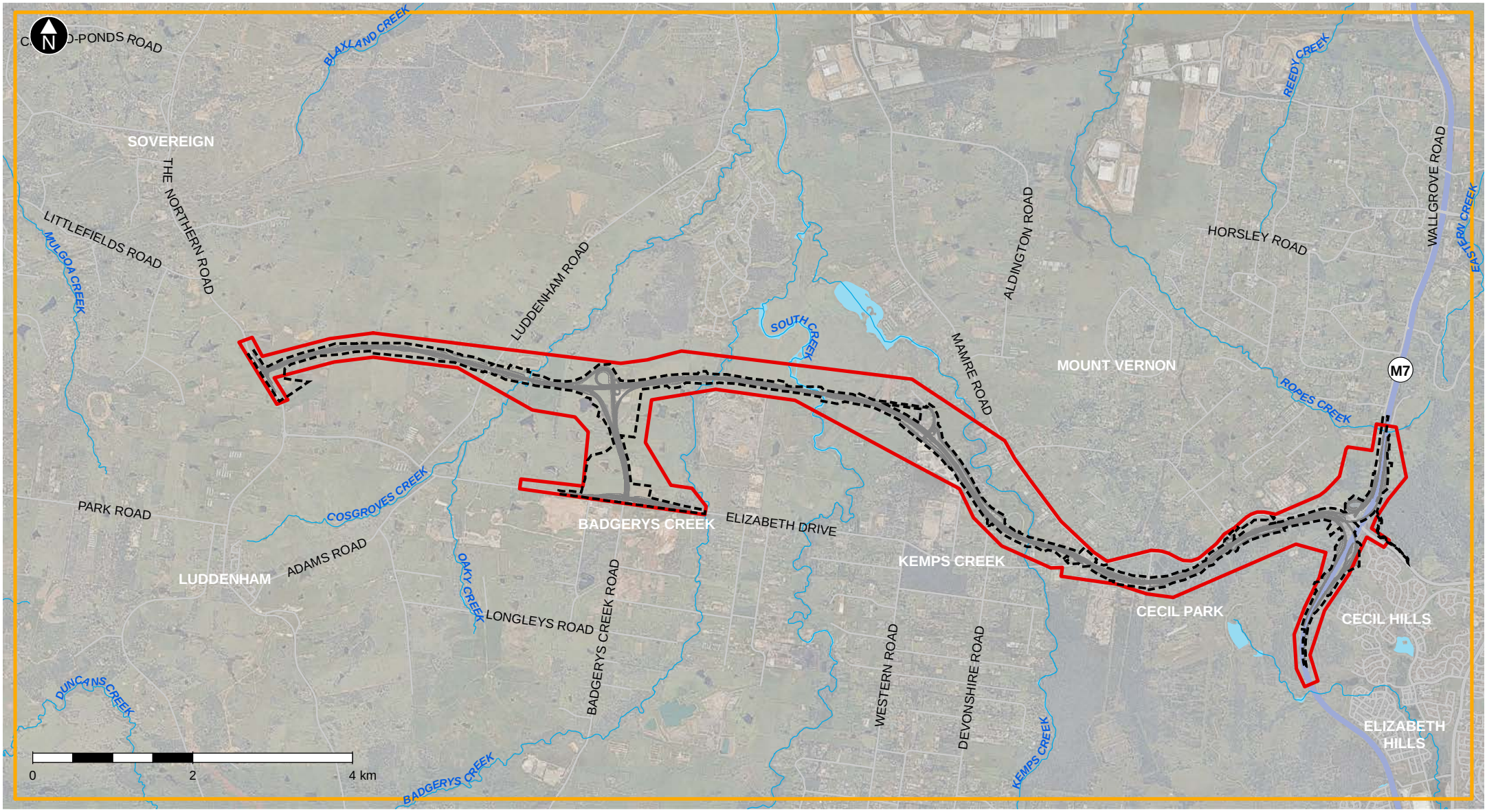
A search of the Commonwealth's lists of National and World Heritage sites in June 2017 identified no sites in or near the detailed investigation area.

Section 89A of the NPW Act requires that un-recorded Aboriginal objects or sites must be notified to by the EESG. Information on gazetted Aboriginal Places and recorded Aboriginal sites and objects is contained in AHIMS, a database managed by EESG. A search of registered AHIMS sites within a two kilometre buffer of the detailed investigation area was conducted on 14 June 2017. This buffer was used to accommodate errors in site mapping and maximise the capture of potentially relevant information.

The AHIMS search identified 24 site records in the detailed investigation area. However, further interrogation of the locations described in the site cards reduced this to 15 registered sites, comprising 14 stone artefact sites and a PAD, of which eight are located in the construction footprint. The reasons for the discrepancy in AHIMS site records include duplicate site records, incorrect mapping and the loss of sites from earlier developments. Specifically:

- The recorded coordinates for AHIMS 45-5-4049, a PAD, are incorrect. The described location indicates that the site is located 9.3 kilometre to the south of the detailed investigation area
- The recorded coordinates for AHIMS 45-5-2748, a scarred tree, are incorrect. The described location indicates that the site was located 180 metre to the east of the detailed investigation area in a farm dam
- AHIMS 45-5-2468, 45-5-2476, 45-5-2477 and 45-5-2722 have been destroyed by M7 Motorway construction
- AHIMS 45-5-0496, 45-5-0528 and 45-5-4937 are duplicate records of 45-5-4749, 45-5-4750 and 45-5-4007 respectively.

Table 3-1 describes the registered sites within the construction footprint and **Table 3-2** describes registered sites that are outside the construction footprint but within the detailed investigation area. The locations of the 15 registered sites (as per the AHIMS site cards) are shown in **Figure 3-14**. It should be noted that some of the 8 registered Aboriginal sites within the construction footprint are mapped outside the project construction footprint due to incorrect mapping or the site boundary being greater that the point marker represented by AHIMS. These issues have been assessed and adjusted in **Figure 3-16**.



Detailed investigation area

The project construction footprint

The project

Waterways

Broader study area

Figure 3-1 Site location showing broader study area for this assessment

Date: 1/07/2019 Path: J:\IE\Projects\04_Eastern\IA145100\08 Spatial\GIS\Directory\Templates\MXDs\Figures\EIS\SpecialistReports\AbHeritage\ACHAR\FinalEIS\JAJV_EIS_F010_AbHer_ACHAR_SiteLocation_r4v1.mxd
Created by : AA | QA by : CJ/NB

These AHIMS search results are typical of the Cumberland Plain, where stone artefact sites are the overwhelmingly dominant site type. The presence of a grinding groove site, 45-5-0215, 270 metres south of the detailed investigation area near the west bank of South Creek, is rare, reflecting an isolated outcrop of Minchinbury sandstone.

Table 3-1 Registered AHIMS sites inside the construction footprint

AHIMS number	Site description
45-5-2308	Eleven flaked stone artefacts were recorded along an eroded fire trail on a narrow ridge top within what is now the Western Sydney Parklands at Cecil Hills.
45-5-3804	A single silcrete flaked piece recorded on an interfluve between two first order drainage lines in a paddock near Luddenham. The artefact was exposed by an erosion scar at the base of a tree. The artefact could not be found during an inspection in 2017.
45-5-4747	Three stone artefacts recorded in a vehicle track exposure on an elevated ridge on the western side of Badgerys Creek. The artefacts were re-located in 2017.
45-5-4748	A single silcrete flake recorded on the Badgerys Creek eastern alluvial floodplain at the base of a tree. The artefact could not be found during an inspection in 2017.
45-5-4786	A single silcrete flake recorded on a ridge in a paddock near Luddenham. The artefact was exposed by a 25 m^2 area of sheet erosion. The artefact could not be found during an inspection in 2017.
45-5-4007/ 45-5-4937	Three silcrete flaked stone artefacts recorded along a first order drainage depression next to Range Road at Kemps Creek as part of the present M12 assessment. On review of the AHIMS records it was discovered that the site had been previously recorded with incorrect coordinates.
45-5-0496/ 45-5-4749	A small number of stone artefacts recorded in 1985 by Professor Richard Wright from the University of Sydney near the concrete bridge over South Creek on the University of Sydney land. The site was inadvertently re-recorded by archaeologists surveying for M12 route options.
45-5-0528/ 45-5-4750	At the time of the assessment, more than 50 artefacts were recorded around a dam/soak waterbody serving as a farm water body with eroding gully walls. The waterbody appears to be located on a natural spring. The site was originally recorded in 1985 by Professor Richard Wright from the University of Sydney, and then inadvertently re-recorded by archaeologists surveying for M12 route options. This natural spring has now been in-filled by land practices.

Table 3-2 AHIMS sites outside the construction footprint but inside the detailed investigation area

AHIMS number	Site description
45-5-2307	Seven artefacts recorded along 100 m of unsealed track in the road reserve on the south side of Elizabeth Drive at Cecil Hills. The site may be continuous with 45-5-4374, however this would require testing of the intervening sub-surface deposits.
45-5-4374	Seventeen artefacts recorded along 45 m of unsealed track in the road reserve on the south side of Elizabeth Drive at Cecil Hills. The site may be continuous with 45-5-2307.
45-5-2310	Five flaked stone artefacts along 80 m of power line maintenance track within road reserve on the south side of Elizabeth Drive. The artefacts could not be found during an inspection in 2017.
45-5-2563	A single broken silcrete flake on a track near a drainage line at Cecil Park near the eastern end of the detailed investigation area, north of Elizabeth Drive. The artefact could not be found during an inspection in 2017.

AHIMS number	Site description
45-5-2721	Thirty-four artefacts recovered from 95 auger pits dug on the headwaters of Ropes Creek as part of the M7 investigation at the very eastern end of the detailed investigation area. A previous testing program undertaken established a low density sub-surface distribution of Aboriginal cultural material across the three landforms that were sampled: the banks of a creek, the associated floodplain and a nearby hillcrest.
45-5-2723	One hundred and forty artefacts recovered from 38 auger pits and one 2 m^2 and twenty-seven were recovered from the open area excavation. A previous testing program undertaken established a low density sub-surface distribution of Aboriginal cultural material across the elevated terrace on the northern side of Hinchinbrook Creek.
45-5-4767	A single silcrete flake recorded in a cutting next to a greenhouse in a highly disturbed context on the eastern side of Kemp Creek. The artefact could not be found during an inspection in 2017.

3.3.2 Previous archaeological assessments

The accompanying AAR (**Annexure C**) provides a detailed review of previous archaeological investigations in and around the detailed investigation area. More than 25 previous studies have been conducted within five kilometres of the detailed investigation area (see **Table 3-3**). All recorded one or more Aboriginal sites, suggesting Aboriginal occupation throughout the South Creek Catchment, Cecil Hills and Luddenham Rolling Hills. A number of observations about the distribution of Aboriginal objects and sites in the detailed investigation area can be derived from the previous studies:

- There is a strong correlation between the reliability of local water sources and the density, size and complexity of sites
- Artefactual material occurs at low density in areas beyond 100-150 metres from watercourses
- Sites are often found on elevated rises above areas subject to periodic inundation
- The presence or absence of artefacts on the exposed ground surface is a poor predictor of the density of subsurface artefactual material
- In contrast to the northern part of the Cumberland Plain, there is limited evidence that access to high quality stone plays a major role in the distribution of sites
- There are limited opportunities for grinding grooves and scarred trees due to the rarity of sandstone outcrops and old growth trees.

Table 3-3 Previous archaeological investigations relevant to the detailed investigation area

Report/Date	Key outcomes
Aurecon 2016	The Strategic Route Options Analysis was prepared to evaluate the potential environmental, heritage and social impacts of alternative routes for the M12 Motorway. The analysis informed the selection of the preferred route which is being assessed in this ACHAR. A total of 60 Aboriginal sites were identified within the original M12 corridor, of which five were located during the field survey. The recommended route options were designed to minimise the potential impact on areas of high cultural significance.
Navin Officer Heritage Consultants 1997	Archaeological survey of the Cecil Hills shooting complex. Eight stone artefact sites were identified. Most of the 19 artefacts were silcrete with mudstone, quartz and volcanics also present.
Brayshaw, 1995	Archaeological survey of a proposed upgrade of Elizabeth Drive. The assessment covered two portions at the eastern end of the detailed investigation area. The survey identified six areas of PAD and one stone artefact site.
Dallas and Hanckel, 1985	Archaeological survey along a minor tributary of Ropes Creek. Two stone artefact sites were identified. Raw materials were silcrete and mudstone. Artefacts types were described as flakes, flaked pieces and a core. The sites were located in a creek bed among ironstone gravels.

Report/Date	Key outcomes
Navin Officer, 2015	Comprehensive review of earlier Aboriginal heritage studies of Western Sydney Airport footprint. Due to size of Western Sydney Airport footprint it provides an opportunity to place the corridor in a strong regional context. Predictions emphasise the potential for hilltop locations with access to fresh water and that the distribution of surface sites is an unreliable indicator of subsurface artefact distributions. Eleven locations were selected for test pitting, with 114 test pits excavated overall. A total of 91 artefacts were identified, with silcrete being the dominant raw material. 12% of artefacts displayed retouch, with the majority being backed blades. Little dorsal cortex on artefacts indicating heavy reduction. Most artefact occurrences single artefact sites with an average density of 1.6 artefacts per square metre, with the highest density 3.1 artefacts per square metre Valley floors and alluvial flats had significantly higher artefact densities than other land forms. Subsurface density was positively correlated with the order of the closest drainage line, and with the order of the largest drainage line within 100 metres. Overall distribution of artefacts variable across landforms.
Australian Museum Consulting, 2014	Survey undertaken for the Western Sydney Airport. Twenty-one Aboriginal cultural heritage sites were identified. Many of the previously recorded sites in the area had been disturbed through erosional effects, dam construction and grazing.
Navin Officer Heritage Consultants, 1997	Survey of Western Sydney Airport footprint, covering 70 acres and identifying 111 Aboriginal sites. Sites comprised 102 artefacts, eight scarred trees and one PAD. Frequencies at most site were low, with silcrete the dominant raw material with small samples of quartz, chert and tuff. Stone tool types predominantly flakes with a small number of cores. Alluvial plains and valley floors identified as having best potential for scarred trees.
Consulting Arboriculturists and Horticulturists, 2014	Two potential culturally modified trees examined. Both within riparian corridor of Badgerys Creek. Concluded that neither tree was culturally modified.
Nicholson, 1989	Archaeological survey of proposed clay/shale extraction site at Badgerys Creek. Location of survey could not be verified. No archaeological material was identified, although visibility described as poor, with high disturbance from previous quarrying.
Dean-Jones, 1991	Archaeological survey of proposed clay/shale extraction site. One artefact scatter of 22 artefacts identified at the edge of small pond near Oaky Creek. Artefacts comprised eight flakes, 12 flaked pieces and two cores. Raw materials included chert, sandstone and mudstone.
Dallas, 1988a	Aboriginal heritage survey. 12 artefact sites identified, dominated by silcrete and chert and comprising flakes, flaked pieces and cores.

Report/Date	Key outcomes
Kelleher Nightingale Consulting 2017	Archaeological survey of The Northern Road between Narellan Road and Mersey Road. Total of 21 artefact sites, one scarred tree and one possible scarred tree. Artefacts described as flakes, broken flakes, flaked pieces, cores, scrapers and backed blades. Dominant raw material was silcrete, with smaller amounts of chert, tuff, quartz, mudstone and quartzite.
ENSR AECOM, 2009	Large-scale test and salvage excavations at Oran Park, approx. 15 km south of detailed investigation area. Total excavated area 509 square metres. Dominant artefact type was flaked material with small sample of cores, shatter and formal retouched tool types, including backed blades and scrapers. 74% of artefacts were silcrete. Concluded that 90% of artefacts were the by-product of tool manufacture and concentrated along watercourses and elevated areas overlooking the main creek valley. Presence of artefacts continued at the limits of excavation, 600 metres from nearest drainage line, well in excess of the predictive 100 metres from reliable fresh water.
Kelleher Nightingale Consulting 2017	Survey of The Northern Road between Mersey Road Bringelly and Glenmore Parkway, Glenmore Park Survey of 16 kilometres of road corridor with 81 artefacts identified. Predominantly silcrete and silicified tuff with a small proportion of chert, mudstone and quartz. Artefact types described as flakes, flake fragments, cores, retouched and utilised flakes. Sites identified on upper slopes of north-south ridgeline, lower slopes and elevated locations adjacent to creeks. Authors suggest that sites not limited to waterways and ridgelines may have been preferred for shelter or tool manufacture.
Dallas and Steele, 2001	Survey of Glenmore Park residential development area. No Aboriginal artefacts identified during survey, however subsurface testing recovered 73 artefacts in 18 one square metre test pits. Artefacts predominant flakes and flaked pieces, with smaller numbers of scrapers, retouched fragments, cores, backed artefacts and a broken hatchet. Raw materials mostly silcrete with sporadic tuff and quartz. One area tested had an anomalous high density of artefacts and was interpreted as a knapping floor.
Dallas, 1981	Archaeological survey of M4 Motorway between Mulgoa Creek and The Northern Road, approximately 800 hectares. A total of 27 artefacts identified. Described as flakes, flaked pieces and a hatchet. Variety of raw materials, including mudstone, chert, silcrete, quartz and basalt.
Kelleher Nightingale Consulting, 2013	Aboriginal heritage assessment for an area off Luddenham Road north of current study area. Four stone artefacts identified.
McDonald, 2001	Archaeological assessment of a hard rock quarry off Elizabeth Drive. Survey identified a single quartz artefact. Adjacent soils were assessed as having potential to contain subsurface deposits and was therefore designated as a PAD.

Report/Date	Key outcomes
Steele, 1999b	Archaeological survey between Luddenham and Mamre Roads. Survey identified six artefact sites and a scarred tree. A low spur above South Creek contained silcrete cobbles, some of which appeared to have been modified. Identified as a source for stone tool manufacture.
Dallas, 1988b	Archaeological study of the Luddenham Equestrian Centre between Luddenham and Mamre Roads. Twelve artefact sites identified with silcrete and chert the raw materials. Silcrete cobbles identified in drainage channels. Artefacts described as flakes, flaked pieces and cores.
Biosis, 2016	Archaeological testing in Mamre West precinct, three kilometres north of study area. 39 square metres excavated producing 43 artefacts. Overall density was 1.1 per square metre and 2.26 per cubic metre of excavated deposit. Notable was the predominance of chert and mudstone, with only 42% silcrete in the assemblage.
McDonald, 2008b	Archaeological excavations off Mamre Road, Erskine Park. Total of 298 square metres excavated. 8,867 flaked stone artefacts recovered, 13 from the surface. Raw materials dominated by silcrete, small proportions of quartz and silicified tuff. Artefacts included cores, debitage, backed blades, backed debitage, retouched artefacts, cores, bipolar artefacts and pebble fragments. Many had evidence of crenated fractures. Backed artefacts reduced in frequency with distance from water. Cores decreased with distance from silcrete sources. Bipolar artefacts more frequent around lower order streams. Platform debitage declined with distance from silcrete sources. Artefacts became smaller with distance from silcrete. Highest densities of artefacts occurred in the local yellow earth soil unit, possibly because of better drainage and therefore more suitable for occupation.
McDonald, 2000	Located 3.6 km north of the detailed investigation area. The raw materials were silcrete and mudstone. Eight stone artefact sites were found. Artefacts were described as flakes, broken flakes, debitage, cores and backed artefacts. All of the sites in the assessment area were located less than 300 metres from the closest water source, in, or near, first order tributaries or second order stream channels. The landforms on which site occurred were hillslope and floodplain-creek banks. Author suggests that increasing stream order is correlated with greater archaeological complexity.
McDonald, 2008a	Archaeological survey three kilometres south east of the detailed investigation area. Survey identified six stone artefact sites and two PADs. Raw materials were silcrete, tuff and quartz.

Report/Date	Key outcomes
Brayshaw and White, 1999	Archaeological survey for the M7 Motorway. Survey identified six stone artefact sites and two PADs. Raw materials included silcrete, mudstone, quartz, quartzite and volcanics. Artefacts were described as cobble tools, flakes, backed pieces, flaked pieces and cores, some showing evidence of bi-polar production. Most of artefacts were located along creek flats.

The abundance and significance of Aboriginal sites recorded during previous archaeological assessments shown in **Table 3-3** indicates that there is a high likelihood that the construction footprint would contain areas of archaeological sensitivity and cultural significance.

3.4 Predictive model

A review of previous archaeological reports indicated that certain landscapes and landforms in the detailed investigation area are more likely to contain Aboriginal sites. The predictive model is based on a 'land system' or 'archaeological landscape' model of site location. This type of modelling enables the prediction of site location based on known patterns of site distribution in similar landscape regions or archaeological landscapes. Within the construction footprint, the degree of ground disturbance and development has resulted in variations in archaeological integrity.

Predictive modelling was used to determine the archaeological sensitivity of particular landforms, and ultimately the location, extent and sampling strategy for the test excavation methodology and program. It was predicted that stone artefact sites would be the primary material evidence for past Aboriginal occupation, and moreover that most of the cultural materials would be contained in the buried soil profile rather than exposed on the ground surface. The predicted associations of surface and sub-surface Aboriginal sites and objects with the varying landscape and landform characteristics of the construction footprint include:

- Stone artefact deposits would occur within the topsoil in Creek Flats areas within at least 300 metres of the major creeks concentrated at the near margins and diminishing in density with increased distance from water
- Stone artefact deposits would occur within the topsoil in prominently elevated landforms near, and with good outlook over, the major South Creek complex of creeks, diminishing rapidly in density with increased distance and obstructed outlook over the creek valleys
- Stone artefacts are not anticipated to consistently occur in the Luddenham Rolling Hills other than as isolated random finds
- Stone artefacts are not anticipated to occur in the Gentle Slopes rising from the creek valleys more than 300 metres from the major creeks other than as isolated random finds
- Stone artefacts may occur in an unknown density and unknown extent on the highest of the Cecil Hills adjacent the M7 motorway, but this may be limited to areas of suitable outlook over adjacent country
- Stone artefacts are not anticipated to consistently occur through the Cecil Hills steeply sloping landscape other than on the eastern high outlook area
- The greatest proportion of flaked stone artefacts would be made of silcrete followed by IMT and then small proportions of quartz, quartzite, petrified wood, igneous stone and chert
- Concentrations of artefacts would reflect the manufacturing of backed artefacts, including the flakes (whole and broken), cores and flaked pieces. Small flakes and flaked pieces would occur in low density distributions
- Stone artefact in surface ground exposures would be of relatively low density compared to associated sub-surface deposits surface material may reflect low artefact densities
- Grinding grooves may occur on suitable outcrops of Minchinbury Sandstone
- Scarred trees may occur sporadically across the wider landscape, although these sites are rare in the Cumberland Plain and many naturally scarred trees are misidentified by some site recorders.

Both the archaeological survey (discussed in **Section 6.5**) and archaeological test excavations (discussed in **Section 3.7**) provided opportunities to investigate these predictions.

3.5 Potential archaeological deposits

The desktop assessment and predictive model enabled the identification of locations that have the potential to contain sub-surface Aboriginal cultural materials. Areas of potential sub-surface artefacts are referred to as PADs. Areas associated with surface artefact sites were also identified for test excavation to determine the character and extent of subsurface Aboriginal objects.

Previous archaeological studies suggest that sub-surface distributions of stone artefacts are the most abundant and widespread type of Aboriginal site on the Cumberland Plain (see Chapter 3 of **Annexure C**). The number of stone artefacts in sub-surface deposits may exceed those on the surface by a least an order of magnitude and that they may extend across areas of more than a hectare.

Based on the predictive model, 14 PADs were initially identified within the detailed investigation area. A list of the 14 PADs and their descriptions are provided in **Table 3-4**.

Table 3-4 PADs based on the predicted model

PAD name	(AHIMS ID)	Assessment area	Landform	Soil landscape
The Northern Road (TNR)	TBC	Luddenham	Gentle Slopes	Blacktown
Cosgroves Creek West (CCW)	TBC	Luddenham	Gentle Slopes	South Creek
Cosgroves Creek East (CCE)	TBC	Luddenham	Gentle Slopes	Blacktown
Badgerys West B (BWB)	TBC	Badgerys Creek	Creek Flats	Blacktown/South Creek
Badgerys Creek West (BCW)	TBC	Badgerys Creek	Luddenham Rolling Hills	Blacktown
Badgerys Creek East (BCE)	TBC	South Creek	Creek Flats	South Creek
South Creek West (SCW)	TBC	South Creek	Creek Flats	Blacktown/ South Creek
South Creek East (SCE)	TBC	South Creek	Creek Flats	South Creek
Kemps North West (KNW)	TBC	Kemps Creek	Luddenham Rolling Hills	Blacktown
Kemps Creek West (KCW)	TBC	Kemps Creek	Creek flats	South Creek
Kemps Creek East (KCE)	TBC	Kemps Creek	Creek flats	South Creek/Blacktown
Range Road (RR)	TBC	Cecil Flats	Creek flats	Luddenham
PCP8 (PCP8)	TBC	Cecil Hills	Gentle Slopes	Luddenham
Cecil Hills Ridge PAD (CHRP)	TBC	Cecil Hills	Gentle Slopes	Picton/ Luddenham

3.6 Archaeological survey

The field surveys carried out between July and September 2017 provided the opportunity to examine each of the identified PADs to confirm the landscape and landforms, the presence of relatively intact soil profiles, potential alignments for test pit transects and site access arrangements.

An effective area of 153 hectares was surveyed on foot across the construction footprint, representing 0.02 percent effective coverage of the total area that would be impacted by the project. It is noted that a much larger area than the construction footprint was surveyed, however the effective coverage for a survey takes account of limitations imposed by ground surface exposure and exposure type.

The coverage achieved is typical of surveys in agricultural areas with dense pasture cover. In such situations surface exposures tend to be limited to tracks, dam edges and other disturbed areas. The survey provided ample coverage of all of the landform units in the construction footprint. The AAR (**Annexure D**, Section 7) provides detail on the survey intensity in each landform and how the test excavation provided the data required for the archaeological assessment.

Four additional Aboriginal archaeological sites were identified within the detailed investigation area during the archaeological survey, however after further investigation only one site, located within the construction footprint, was considered to have potential archaeological value; M12-AS-03 (AHIMS 45-5-4935). This increased the number of registered stone artefact sites in the construction footprint from eight to nine.

Some of the site views showing the landscape character of the PADs are also provided in **Figure 3-2** to **Figure 3-13**.

The location of the identified 15 AHIMS sites, 14 PADs and one new Aboriginal site is shown in **Figure 3-14**.

Figure 3-2 TNR PAD, view north

Figure 3-3 CCW PAD, view north

Figure 3-4 CCE T2 PAD, view east

Figure 3-5 BWB PAD, view east

Figure 3-6 BCW PAD, view north

Figure 3-7 BCE PAD, view south

Figure 3-8 SCE PAD, view east

Figure 3-9 SCW PAD, view east toward South Creek East PAD

Figure 3-10 KNW PAD, view east

Figure 3-11 KCW PAD, view west

Figure 3-12 PCP8 PAD, view south

Figure 3-13 CHRP PAD, view north

3.7 Test excavations

Based on the predictive model, 14 PADs were initially identified within the detailed investigation area however based on differences in landform, soils and archaeological characteristics noted during test excavations, two of the 14 PADs (Cosgroves Creek East and South Creek West) were later sub-divided into three and two separate PADs respectively. Therefore, a total of 17 PAD have been considered within the detailed investigation area and investigation as part of the test excavations. **Table 3-5** presents the names and descriptions of the final 17 PADs.

Test excavations were conducted in each of the 17 PADs. The purpose of the test excavations was to confirm whether Aboriginal objects were present in the sub-surface soils in a PAD, and if so to provide information about the type, extent and density of cultural materials.

Test pits were excavated along transects (lines) at each PAD at intervals between 20 to 200 metres, depending on the size of the PAD. Transects were positioned to ensure that each PAD was adequately sampled, including potential differences in soils and cultural contents associated with varying distance from watercourses. Between three and 27 test pits were excavated in each PAD. Full details on the selection, location and physical attributes of every test excavation pit are provided in the AAR in **Annexure C**.

A total of 166 test pits (one metre by one metre) were excavated, along with 25 larger geotechnical test pits (which were either two or three square metres, this was required as part of the wider project). The location of test excavations is shown in **Figure 3-15**.

Note that several excavation areas were aimed at identifying the boundaries of registered sites, rather than those designated as PADs.

The location of the PADs, with the exception of the TNR PAD (following the absence of archaeological artefacts during test excavations), is shown in **Figure 3-16**.

Figure 3-14 Location of identified Aboriginal sites and PADs prior to test excavations

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 3-14 Location of identified Aboriginal sites and PADs confirmed during field surveys

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 3-14 Location of identified Aboriginal sites and PADs confirmed during field surveys

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Table 3-5 PADs within the construction footprint

PAD/Excavation area name	AHIMS #	Landforms	Description
The Northern Road (TNR)	45-5-3804	Luddenham Rolling Hills	Excavation area crossing a first order drainage line near ephemeral ponds exploring whether deposit is associated with the single surface artefact originally recorded as site 45-5-3804.
Cosgroves Creek West (CCW)	TBC	Creek Flats	PAD on the western side of Cosgroves Creek in the vicinity of trotting tracks with exposed artefacts.
Cosgroves Creek East T1 (CCE T1)	TBC	Creek Flats; Gentle Slopes	PAD on a low dividing ridge east of Cosgroves Creek. Continuous with Cosgrove Creek East T2.
Cosgroves Creek East T2 (CCE T2)	TBC	Gentle Slopes	PAD on a low rise over a second-order tributary. Continuous with Cosgrove Creek East T1 and T3.
Cosgroves Creek East T3 (CCE T3)	TBC	Gentle Slopes	PAD on high ground distant from watercourses. Continuous with Cosgrove Creek East T2.
Badgerys West B (BWB)	TBC	Gentle Slopes	PAD on a prominent hillock and low ridge overlooking South Creek. Incorporates 45-5-4747
Badgerys Creek West (BCW)	TBC	Creek Flats; Gentle Slopes	PAD on floodplain and gentle slopes of Badgerys Creek adjacent to Elizabeth Drive
Badgerys Creek East (BCE)	45-5-0528; 45-5-4750; 45-5-4748	Creek Flats	PAD on floodplain of South Creek. Continuous with South Creek West T1.
South Creek West T2 SCW T2)	TBC	Gentle Slopes	PAD on a low rise running north-south and parallel to South Creek. Continuous with Badgerys Creek East and South Creek West T1.
South Creek West T1 (SCW T1)	45-5-0496/45-5-4749; 45-5-0528/45-5-4750	Creek Flats	PAD on floodplain on the western edge of South Creek. Continuous with South Creek West T2 and South Creek East.
South Creek East (SCE)	TBC	Creek Flats	PAD on floodplain on the eastern side of South Creek. Continuous with South Creek West T1.
Kemps North West (KNW)	TBC	Gentle Slopes	Gentle slopes on the western side of Kemps Creek.
Kemps Creek West (KCW)	TBC	Creek Flats	Creek flats on the western side of Kemps Creek. Continuous with Kemps Creek East
Kemps Creek East (KCE)	TBC	Creek Flats; Gentle Slopes	Creek flats on the eastern side of Kemps Creek. Continuous with Kemps Creek West.
Range Road (RR)	45-5-4007/45-5-4937	Gentle Slopes	Excavation area across site on gentle slopes along a first order drainage line.
PCP8	45-5-2308	Cecil Hills	Excavation area across site on ridgeline and hillslopes exposed by a fire trail.
Cecil Hills Ridge PAD (CHRP)	45-5-4935	Cecil Hills	Excavation area across site on high hillslope and ridgetop above the M7. Incorporates 45-5-4935.

Figure 3-15 Location of all excavated test pits

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 3-15 Location of all excavated test pits

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 3-15 Location of all excavated test pits

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

3.8 Summary of test excavation results

3.8.1 Predictive model

Table 3-6 documents the archaeological predictions that were tested during the survey and excavation program.

Table 3-6 Predictive model

Archaeological prediction	Outcome
Stone artefact deposits would occur within the topsoil in Creek Flats areas within at least 300 m of the major creeks concentrated at the near margins and diminishing in density with increased distance from water	Confirmed by artefact distribution and abundance data
Stone artefact deposits would occur within the topsoil in prominently elevated landforms near, and with good outlook over, the major South Creek complex of creeks, diminishing rapidly in density with increased distance and obstructed outlook over the creek valleys	Confirmed by artefact distribution and abundance data
Stone artefacts are not anticipated to consistently occur in the Luddenham Rolling Hills other than as isolated random finds	Partial confirmation. This landscape unit contains a low but extensive distribution of low density sub-surface stone artefacts
Stone artefacts are not anticipated to occur in the Gentle Slopes rising from the creek valleys more than 300 m from the major creeks other than as isolated random finds	Partial confirmation. These landscapes contain a low but extensive distribution of low density sub-surface stone artefacts
Stone artefacts may occur in an unknown density and unknown extent on the highest of the Cecil Hills adjacent the M7 motorway, but this may be limited to areas of suitable outlook over adjacent country	Confirmed. The distribution of sub-surface artefacts appears strongly focused at the crest of the main southeast facing ridge at Cecil Hills
Stone artefacts are not anticipated to consistently occur through the Cecil Hills steeply sloping landscape other than on the eastern high outlook area	Confirmed. Testing in the Cecil Hills landform demonstrated a highly discontinuous distribution of stone artefacts
The greatest proportion of flaked stone artefacts would be made of silcrete followed by IMT and then small proportions of quartz, quartzite, petrified wood, igneous stone and chert	Confirmed by artefact analysis
Concentrations of artefacts would reflect the manufacturing of backed artefacts, including the flakes (whole and broken), cores and flaked pieces. Small flakes and flaked pieces would occur in low density distributions	Potential confirmation. A high-density concentration of flakes was tested on the eastern bank of South Creek and appears to be the primary reduction of cobbles. The recovered flakes are not necessarily associated with the production of backed blades
Stone artefact in surface ground exposures would be of relatively low density compared to associated sub-surface deposits surface material may reflect low artefact densities	Confirmed by artefact distribution and abundance data
Grinding grooves may occur on suitable outcrops of Minchinbury Sandstone	Confirmed outside the construction footprint. No sandstone outcrops identified during the survey
Scarred trees may occur sporadically across the wider landscape, although these sites are rare in the Cumberland Plain and many naturally scarred trees are misidentified by some site recorders	Confirmed outside the construction footprint. No scarred trees identified during the survey

3.8.2 Aboriginal occupation

The project test excavation program identified archaeological evidence of Aboriginal occupation widely distributed across creek valleys crossed by the construction footprint.

Test excavation found Aboriginal settlement in the South Creek valley, camping along Cosgroves, Badgerys and Kemps Creeks, activities along minor watercourses and occupation at the eastern margin of the construction footprint on an atypical hilltop location overlooking Darug-Tharawal boundary country. Archaeological evidence is near-absent in the Luddenham hills at the western end of the detailed investigation area, aside from rare single-artefact surface sites.

The South Creek valley demonstrated evidence of stone extraction, primary flaking, stone tool production, artefact use and repeated camping activity in strategic locations, such as close to the creek channel, along a central low spur within the Badgerys-South creeks confluence and adjacent hills at the valley floor edge. Further afield from vantage points, a consistent low density artefact signature reflects resource extraction activity. Present evidence does not suggest cultural stratification of archaeological deposit in deep Quaternary Alluvium valley fill. There is no bimodal distribution of artefacts within alluvium suggesting lower Pleistocene and upper Holocene phases, as suggested in deep sand deposits at Pitt Town. The age of the deeper alluvial topsoil is at present unknown. Obtaining an age for the deep alluvial topsoil is a research question worth pursuing to address Aboriginal assemblage age.

Cosgroves Creek is associated with a broad, low density distribution that extends for more than 400 metres from its banks, including low density deposit along minor tributaries and occasional artefacts along the high ground between Cosgroves and Badgerys creeks.

Kemps Creek is associated with vary densities along the creek within the Quaternary Alluvium on the western side. Very low numbers of artefacts were found on the residual soils on the eastern side of Kemps Creek.

In only one location tested, TNR PAD was there absence of evidence, which is taken to reflect a low level of Aboriginal activity in the Luddenham Hills and a focus of Aboriginal settlement in the major creek valleys and primarily along South Creek and associated vantage points.

3.8.3 Constraints and limitations

The limit of artefact distribution was not detected at sites CCW and KCW due to logistical and structural constraints. The presence of a sparse distribution identified between Cosgroves and Badgerys Creeks may also be present on the Luddenham Hills. These data gaps only emerged through the analysis of results following fieldwork. Furthermore, test excavation was constrained by lack of access to most of the properties across the Luddenham Rolling Hills landscape.

3.8.4 Amendments to sites and PADs following test excavations

Test excavation demonstrated the presence of stone artefacts in all but one PAD (TNR PAD) where subsurface deposit was predicted and a wide distribution of Aboriginal occupation across creek valleys. Furthermore, the areal extent of artefacts within the topsoil away from major creek exceeded the standard model of Aboriginal site location (200 metres from creeks) by hundreds of metres. Therefore, the term “Aboriginal site” in conventional use does not adequately describe the scale of the archaeological evidence found across 17 kilometres of creek valley landforms and the term ‘site complexes’ has been used instead to describe sites that occur in close proximity and appear to be associated with a specific landform feature, either creek or a ridgeline. This is discussed further in **Section 7.2**.

The recorded Aboriginal sites and PADs identified within the construction footprint as part of the desktop assessment, predictive model and archaeological survey (ie eight registered AHIMS sites, 17 PADs, and one new Aboriginal site (M12-AS-03; AHIMS 45-5-4935)) have been consolidated, corrected or changed to better reflect the findings of the test excavations.

Areas of PAD are likely to remain outside of the detailed investigation area, but such areas were not investigated so as not to cause unnecessary harm to Aboriginal objects that would not be impacted by the project, and are no longer considered as part of this assessment.

Following test excavations, the term ‘Potential Archaeological Deposit’ is no longer used given that the ‘potential’ for archaeological deposit at each test excavation location has now been confirmed or discarded. Therefore, herein only the term ‘Aboriginal site’ or ‘Aboriginal object’ (as part of the impact assessment) is used.

A final number of 19 Aboriginal sites are located within the construction footprint, including:

- CCW
- CCE T1
- CCE T2
- CCE T3
- BWB
- BCW
- BCE
- SCW 1
- SCW 2
- SCE
- KNW
- KCW
- KCE
- RR
- PCP8
- CHRP
- 45-5- 4747 (M12A1)
- 45-5- 3804 (Isolated artefact 4)
- 45-5- 4786 (TNR AFT-14).

An additional seven Aboriginal sites are located outside of the construction area but within the detailed investigation area, including:

- CP AS1
- P-CP9
- PAD-OS-7
- PAD-OS-5
- DLC 2
- M12A5
- KC/ED2.

A detailed description of how recorded Aboriginal sites and PADs have changed, been corrected or been absorbed following results of the field surveys and test excavations into the 'final sites' is shown in **Table 3-7** and **Table 3-8**. The revised site boundaries following test excavation and the location of the 19 Aboriginal sites within the construction footprint, and seven within the detailed investigation areas are shown in **Figure 3-16**.

Table 3-7 Description of AHIMS/recorded site and PAD nomenclature changes throughout the assessment process within the construction footprint

AHIMS sites pre-test excavation	PAD as defined by desktop assessment	PAD as refined during excavations	Final sites (shaded)	Comments
Sites within construction footprint				
45-5- 2308			Part of PCP8	Site is located within PCP8 and has been incorporated into that site.
45-5- 3804			45-5- 3804 **(Isolated artefact 4)**	

AHIMS sites pre-test excavation	PAD as defined by desktop assessment	PAD as refined during excavations	Final sites (shaded)	Comments
45-5- 4747			45-5- 4747 **(M12A1)**	
45-5- 4748			Part of BCE	Site is located within BCE and has been incorporated into that larger site.
45-5- 4786			45-5- 4786 **(TNR-AFT-14)**	Single stone artefact, not be relocated during project fieldwork. Site is located within TNR PAD. No other artefacts were discovered in the PAD, therefore site remains as a single stone artefact
45-5-4007/4937			Part of CHRP	Site was recorded twice with duplicate entry in AHIMS. Site is located within CHRP and has been incorporated into that larger site.
45-5-0496/4749			Part of SCE	Site was recorded twice with duplicate entry in AHIMS. Site is located within SCE and has been incorporated into that larger site.
45-5-0528/4750			Part of BCE	Site was recorded twice with duplicate entry in AHIMS. Site is located within BCE and has been incorporated into that larger site.
45-5-4935 (M12-AS-03)			Part of CHRP	Identified during project surveys June-Sept 2017. Site is located within CHRP and has been incorporated into that site.
	TNR PAD	TNR PAD	Not a site	No artefacts were discovered in test excavations in the PAD. As a result the PAD is not considered a site.
	CCW PAD	CCW PAD	**CCW**	
	CCE PAD	CCE T1 PAD	**CCE T1**	The original CCE PAD was divided into 3 separate PADs based on field observations of soils and landforms
		CCE T2 PAD	**CCE T2**	
		CCE T3 PAD	**CCE T3**	
	BWB PAD	BWB PAD	**BWB**	
	BCW PAD	BCW PAD	**BCW**	
	BCE PAD	BCE PAD	**BCE**	Incorporates 45-5- 0528/4750 and 45-5-4748
	SCW PAD	SCW T1 PAD	**SCW 1**	The original SCW PAD was divided into 2 separate PAD based on field observations of soils and landforms
		SCW T2 PAD	**SCW 2**	
	SCE PAD	SCE PAD	**SCE**	Incorporates 45-5- 0496/4749
	KNW PAD	KNW PAD	**KNW**	
	KCW PAD	KCW PAD	**KCW**	
	KCE PAD	KCE PAD	**KCE**	

AHIMS sites pre-test excavation	PAD as defined by desktop assessment	PAD as refined during excavations	Final sites (shaded)	Comments
	RR PAD	RR PAD	**RR**	
	PCP8 PAD	PCP8 PAD	**PCP8**	Incorporates 45-5-2308
	CHRP PAD	CHRP PAD	**CHRP**	Incorporates 45-5- 4007/4937
TOTAL				
9 Registered Sites	**14 PADS**	**17 PADS**	**19 Final Sites (within construction footprint)**	

Table 3-8 Description of AHIMS/recorded site and PAD nomenclature changes throughout the assessment process within detailed investigation area (outside the construction footprint)

AHIMS sites pre-test excavations	PAD as defined by desktop assessment	PAD as refined during excavations	Final sites (shaded)	Comments
Aboriginal sites inside detailed investigation area (outside the construction footprint)				
45-5-4374			**CP AS1**	Stone artefact site
45-5-2307			**P-CP9**	Stone artefact site
45-5-2721			**PAD-OS-7**	Stone artefact site: initially a PAD with artefacts discovered in test excavation
45-5-2723			**PAD-OS-5**	Stone artefact site: initially a PAD with artefacts discovered in test excavation
45-5-2563			**DLC 2**	Stone artefact site
45-5-4767			**M12A5**	Stone artefact site
45-5-2310			**KC/ED2**	Stone artefact site
TOTAL				
7 Registered Sites			**7 Final Sites (within detailed investigation area)**	

Figure 3-16 Aboriginal sites following test excavations

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Figure 3-16 Aboriginal sites following test excavations

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 3-16 Aboriginal sites following test excavations

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4. Consultation

Aboriginal stakeholder engagement and involvement is essential for the identification and management of Aboriginal cultural heritage values that may be impacted by the project. This section presents a summary of each stage of consultation with Aboriginal stakeholders. Documentation of the consultation process is provided in **Annexure A**, including AFG meeting minutes, examples of the letters sent to RAPs and knowledge holders, native title search results, records of cultural heritage values workshops and interviews and a detailed consultation log that has been kept for the duration of the planning stage of the project.

4.1 Summary of consultation

Aboriginal stakeholder engagement was undertaken to address the requirements of the PACHCI which provides an opportunity for Aboriginal people to participate in decision making about the management of their cultural heritage. The four stages of the PACHCI are designed to ensure compliance with statutory requirements and EESG policies, including the ACHCRP.

The project is located in the Gandangara LALC and the Deerubbin LALC areas. The following consultation activities have taken place:

- Deerubbin and Gandangara LALCs participated in multiple, targeted archaeological surveys of the detailed investigation area in July and September 2017 under Stage 2 of the PACHCI for this project. Site officers provided comment on the Aboriginal cultural heritage of the detailed investigation area
- Following their participation in the Stage 2 PACHCI, letters under Stage 3 of the PACHCI inviting registration to the project were sent to the Deerubbin and Gandangara LALCs in October 2017
- Newspaper advertisements were placed in October 2017 inviting all other Aboriginal persons with relevant cultural knowledge to participate in the project's Stage 3 PACHCI process. Respondents were listed as Registered Aboriginal Parties (RAPs) in November 2017
- RAPs took part in an Aboriginal Focus Group (AFG) meeting in January 2018 and reviewed the initial survey results and draft methodology for test excavations
- RAP site officers took part in archaeological test excavation fieldwork between February and June 2018
- A second AFG meeting was held on 7 August 2018 where the results of the test excavation fieldwork were discussed and a draft archaeological survey report was provided for comment
- Following preliminary consultation, Balarinji conducted a process to prepare conceptual design directions underpinned by the locally endorsed Aboriginal narrative. These design directions were gathered through an inclusive consultation process with artists and Elders who originate from or live and work in the Aboriginal community through which the project would run
- A third AFG meeting was held on 27 February 2019 where the results of the test excavations, the recommendation for salvage and the cultural values and significance assessment were discussed
- A search of Native Titles Claims and Aboriginal Land Claims was re-run on the 22 July 2019.No native title or land claims within the detailed investigation area were identified.

Further detail on the four stages of consultation under the PACHCI is provided below.

4.2 PACHCI Stage 1

Stage 1 of the PACHCI activities undertaken for this assessment involved a desktop risk assessment and initial consultation to determine whether the project would potentially impact on Aboriginal cultural heritage and therefore require further assessment. This included an assessment of potential impacts on Aboriginal objects and Aboriginal Places as defined in the NPW Act and to determine there were no current Native Title holders or claims or Aboriginal Land Claims in the detailed investigation area.

The Roads and Maritime desktop risk assessment determined that impacts to Aboriginal cultural heritage were likely given existing information about the distribution of Aboriginal cultural sites in, and in the vicinity of the detailed investigation area. This result therefore triggered the subsequent actions under Stage 2 of the PACHCI.

4.3 PACHCI Stage 2

Stage 2 PACHCI actions are detailed in **Table 4-1** below.

Table 4-1 Consultation activities carried out during Stage 2 of the PACHCI

Stage 2 PACHCI action	Consultation activities
Identify key Aboriginal stakeholders	• The National Native Title Tribunal was contacted on 16 October 2017 to identify any registered native title claimants or native title holders for the assessment area. Their response is provided in full in **Annexure B**. The response indicated that there were no current native title claimants or native title holders for the detailed investigation area. There were no results for native title holders in either the Liverpool, Penrith or Fairfield local government areas. • Prior to RAPs being appointed, Deerubbin and Gandangara LALC were identified as relevant LALCs • A search of the Register of Aboriginal Owners (*Aboriginal Land Rights Act 1983*) was requested on 18 October 2017. There were no Registered Aboriginal Owners in the detailed investigation area.
Engage Aboriginal stakeholders to undertake a site survey	• Site officers from the Deerubbin and Gandangara LALCs were engaged to participate in the archaeological survey. Details are provided in **Annexure B**.
Carry out the pedestrian site survey	• Site officers nominated by the Deerubbin and Gandangara LALCs participated in archaeological surveys of the detailed investigation area, including consultation regarding the assessment process during the surveys on 11, 12, 13 and 21 July and 11 September 2017. A summary of timing and personnel are provided in **Table 4-2**. • Further details are provided in **Annexure B**.
Aboriginal stakeholders to prepare cultural heritage survey report	Deerubbin and Gandangara LALCs were asked for a cultural heritage survey report outlining cultural heritage issues that may arise as a result of the project. No report was received during Stage 2 PACHCI activities.

4.3.1 Timing and personnel

Field surveys were carried out between July and September 2017 with the nominated site officers from Deerubbin LALC and Gandangara LALC. Fieldwork was split up and conducted on numerous occasions due to difficulties in securing access to multiple private land parcels. Details of fieldwork activities and the participation of the nominated site officer are provided in **Table 4-2.**

Table 4-2 Field survey timing and personnel

Date	Jacobs personnel	Sub-consultant	Roads and Maritime personnel	Aboriginal stakeholder involvement
11 July 2017	Andrew Costello (Senior Archaeologist, Jacobs)	Neville Baker (Director – Archaeologist, Baker Archaeology)	Mark Lester Aboriginal Cultural Heritage Officer	Steve Randall & Steve Knight (Site Officers, Deerubbin LALC)
12 July 2017	Andrew Costello (Senior Archaeologist, Jacobs)	Neville Baker (Director – Archaeologist, Baker Archaeology)	Mark Lester Aboriginal Cultural Heritage Officer	Steve Randall & Steve Knight (Site Officers, Deerubbin LALC)
13 July 2017	Andrew Costello (Senior Archaeologist, Jacobs)	Neville Baker (Director – Archaeologist, Baker Archaeology)	Nigel Robinson - Aboriginal Cultural Heritage Officer	Deon McDermott & Shannon Beale-Bogg (Site Officers, Gandangara LALC) Brad Maybury – (CE), Gandangara LALC)

Date	Jacobs personnel	Sub-consultant	Roads and Maritime personnel	Aboriginal stakeholder involvement
21 July 2017	Andrew Costello (Senior Archaeologist, Jacobs)	Neville Baker (Director – Archaeologist, Baker Archaeology)	Mark Lester Aboriginal Cultural Heritage Officer	Steve Randall & Ray Adams (Site Officers, Deerubbin LALC)
11 September 2017	Andrew Costello (Senior Archaeologist, Jacobs) and Chelsea Jones (Graduate Archaeologist, Jacobs)	Neville Baker (Director – Archaeologist, Baker Archaeology)	Mark Lester Aboriginal Cultural Heritage Officer	Ray Adams (Site Officers, Deerubbin LALC)

4.4 PACHCI Stage 3

Consultation activities under Stage 3 of the PACHCI are detailed in **Table 4-3** below.

Table 4-3 Consultation activities carried out during Stage 3 of the PACHCI

Stage 3 PACHCI Action	Consultation activities
Seek the names of Aboriginal people with cultural knowledge by letter or notify native title holders	Letter were sent to the following organisations in October 2017 requesting details of Aboriginal people who may have an interest in, and cultural knowledge of, the detailed investigation area: • EESG • Gandangara LALC • Deerubbin LALC • The Registrar appointed under the *Aboriginal Land Rights Act 1983* • The National Native Title Tribunal • The Native Title Services Corporation Limited • Fairfield City Council, Penrith City Council and Liverpool City Council. Based on the responses a list of 20 Aboriginal groups and individuals was compiled. Details of these groups and individuals are provided in **Annexure A**.
Notify Aboriginal people with cultural knowledge by letter	Correspondence was sent to the 20 nominated Aboriginal groups and individuals inviting them to register interest in the project.
Notify Aboriginal people with cultural knowledge by advertisement	Advertisements inviting Aboriginal groups or people to register their interest in the project were placed in two local newspapers (Liverpool Leader and National Indigenous Times) on 10 October 2017.
Prepare a Register of Aboriginal Parties	A Register of Aboriginal Parties was compiled based on the responses to letters and advertisements. Each RAP was sent a letter confirming receipt of their registration. Fifteen RAPs were registered for the project.
Send the names of registered parties to EESG and local Aboriginal land councils	The list of RAPs was forwarded to EESG, Deerubbin LALC and Gandangara LALC in November 2017.
Send invitation to attend an Aboriginal focus group (AFG) meeting and draft methodology for review	Invitations to attend the initial AFG meeting on 17 January 2018 were sent to RAPs and EESG on 21 December 2017. The invitations provided a meeting agenda, an Aboriginal Site Officer application form and a draft archaeological methodology (see **Annexure B**).

Stage 3 PACHCI Action	Consultation activities
Hold an AFG meeting	There have been three AFG meetings for the project. The first was held on 17 January 2018. A project overview, results of the archaeological survey and proposed archaeological methodology were discussed. The minutes of this meeting are provided in **Annexure B.** The preliminary results of the test excavation program were presented at the second AFG meeting on 7 August 2018 (see **Annexure B** and **Annexure C**). RAPs were asked to advise on mitigation and management measures for potentially impacted sites. Third AFG was held on 27 February 2019 to discuss draft ACHAR and AAR, salvage program, the Aboriginal cultural heritage design process, and proposed management measures for potentially impacted sites
Provide meeting minutes to Aboriginal parties	Written summaries of comments and minutes from the AFGs were provided to the RAPs via email and letter and tabled at subsequent meetings.
Finalise methodology	The draft archaeological methodology was sent to the RAPS and EESG on 21 December 2017, allowing for a 28-day review as required under the EESG Aboriginal consultation guidelines. No changes were requested by the RAPs.
Engage Aboriginal site officers	Aboriginal site officers were engaged in January 2018 for test excavations scheduled to be carried out between 21 February and 27 June 2018.
Implement archaeological testing methodologies	Aboriginal site officers participated in test excavations between 21 February and 27 June 2018.

4.5 PACHCI Stage 4 and ongoing consultation

As outlined in PACHCI and the ACHCRP, a copy of this ACHAR has been provided to EESG and all RAPs for the project for review and comment. A review period of at least 28 days has been allowed, with another AFG meeting held during this period to provide a forum for the discussion of the project impacts and proposed management recommendations documented in this ACHAR.

Any additional comments received during ongoing consultation would be included in the final version of the ACHAR. During future stages of the project, RAPs would be consulted about significant design or construction changes in a manner consistent with the relevant guidelines.

4.6 Consultation log

A log summarising all of the consultation conducted with Aboriginal parties in relation to the project is provided in **Annexure A**.

5. Existing environment

5.1 Environmental Context

This section includes a description of the existing environment and has been informed by the desktop investigations and field inspections undertaken for the project. The environmental context provides a framework for understanding possible variations in the distribution of cultural materials and associated activities within the detailed investigation area. A more detailed account of the environmental context, including maps of geology, landscapes and soils, is provided in **Annexure C**.

5.1.1 Geology, geomorphology and soils

The detailed investigation area is located on the Cumberland Plain, a relatively flat, low lying subregion of the Sydney Basin. The Cumberland Plain is a depression characterised by Wianamatta shales with interleaved Minchinbury sandstone. Weathering has given rise to a topography of flats and rolling hills. The Cumberland Plain is surrounded by the elevated Hawkesbury Sandstone ridges of the Blue Mountains, Hornsby Plateau and Woronora Plateau.

The geomorphology of the detailed investigation area is dominated by the flat Quaternary Alluvium valleys of the major creeks in the centre and the shale slopes and hills to the east and south (see **Annexure C**).

Four major landscapes were identified for the purpose of investigating the Aboriginal cultural heritage values of the detailed investigation area. These are Luddenham rolling hills, Cecil Hills, creek flats and gentle slopes. The Luddenham rolling hills are an area of slightly higher relief on the southern edge of the detailed investigation area. The Cecil Hills are a distinctive set of elevated ridges to the east of the detailed investigation area. The creek flats are flat to gently undulating terrain in the central part of the detailed investigation area. The gentle slopes landscapes are concentrated along the borders of the creek valleys.

There are four main soil landscapes in the detailed investigation area: alluvial South Creek soils located near major creeks; residual Blacktown soils on western low rises and crests; erosional Luddenham soils on the ridge and hill slopes and colluvial Picton soils in the eastern Cecil Hills. The location and extent of each soil landscape is closely related to surface landform and topography.

Two important geo-physical characteristics of the detailed investigation area are the potential for deep archaeological deposits in the Quaternary alluvium, and the presence of small outcrops of Minchinbury sandstone which may have been used to sharpen stone axes.

5.1.2 Climate, vegetation and natural resources

Average annual rainfall varies from 900 millimetres on the eastern flank of the detailed investigation area to 700 millimetres on the western side, with the wettest periods being late summer and mid-winter (Tozer 2003). Mean maximum temperatures vary between 17.8 and 30.8 degrees and minimums between 5.4 and 18.6 degrees (Bureau of Meteorology 2017).

The diversity and abundance of vegetation in the detailed investigation area has been diminished through agricultural land use practices. Wide scale clearing of native vegetation has been ongoing since the arrival of European settlers. Limited areas of native vegetation remain within the detailed investigation area. These are classified as Shale Hills Woodland, Shale Plains Woodlands and Alluvial Woodland, as presented in **Table 5-1**.

A wide range of natural resources were utilised by Aboriginal people on the Cumberland Plain, providing edible flora and fauna, wood and bark for the construction of tools and shelter, stone for the production of flaked and ground edge artefacts and ochres for ceremonial purposes. A particularly important characteristic of the detailed investigation area was the extensive freshwater habitats associated with the major waterways of the South Creek Catchment. In addition to enhancing the variety and abundance of edible flora and fauna these waterways provided a reliable source of fresh water. **Section 5.2** below discusses the use of these resources.

Table 5-1 Native vegetation types within the detailed investigation area and corresponding landform

Native vegetation type	Description
Shale Hills Woodland	The characteristic vegetation of this community includes: canopy species Grey Box (*Eucalyptus moluccana*), Narrow Leaved Ironbark (*Eucalyptus crebra*) and Forest Red Gum (*Eucalyptus tereticornis*); understory species Hickory Wattle (*Acacia implexa*), Blackthorn (*Bursaria spinosa*) and Giant Hop Bush (*Dodonaea viscosa*); and ground species Kangaroo Grass (*Themeda australis*), Kidney Weed (*Dichondra repens*), *Desmodium varians* and Weeping Meadow Grass (*Microlaena stipoides var stipoides*) (Blacktown City Council 2013).
Shale Plains Woodland	Characteristic vegetation of this community includes: canopy species such as Spotted Gum (*Corymbia maculata*), Thin leaved Stringybark (*Eucalyptus eugenioides*), Grey Box (*Eucalyptus moluccana*) and Forest Red Gum (*Eucalyptus tereticornis*); understory species including Blackthorn (*Bursaria spinose*); and ground cover species Kangaroo Grass (*Themeda australis*), Kidney Weed (*Dichondra repens*), *Desmodium varians and* Weeping Meadow Grass (*Microlaena stipoides var stipoides*) (Blacktown City Council 2013).
Alluvial Woodland	Characteristic vegetation of this community includes: canopy species such as Cabbage Gum (*Eucalyptus amplifolia*), Swamp Oak (*Casuarina glauca) and* Forest Red Gum (*Eucalyptus tereticornis*); understory species such as Grey Myrtle (*Backhousia myrtifolia*), White Sally (*Acacia floribunda*) and Coast Myall (*Acacia binervia*); and ground species including Weeping Meadow Grass (*Microlaena stipoides var stipoides*) and Kangaroo grass (*Themeda australis*) (Blacktown City Council 2013).

5.2 Cultural Context

5.2.1 Historical context

Shortly after European arrival to Australia in 1788, many of the areas around Sydney Cove were surveyed for settlement, including Botany Bay, Rose Hill (Parramatta), Broken Bay, Prospect Hill, and the Hawkesbury, Nepean and Georges Rivers (Attenbrow 2002). Most accounts of the Cumberland Plain and wider Sydney area were produced by explorers, army officers and surveyors. Their accounts are therefore not necessarily accurate or objective reflections of encounters with Aboriginal people (Barralier 1897; Hunter 1793; Tench 1788; 1793).

During the initial phase of exploration there was minimal interaction between the European people and Aboriginal groups, however as more settlers entered the regions beyond the established settlements of Sydney camps interactions became increasingly frequent and adversarial. Conflicts intensified between 1812 and 1816 and military expeditions were sent throughout the Sydney area (Attenbrow 2010; Australian Museum Consulting 2014; GML 2007).

One such expedition was known as George Caley's exploration, which passed through Badgerys Creek, the Bringelly area and then into the Mulgoa Valley from 1802 (Godden Mackay 1997, p. 5-1). This expedition led to contact with Aboriginal groups, most likely the Cabrogal clan. George Caley (1801, p. 47) noted burning practices, the presence of huts, and walking trails. The Cabrogal clan were located in what is currently known as the Cabramatta district approximately seven kilometres east of the project.

European occupation began in the region following these explorations. Land grants were provided for areas with moderately fertile soils and open forest. One of these grants occurred in 1809, when 840 acres of land at South Creek was granted to James Badgery by Governor Macquarie, now known as Badgerys Creek (**Figure 6-1**). This area of land developed into a farming and agricultural enterprise which would evolve into the company Pitt Son & Badgery by the nineteenth century.

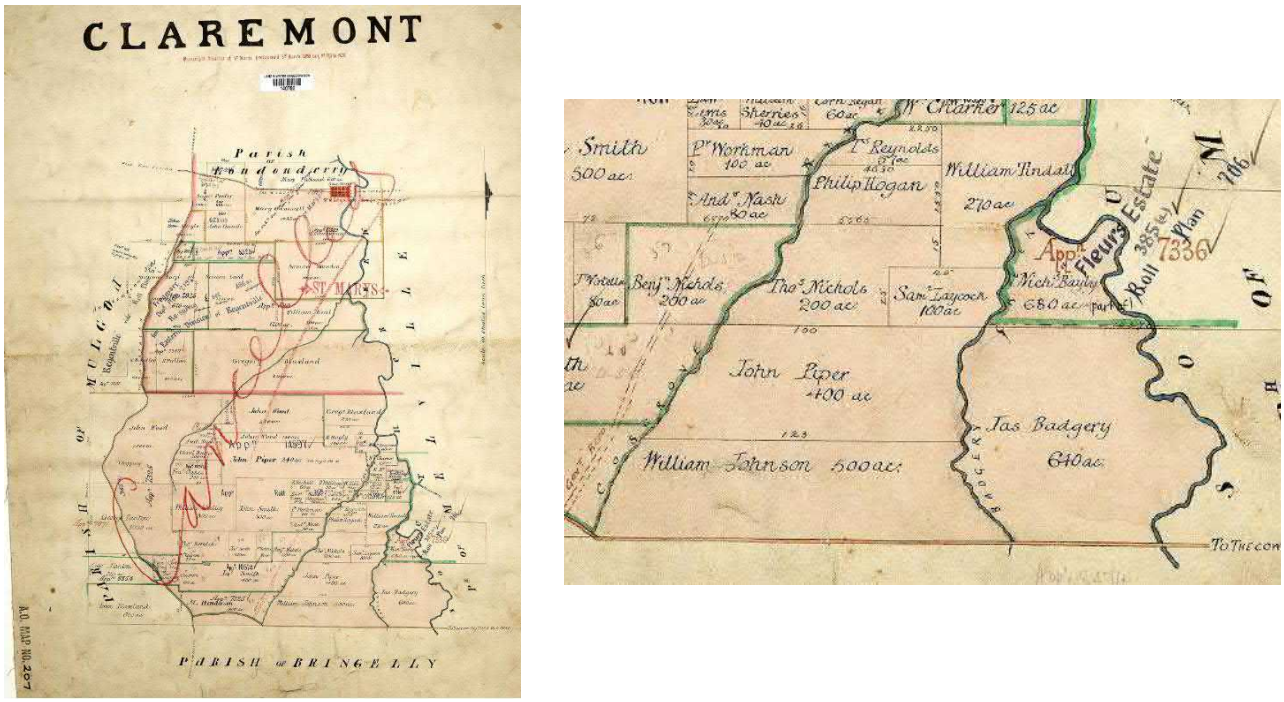

Figure 5-1 Map of Parish of Claremont with detail.

Note: Shows land grants in the area including 640 acres to James Badgery (Source: NSW Land & Property Information **(n.d.)**, Historical Land Records Viewer, available at: http://hlrv.nswlrs.com.au, accessed 24 January 2019).

Other land grants in the region included 1000 acres to Robert Lowe, 6710 acres to John Blaxland, and 1200 to D'Arcy Wentworth. These land grants and the development of European occupation led to Aboriginal people to be pushed off their land and resulted in an increase in conflicts. One such conflict was the Appin Massacre on the 17th April 1816. The massacre resulted the death of at least 14 Aboriginal people and occurred due to a military reprisal raid ordered by Governor Lachlan Macquarie (Karskens 2015).

Historical land use

Following European arrival, the local landscape became used primarily for agriculture. Activities included stock grazing, cropping, orcharding, and dairying. As populations increased and land use intensified, lands were subdivided into small holdings and agricultural plots resulting in even more disturbance and modification of the environment. Within the investigation area, land use activities included logging, clearing native vegetation for agricultural purposes, quarrying for clay shale extraction, roads, and excavations for farm dams.

High levels of ground disturbance commenced in 1956 as a result of excavation and quarrying activities, as well as the associated development of these facilities. The Luddenham portion of the detailed investigation area was subject to intensive clearing and farming over the last 80 years. The area has been used for a myriad of activities over this time, including dairy farming, horse yards and stables, excavation for dam development and disposal of demolition rubbish (Dean-Jones 1991). There is widespread evidence of illegal historic land uses including the unapproved disposal of construction and industrial wastes.

The section north of Elizabeth Drive between Luddenham Road and Mamre Road has been subject to clearing and ripping of the topsoil to facilitate grazing and related farming activities.

Aboriginal historical context

Historic and ethno-historic information about the lives of Aboriginal people on the Cumberland Plain prior to and since the first encounters with European forces in the late 18th century is far from complete. Information sources include the personal oral histories of Darug descendants and other long-term residents and the journals, diaries and official reports of the European people.

There are no known historical references to Aboriginal people that specifically relate to the study area. The information below draws upon the broader Sydney region as described by anthropologists, historians and archaeologists such as Matthews (1901), Kohen (1986), Attenbrow (2010), Goodall and Cadzow (2009) and Irish (2017).

There is less information in the early historical accounts about the lifestyle of Aboriginal people on the Cumberland Plain where the project is located, than that for the more coastal parts of Sydney. The major reason for the paucity of historical accounts is the scale and rapidity of mortality as a result of the epidemics that swept through the Aboriginal population of the Cumberland Plain before they were in regular contact with the Europeans. At least two waves of smallpox are recorded, the first in 1789 and another in the late 1820's. It is estimated that half of the Aboriginal population of the Sydney region was lost in the first epidemic (Turbet 1989).

The social disruption that must have accompanied this extraordinary loss of life was followed by the rapid dispossession of traditional lands across the Cumberland Plain. The first excursion of the Europeans as far west as Parramatta took place in 1788. A party led by Watkin Tench had ventured as far west as the Nepean River by 1789. The agricultural potential of the fertile soils on the Wianamatta shales was immediately apparent and the Cumberland Plain was quickly divided into a series of land grants. Early land holdings in the immediate vicinity of the study area included the 1806 grant of 640 acres to James Badgery on the southern side of Elizabeth Drive, and the 1813 grant to John Blaxland of 6,710 acres between Badgerys Creek and the Nepean River.

The scale of impacts on the Aboriginal occupants of the Cumberland Plain means that almost all recorded observations were of a society adjusting to rapid and severe change. Furthermore, the observers carried their own inherent biases and limited understanding of what they were observing. For these reasons the ethno-historic picture of Aboriginal life that can be extracted from the ethno-historic data is limited and cannot represent the complexity or richness of social, spiritual or economic activities that took place in the study area.

Matthews suggested that following the major epidemics in the late 18th and early 19th centuries that surviving Darug responded to the loss of life by consolidating into a South Creek group.

Darug descendants continued to live and practice cultural activities on several properties in the South Creek catchment. Three such properties, Exeter Farm on Badgerys Creek (AHIMS site card 45-5-215), Mamre Farm at Orchard Hills (Martin 1988) and the Macarthur farm at Mulgoa (Keating 1996) are located within fifteen kilometres of the study area.

Aboriginal archaeological context

Archaeological evidence suggests that the early Holocene occupation of the Cumberland Plain was sporadic with a relatively low population base, especially when compared to the nearby coastal zones. The intensity of occupation appears to have increased across the Cumberland Plain from approximately 5,000 years ago (Attenbrow 1981; Attenbrow 2010). It should be noted that this is based on archaeological evidence available at the time of archaeological surveys and does not consider the potential for the number of Aboriginal artefacts removed and/or damaged by European land use practices and/or collected by property owners such as Badgery, Blaxland and others that followed.

The last 5,000 years is characterised by a series of changes in stone tool assemblages known as the Eastern Regional Sequence (McCarthy 1948). The Eastern Regional Sequence is separated into Capertian and Early, Middle and Late Bondaian phases. The Capertian is characterised by large heavy artefacts such as hammerstones, core stones and bipolar implements. During the Bondaian phase there is a shift towards smaller implements and the increased use of silcrete and fine grained siliceous materials (Brayshaw and White 1999).

Social organisation and language

Historical observations suggest that Darug, Gundungurra, and Tharawal peoples inhabited the Cumberland Plain (Kohen 1986).

Attenbrow (2010) describes four language groups around the study area:

- Darug, coastal dialect/s – the Sydney Peninsula (north of Botany Bay; south of Port Jackson, west to Parramatta), as well as the country to the north of Port Jackson, possibly as far as Broken Bay;
- Darug, hinterland dialect — on the Cumberland Plain from Appin in the south to the Hawkesbury River in the north; west of the Georges River, Parramatta, the Lane Cove River and Berowra Creek;
- Dharawal — from south side of Botany Bay, extending south as far as the Shoalhaven River; from the coast to the Georges River and Appin, and possibly as far west as Camden;
- Gundungurra — southern rim of the Cumberland Plain west of the Georges River, as well as the southern Blue Mountains Attenbrow (2010: 34).

Attenbrow's analysis suggests that the study area falls within the traditional lands of the Darug language group.

People from adjoining language groups could generally understand one another and shared common items of vocabulary. After observing exchanges between his Aboriginal companions from Port Jackson and a group of Darug people they met near the Nepean River, Trench noted *'Although our natives and the strangers conversed on a par and understood each other perfectly, yet they spoke different dialects of the same language; many of the most common and necessary words used in life bearing no similitude, and others being slightly different'* (Trench 1789; cited in Flannery 1996: 194).

The position of Darug country on the Sydney peninsula meant that they were one of the first cultural groups to be impacted by European arrival (Tindale 1974a). The coast became residential and commercial areas, while the lowlands and hinterland became developed for agricultural production and the granting of freehold lands.

Though ethnographic observations and accounts were not systematically recorded within the region, the accounts that exist provide a glimpse into the social and cultural life of the Aboriginal people at that time. European observations often used the generic term 'tribe' when referring to Aboriginal people in the Sydney region. However, the societal organisation of Aboriginal people in the Sydney area was far more complex than tribal affiliation and based upon kinship systems (Peterson 1976). Kinship defines the roles and obligations of every individual within the community, it aids in community structure and cohesion. The Elders provide knowledge and guidance for the younger members, passing on information and traditions.

The first level in the social hierarchy of Aboriginal groups of south-eastern Australia was the individual families who occupy and move throughout their traditional lands. Related families form bands who regularly come together for social, ceremonial and economic activities. Clans are likewise defined by descent and shared language, cultural practices and land. European interpretations of clan names were often adopted as place names in Sydney and more broadly across Australia. The languages spoken by clan members would generally share common elements with those of adjacent clans. Language groups or tribes form the highest level of related structure.

Apart from kinship structures, ethnographic observations in the region describe various corroborees that took place, with John Macarthur describing one that took place on his property (Liston 1988), R.H. Mathews documenting them throughout the late 1800s, and then a mention of one occurring in the 1830s at Denbigh homestead, 11 kilometres to the south of the project (Kohen 1985). Another corroboree occurred at the same area at Denbigh in the mid- 1820s and is said to have involved d over 400 individuals (Hassell 1902).

Many of the European observations related to Darug, Gandangara, and Tharawal groups refer to hunting, fishing, cooking and conflict, issues of shared interest to the European observers. The burning practices that are observed by Caley (1801, p. 47) fit into the image provided by Gammage (2012) where fire was a common element of the life of Aboriginal people. Fires were regularly lit for both hunting practices and for vegetation management, and wild fire maintained. The relationship Aboriginal people had with fire is eloquently described by John Lort Stokes who states:

> *'met a party of natives engaged in burning the bush, which they do in sections every year. The dexterity with which they manage so proverbially a dangerous agent as fire is indeed astonishing… I can conceive no finer subject for a picture than a party of these swarthy beings engaged in kindling, moderating, and directing the destructive element, which under their care seems almost to change its nature, acquiring, as it were, complete docility…*' (Gammage 2012, p. 166).

For the Darug people, the connection to the Cumberland Plain was an integral component of Country and to the formation of a cultural identity, all of which was extremely damaged and with some knowledge lost due to European occupation and subsequent dispossession of land occupied by the Darug people.

5.2.2 Subsistence

Ethno-historical observations indicate that subsistence activities on the Cumberland Plain were focused on terrestrial animals and the collection of plant foods, including highly abundant and nutritious yams (Tench 1793). Animals that were hunted include kangaroos, wallabies, possums, bandicoots, echidna, waterfowl, parrots, monitors and other large lizards, eels, fish and freshwater mussels. A range of capture techniques were documented:

- Cutting into a tree to create toe holds and extract arboreal animals and honey
- Lighting tree hollows to smoke out animals
- The broad scale use of fire to flush animals from cover
- Traps and snares to catch wallabies and bandicoots
- Decoys and snares to catch birds (Kohen 1993: 10; Kohen 1985: 9; Tench 1793: 82; Gammage 2012).

An important plant food was the wild yam which was abundant along the Hawkesbury and Nepean Rivers and their tributaries. The yam was viewed as so important to the Darug people that they would refer to themselves by name for it (Pascoe 2014, p. 26). In relation to the detailed investigation area, Yam beds were documented as existing alongside freshwater creek systems prior to land clearing. Other significant plant foods were various edible berries, banksia flowers and Burrawang seeds (*Macrozamia communis*). The Burrawang seeds required careful preparation by soaking in running water and pounding to a flour to remove lethal toxins. The flour was formed into small cakes and cooked (Kohen 1993, p. 8).

In relation to other subsistence practice, seasonal indicators were and still are used to guide subsistence strategies like fishing practices. The appearance of golden yellow flowers of the Kai'arrewan (*Acacia binervia*) indicate that fish are running in the river, while the appearance of the flowering of Burringoa (*Eucalyptus tereticornis*) is an indicator of incoming cold weather and indicates that people are not permitted to eat shellfish (Balarinji 2018b, p. 26).

The presence of creeks and waterways was important for both subsistence and as landmarks. The Nepean River, not far from the project area, is a known focal point, and a possible weather refuge area for Aboriginal people at the time of European arrival (Wouldiams *et al.* 2013). The key creek within the project area is South Creek which flows for 70 kilometres, and which was dual named as Wianamatta meaning 'mother place' in the Darug language. Additionally, there is Kemps Creek which flows for over 17 kilometres, and Badgerys Creek which is 16 kilometres long. All these watercourses provide water, food sources, and cultural significance for Aboriginal groups (Balarinji 2018b, p. 27).

5.2.3 Tools, weapons and shelter

The overhangs and rock shelters that provided shelter during inclement weather in the sandstone country are almost entirely absent from the Cumberland Plain. Shelters were described as pieces of bark laid together to form a low-lying, hut-like shelter, constructed from bark over a framework of timber and often large enough to hold eight people (Collins 1798). Tench described huts near the Nepean in 1789 as '*nothing more than a large piece of bark, bent in the middle and open at both ends, exactly resembling two cards set up to form an acute angle'* (Tench 1789 cited in Flannery 1996: 112).

Canoes were critical for access, hunting and fishing along the coast and rivers. This included at least the major waterways of the Cumberland Plain. Tench observed canoes on at least two excursions, the first in 1789 '*We also met with two old damaged canoes hauled up in the beach, which differed in no wise from those found on the sea coast*' (Tench 1789 cited in Flannery 1996: 112).

The typical tool kit on the Cumberland Plain consisted of stone flakes, ground stone axes, hatchets, spears, clubs, bowls and canoes (Tench 1961).

Ground stone axes were essential for the climbing techniques recorded on the Cumberland Plain as well as for a variety of other woodworking and hunting tasks. Potential sources for the igneous rock types favoured for ground edge axes include the deep gravel beds along the Nepean River as well as more distant igneous rock quarries near Tamworth and Oberon. Raw materials for flaked stone artefacts are widely distributed across the region. The most commonly used material for stone artefact production was the silcrete gravels associated with the St Marys Formation, which is available at multiple sites including the junction of Cosgroves and South Creeks to the north of the study area.

Examining ethnographic accounts by Trench (1789) and Collins (1798) allow a glimpse into the type of shelter that may have been used. They describe rock shelters, huts which would have been big enough to fit up to eight people, and bark 'ovens' which were constructed to allow one person to lie down inside for shelter. Within the study area, there is a reference to, but not a description of the presence of huts by Caley (1801, p. 47), as well as a mention of 'Good Land, Native Huts' by Wouldiam Dawes (Wouldiam 1792).

5.2.4 Land management

Fire provided a powerful tool in the Darug's management of the woodlands of the Cumberland Plain. Selective burning reduced undergrowth and improved access, generated fresh pick to encourage kangaroos and other macropods, synchronised the flowering and fruiting of plants foods such as burrawangs and was used to smoke arboreal fauna from their hollows (eg Tench 1879 as cited above). Fire was used in hunting and more broadly to manage fire regimes at the landscape scale to improve the predictability of the resources and provide access to country (Gammage 2012).

Accounts from 1788 by John White (1790) describe Aboriginal hunting traps and marked trees in Darug Country by explorers:

> *'On our way back, which we easily discovered by the marks made in the trees, we saw a hollow tree on fire, the smoke issuing out of the top part as through a chimney. On coming near, and minutely examining it, we found that it had been set on fire by the natives; for there was some dry grass lighted and put into the hole wherein we had supposed they used to snare or take the animal before alluded to' (White 1790 p 347).*

6. Aboriginal Cultural Values

This chapter describes the process used to inform, and summarises the outcomes from, the cultural values assessment.

6.1 Overview

The cultural values assessment in this report includes cultural information collected during consultation, field survey and during the test excavation program. The Aboriginal cultural values assessment was carried out by the project archaeologists and the Balarinji strategic design team (Balarinji 2018b).

The assessment involved a number of methods of consultation with knowledge holders as identified by the RAPs for the project (see **Chapter 4** for further details on consultation). The cultural assessment was based on:

- Reviewing archaeological fieldwork and consultation previously conducted for the concept design (Aurecon 2016)
- Reviewing literature relevant to the project and the surrounding landscape (see **Section 4.2**)
- Consultation with knowledge holders for the region during AFG meetings (see **Chapter 4**)
- Consultation with knowledge holders at arranged meetings (see **Chapter 4**)
- Consultation with Aboriginal site officers during field work regarding Aboriginal objects and cultural values (see **Chapter 4**).

The information provided has contributed to an understanding of the cultural value of the broader landscape within which the project would be located. Knowledge holders have provided information about the traditional presence of Aboriginal people in the landscape, ceremonial sites and the impact of European land management practices on their traditional land, and subsequently their culture. The cultural assessment identified locations of Aboriginal cultural value relevant to the project.

The RAPs identified three specific areas of high cultural significance, all of which were associated with previously recorded Aboriginal sites. These locations were included in the archaeological testing program. The three areas of high Aboriginal cultural heritage significance identified comprise: a small knoll immediately to the west of Badgerys Creek (site BCW); a large area on a rise and floodplain between Badgerys Creek and South Creek (sites BCE, SCW T1, SCW T2 and SCE); and a prominent ridgeline overlooking the M7 motorway (site CHRP).

The RAPs' representatives confirmed that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of high social significance as they provide tangible evidence of the use of the area by Aboriginal people.

The RAPs expressed a concern that silcrete sources within the construction footprint would be impacted and asked if there was a way to preserve them. This would be included in the salvage collection prior to construction with a conversation with EESG to determine how this resource could be used.

An additional request was made at AFG 3 for a stone artefact training and analysis workshop to be facilitated by the JAJV for site officers, particularly younger community members, to attend on a voluntary basis.

The RAPs were curious to know if the archaeological investigation could reveal if the landscape been used and occupied continuously over time or different levels of occupation over different times. The salvage excavation program would provide further details surrounding periods of occupation within the study area through Optically stimulated luminescence or radiocarbon dating. There is also the potential to select some of the tools recovered from the salvage excavation for residue analysis or 3D modelling and printing technology, where appropriate.

6.2 Cultural significance

Cultural significance can be associated with, or attached to, any place, places, and objects by any individual, group or groups of people. Cultural significance is embodied in the place itself; its fabric, setting, use, associations, meanings, records, connected places and objects. Place is a geographically defined area and may include tangible features that embody the physically identifiable landscape; as well as intangible features such as conceptual ideas or spiritual beliefs held over places or landscapes irrespective of observable physical evidence (Australia ICOMOS 2013).

Australia ICOMOS (2013) defines cultural significance as:

> *Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations.*
>
> *Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects.*

6.3 Cultural landscape

The understanding and perception of the landscape expressed by the knowledge holders and the community is an area traversed by an interconnecting network of physical, social and spiritual places. The World Heritage Convention of United Nations Educational, Scientific and Cultural Organization (UNESCO) define an associative cultural landscape as one which has 'powerful religious, artistic or cultural associations of the natural element rather than material cultural evidence, which may be insignificant or even absent' (UNESCO 1991). The relationship between Aboriginal Australians and the land can often be conceived in spiritual terms rather than primarily in material terms (Andrews *et al.* 2006).

Aboriginal cultural knowledge has been defined as:

> *'Accumulated knowledge which encompasses spiritual relationships, relationships with the natural environment and the sustainable use of natural resources, and, relationships between people, which are reflected in language, narratives social organisation, values, beliefs and cultural laws and customs.'* (Andrews *et al.* 2006).

Aboriginal cultural knowledge was traditionally passed down through oral traditions from generation to generation. Within all Aboriginal communities there was a time of dislocation and upheaval associated with the arrival of European people. This widespread disruption resulted in the loss of varying degrees of detailed knowledge and understanding of many of the elements of the cultural landscape from Aboriginal communities. A recognition and concern regarding this loss of knowledge of the cultural landscape and the meanings embedded in the landscape was expressed by several of the stakeholders during consultation for the project.

It should be noted that Indigenous communities across Australia are extremely diverse, and defy generalisation. The above descriptions are common conceptions of Aboriginal cultural landscapes and values, however, a large range of beliefs and practices are evident across Australia and uniformity should not be assumed.

It is important to acknowledge that the wider Sydney basin and Cumberland Plain are areas of early contact, meaning there have been significant cultural losses, including the desecration of sacred sites, destruction of stone formations and clearing of scarred trees.

The M12 Motorway project is on the land of the Mulgoa, Cabrogal and Cannemegal of the Darug (Dharug, Daruk) language group, with the neighbouring Dharawal language group to the east and south and Gandangara language group to the west and southwest. It passes through the Deerubbin LALC area not far from the northern boundary of Gandangara LALC (Balarinji 2018a). Further information about the Aboriginal cultural values of sites and objects in the detailed investigation area would be collated during Stage 4 of the PACHCI (see **Section 3.5**). This ACHAR would be updated to reflect any new information provided in that process.

6.4 Identified Aboriginal cultural heritage values

The consultation activities and discussions with Aboriginal knowledge holders described in **Chapter 4** have identified a variety of cultural heritage values within the regional landscape. It should be noted, however, that not all of these cultural values have been identified for the project during the archaeological assessment (see **Annexure C)**.

Table 6-1 provides a summary of cultural heritage values identified by RAPs during the consultation process.

Table 6-1 Cultural heritage values identified by RAPs

Cultural heritage value	Description
Aboriginal stone tool technology and local resources	Red Silcrete as a material was strongly associated with the Western Sydney region and different shades of silcrete can be traced to certain known quarry sites in the region. It was noted that silcrete from the Badgerys Creek area is known for its shimmery or glittery appearance. Mudstone was another material that was raised as having local significance. The banded appearance of this material (which is commonly associated with the Bringelly Shale in the area) was suggested to have potential interpretation value. The knowledge holders discussed that mudstone was commonly found in and around sandy rivers in the Penrith and Windsor areas. There is a long history of tool making in the area and a tradition of heat-treating stone that occurred during the tool making process whereby the raw material was heated to high temperatures to stabilise and strengthen the material and make it more conducive to knapping. This indicates a high level of geological and engineering knowledge, and effective use of technology. There have been silcrete tools from the Western Sydney region found in stone tool assemblages up and down the NSW coast. This speaks to the value of the material and indicates that either manufactured tools or potentially raw material was most likely traded amongst communities within the region. The knowledge holders proposed that the distribution and trade of the silcrete items could be associated with local cultural groups coming together for initiation, education or ceremony. It is important to the community that Aboriginal culture is not presented as a relic, or ancient history. It is proposed that the archaeological finds be used to reflect the continuity and resilience of the Aboriginal community and their connection to Country. It was also noted that in interpreting any of these sites it would be important to ascertain if the site is a men's or a women's site, as well as an idea of the dating of the site. There was positive feedback that the project was looking to move past archaeological salvage and compliance protocols and towards interpreting the sites as places of significance. It is seen as an opportunity to learn about the people who created the tools and tell their story. "When we talk about archaeology and the artefacts found, instead of looking at tools and just counting, they can tell us a lot about people were doing" (Barry Gunther, (Balarinji 2018b).
Resource gathering locations and techniques	The area surrounding the detailed investigation area is heavily interspersed with creek systems. These creeks have emerged as a key Aboriginal theme of the area. They are freshwater places which are associated with local learning and feature in local stories. The creek systems provide a wealth of resources, ranging from food and medicine through to construction materials. The area was known as a gathering place and an area where the Darug, D'harwahal and Gandangara people would visit. Western Sydney is Freshwater Country and it is well known that yams were a staple food source for the local people. Yams were a commodity for the Darug as well as a food source, and are known to have been traded with neighbouring cultural groups. The yams were systematically cultivated in growing areas which were destroyed when the land was cleared and fenced by Europeans.
Aboriginal sense of place	The study area has a 40,000-year history; it is a freshwater place; and the Country is on red silcrete foundations. The Darug Nation are custodians of the land, with 35 clans within the Darug Nation and five to six kin groups within each clan. There was a creek Dreaming story which was eluded to, but not shared during consultation. Leanne Watson, Balarinji facilitator and Darug woman shared with the group that she has been working on research connected to the Darug seasonal calendar; this calendar works on a six-season basis.

Cultural heritage value	Description
Campsites	Knowledge holders identified campsites as culturally significant as they provide a link between family units, the gathering of resources, pathways through the landscape, land care rejuvenation and communication between other groups. In the course of the fieldwork, the identified site locations containing dense stone artefact scatters were noted as having these types of cultural significance. Given the area may have been a focal point for Darug, D'harwahal and Gandangara people, the RAPs are interested in whether there may be archaeological evidence for multi-group gatherings.
Scarred trees	Scarred trees are of great importance to knowledge holders as they are of sacred and ceremonial importance. Due to European land use and agricultural practices scarred trees can often be the only remaining markers for ceremonial sites and burials in the landscape. None were noted during the archaeological survey **Section 3.6**)
Pathways through and focus points of the landscape	Aboriginal knowledge holders identified pathways that intersect the project. These pathways link spiritual and ceremonial sites, as well as travel corridors throughout the landscape between the coast and higher ground. During the assessment, knowledge holders commented on the importance of spurs and ridgelines as routes for travel, and the large hill at the Cecil Hills was an important vantage point. "In the old days, people would have camped up on rises and Cecil Hill to escape mosquitoes and to get a breeze in summer"(Phil Khan from the Kamilaroi-Yankuntuatjara Working Group). These pathways link spiritual and ceremonial sites, artefact scatters often occur along these pathways, as well as scarred trees which may be located at junctions, ceremonial sites or other significant points in the pathways.
Water courses, water holes or springs	Creeks and waterways were important to Aboriginal people as sources of food and landmarks. The proposed M12 crosses several creeks and the route ends in the west, not far from the Nepean River which is known to be an important focal point for Aboriginal people at the time Europeans arrived, and postulated to be a refuge during the more distant and harsher climatic periods. The Nepean River and a series of freshwater creeks, which sometimes flooded, supported a large Aboriginal population which utilised abundant mullet, bass and other fish, eels, platypus, waterbirds and edible plants, usually collected by the women and children. Permanent water bodies are culturally significant as a central location for gathering of people, resource collection and camping. During field work RAPs indicated certain water courses as important sources of food as well as significant for ceremonial practices. The importance of the waterways in this area was identified by Aboriginal knowledge holders, in particular the connections to the underlying geology, and the surface ecology and food chain. Historically, a natural spring fed watercourse was associated with Badgerys Creek East / M12 A3 (45-5-4750) which would have been an important water source for past communities during the drier cycles of seasonal variation. This natural spring has now been in-filled by land practices.
Plants and animals	Plants and animals are significant to traditional owners. During field work the fauna and flora were often mentioned in context with spiritual importance. Throughout the consultation process plants and animals were often mentioned in discussion with resource collection. The local totems were identified as: black swan Mulgoa/mulgo; black duck Yurangai; flying fox Wuban-Burumin; and possum Wuban-marli. A number of participants discussed the significance of certain local animals. It was widely agreed that the appearance of reptiles denotes sickness for yourself or someone close to you, and that there are certain birds (whistling kite – diamuldiamul) such as the whistle bird, whose call denotes rain coming.

Cultural heritage value	Description
Aboriginal astronomy	The constellations visible above Western Sydney have been a navigation tool for the local Aboriginal community for an estimated 40,000 years. There is still active engagement and study of this ancient knowledge, with Western Sydney University holding Indigenous astronomy nights bi-monthly. Western Sydney Elder Greg Simms told the Dreaming story of The Two Women on the Moon: "They wander around the bush, and the Elders say, "Don't go too far." When it gets late in the afternoon, and then went out into the bush, and then they chase the Aboriginal men. They chase them. Girls ran and ran and ran, and they came to the hill, and start running up the hill. Getting away from these men. So those men turned into dingoes, gaining on these two girls. Same two girls turned into emus. The dingoes were right there, to get them. And instead of flying back down to the ground, they flew upwards, and they landed on the moon. That's where they landed. When you see a full moon, you'll see two emus right down the middle. When you look at the full moon, two emus on the bottom. That's why the dingoes and dogs howl at the moon on those nights, trying to call these two girls back to earth." (Balarinji 2018b).
Burial sites	Burial sites are of great importance and are generally of high concern to Aboriginal people as the locations of burials are rarely documented. Knowledge holders identified the landscape features chosen for burial sites as typically being areas near the campsites and on sandy rises. "Burial sites would often be left alone or abandoned for other activities; people would leave the area after cemeteries had been established as it had become sacred land." Phil Khan (Kamilaroi-Yankuntuatjara Working Group). Although archaeological assessment included test excavation in areas identified to have been potential burial sites, no burials were identified (see **Chapter 7**).
Areas of spiritual significance	Registered Aboriginal knowledge holders identified pathways within the project boundary. These pathways link spiritual and ceremonial sites, as well as travel corridors throughout the landscape between the coast and higher ground. No archaeological evidence for areas of spiritual significance were identified during the archaeological assessment (see **Chapter 7**).
Post-contact sites	Post-contact sites are those that have gained significance to Aboriginal people since the arrival of European people. No sites of this type were mentioned as having any particular significance. No post-contact sites were identified within the detailed investigation area during the archaeological assessment (see **Chapter 7**). However, an artefact scatter (45-5-4022) approximately 160 m outside detailed investigation area is situated on the same Cecil Hill ridgeline as CHRP, has evidence of knapped ceramics and flaked glass, indicating a contact site where Aboriginal people manufactured traditional tool types form introduced materials. However, given this site is located outside the construction footprint, there would be no impact to this site through the project.
Massacre sites	These sites are important to Aboriginal people and are often difficult to discuss. No massacre sites were identified during the archaeological assessment (see **Chapter 7**).
Cultural knowledge	Knowledge holders have indicated grave concern for the loss of cultural knowledge and the meanings embedded in the landscape of the region. It is felt that the loss that began with early colonisation has been exasperated by significant development in the region. The sense of loss and belonging instils a feeling of guilt that the country is not being protected for the future generations; that there is poor cultural heritage management, and that archaeologists facilitate the destruction. The farmers took land, yam, totem and trade. The clans fought back for 22 years, until all were dead or hiding (Pascoe 2014). Recognition and concern regarding the loss of cultural knowledge and the meanings embedded in the landscape were also expressed by several RAPs throughout the course of recent fieldwork and consultation (Jamie Eastwood, Steven Hickey, Barry Gunther)

6.4.1 Oral testimonies and statements of cultural significance

The following testimonies from knowledge holders for the project were received during the AFG meetings, test excavations and inclusive consultation conducted by Balarinji (Balarinji 2018b).

Barry Gunther (Gandangara Local Aboriginal Land Council)

Barry participated in the cultural values assessment at AFG 2 on 7 August 2018 and during consultation on 4 October 2018. Barry is a representative of Gandangara LALC and has lived in south-west Sydney for over forty years, working in Badgerys Creek and surrounding areas. Barry was part of the first Environmental Impact Study Aboriginal assessments for the Western Sydney Airport in 1997. Barry explains Badgerys Creek area is important to him to source a special type of ochre for cultural and educational purposes.

"To embed Aboriginal culture you should consider Traditional land care protocols. An example would be firestick farming, but it's really important with the rural fire service and bush fires in the mountains to burn every few years. There should be Aboriginal management of that".

"You don't just open and close a book and know what you need to know, it's about physically seeing it and experiencing it".

"When we talk about archaeology and the artefacts found, instead of looking at tools and just counting, they can tell us a lot about people were doing".

Jamie Eastwood (Darug Aboriginal Cultural Heritage Assessments)

Jamie is a traditional Nagamba-Darug Man who has worked on both large and small-scale community art projects and has lived in the Western Sydney area for the past thirty years. As well as being an active cultural heritage officer and field leader for archaeological assessments in Western Sydney for over two decades, Jamie has been a practicing visual artist, working on both large and small-scale community art projects. Using mainly acrylic paint, his work has been exhibited widely and he has won several awards, including being named NSW Aboriginal artist of the year; the Centennial Medal award for service to the arts; and the Young Australian Citizen of the Year by Parramatta City Council.

With a wealth of experience in cultural heritage, archaeology and as an artist, Jamie loves to teach and pass on his skills and knowledge to others, as he is shown doing in **Figure 6-1**. He is passionate about telling the stories of his Aboriginal culture through art in both a traditional and non-traditional way and, by doing so, he hopes to keep the Dreaming alive.

Statement of cultural significance/ cultural value and significance

"*The M12 project area regions have important creeks and iconic landmarks that feature prominently within the surrounding landscape. The site officers appreciate our role and responsibility for the care and protection of the integrity of these landscapes, for and on behalf of its original First Peoples and their descendants. We enjoy the work and it is important to touch and feel and participate in the archaeology work, to remain connected to our Ancestors".*

"The waterways and creeks are really important, with rich cultural heritage and artefacts. There are many areas that contain evidence of this connection, resulting from occupation on varying levels and physical reminders left by our Ancestors, which provide us descendants who are working on the project an opportunity to make a physical connection through time. This connection is one of those avenues that produce in us the sense of perception, appreciation, familiarity and recognition of who we are and where we belong as Aboriginal People".

"During excavation, it is important to see the artefact in situ. It is dusty work using the trowel and brush, or dry sieving at the pit, but when you record and photograph it in three dimensions, or find a lot of artefacts in one spit, you can track changes in density of artefacts, track points where things have changed".

"It is important work to be on site doing the cultural heritage work. I am a proud Darug man and I am proud to be working on country, investigating, excavating and learning about my Ancestors' cultural heritage. Here on site there are lots of other nations, lots of people here involved in the work, in the project, on site finding the artefacts. It's good for everyone to be connecting to the past".

Figure 6-1 Jamie Eastwood describing an in situ artefact to site officers at Badgerys Creek West site (photo: G Dunnett)

Leanne Watson (Darug Custodian Aboriginal Corporation)

Leanne is the daughter of Edna Watson and Allan Watson, Elders of the Darug community. Leanne was born and raised in Western Sydney where she still resides. Leanne has spent her life living, promoting and protecting Darug Culture, People and Places, and has been the director of Darug Custodian Aboriginal Corporation for more than fifteen years.

Taught by her mother, Edna Watson and her brother, Bundeluk Watson, Leanne started painting at a young age and is now an accomplished and renowned artist. She finds inspiration from her family, her environment, and her life experiences.

Leanne's artwork and cultural knowledge has taken her overseas to promote Darug culture, delivering workshops, interpretive projects and educational programs. Leanne is commonly known in the Aboriginal community and signs her work as Mulgo, meaning black swan.

"Most Dreaming stories relate to the physical and spiritual role of the Land as Mother. Everything starts with the Land as Mother and comes from her - people, cycles, seasons, the sky, the stars, the sunlight, the cosmos, all connected through ceremony, through practical living and through ecological management".

Julie Jones and Corrina Norman-Dadd (Darug Tribal Aboriginal Corporation)

Julie Jones and Corrina Norman-Dadd are proud local Darug women and members of the Darug Tribal Aboriginal Corporation.

> ***"The Darug Emu story goes back to the creator, the Rainbow Serpent. To the Darug, the Emu is significant for women and men because she represents Mother. Emu is often depicted to represent Mother Earth in art, song and dance. The Emu story connects across Darug land and Australia wide. In Darug Country the Emu is often related to Women's business but in other areas the Emu is men's business. This is the story of the Great Emu in the sky which stretches across the Milky Way Constellation. The constellation changes with the seasons: when the emu is tucked in, he is sitting on the eggs and they cannot be hunted but when he is stretched out or running it's ok to hunt and collect Emu eggs. It is important to show the Emu and the change in seasons in the landscape. The Bowerbird nest also has a strong Dreaming around the creeks".***
>
> ***"Specific grid marks in the rocks and land were used to mark country so you would know when you are in Darug Country or travelling into another clan's Country. Engravings are very important to the local community. It would be great to see engravings created by local Darug men in natural materials from the area."***

Jasmine Seymour (Darug Custodian Aboriginal Corporation)

Jasmine is a Darug woman from the Hawkesbury area belonging to the Boorooberongal cultural group. A member of Darug Custodian Aboriginal Corporation, Jasmine is the five times Great-Granddaughter of Maria Locke. Maria Lock was a prominent Boorooberongal woman in early colonial Sydney and the daughter of renowned Elder Yarramundi. Jasmine works with lino print, watercolours and ink. Her work is inspired by the Sydney rock engravings and is a response to the stories they still hold and tell every day.

> ***"My artwork depicts the Darug ancestral heroes, Baiame and his son Dharamulan who both shape shift into Emus and also Mariong, Baiame's wife. The footprints belong to Baiame. The male emu is often depicted standing on one leg because when he places down his other leg this is how yam seeds are planted. Darug in language means Yam."***

6.5 Aboriginal cultural values within or adjacent to the project

Within the range of values discussed in **Table 6-1**, this cultural assessment has identified three areas with high Aboriginal cultural significance and high cultural values next to or within the construction footprint (**Table 1-1**). The three Aboriginal cultural values areas are not gazetted Aboriginal Places under S86(4) of the NPW Act, but values of local significance identified during this cultural values assessment. All three of these cultural values areas are located within the construction footprint and are all associated with Aboriginal archaeological sites identified during the archaeological assessment (see **Annexure C**). Details of each of these cultural values and their locations are listed in **Table 6-2** below.

Three areas associated with recorded sites are designated high Aboriginal cultural heritage significance and were identified by the RAPs during fieldwork (**Table 6-2**) including:

- A small knoll immediately to the west of Badgerys Creek (site BCW);
- A large area on a rise and floodplain between Badgerys Creek and South Creek (sites BCE, SCW T1, SCW T2 and SCE)
- A prominent ridgeline overlooking the M7 motorway (site CHRP).

The locations of the sites that comprise these three sites of high cultural significance and value (ie BCW, BCE, SCW T1, SCW T2 and SCE) are shown on **Figure 3-16** and **Figure 7-1**.

The archaeological analysis revealed substantial variations in the distribution of cultural materials which are likely to reflect different cultural, subsistence and technological values and activities. As songlines are intangible, no specific details of cultural value have been suggested by Aboriginal knowledge holders in the Cecil Hill area as discussed during the cultural values assessment.

Table 6-2 Aboriginal cultural values near or within the project

Cultural value name	AHIMS ID	Within or adjacent to project	Description
Badgerys Creek site (BCW)	45-5-4747 Updated AHIMS ID to be determined	Within	A small knoll immediately to the west of Badgerys Creek (site BCW) and a part of Badgerys Creek Upstream, occupies an important vantage point in the landscape. The RAPs felt a particular connection to the area and spoke of the high likelihood this site would have been a significant area for the Ancestors.
Badgerys Creek and South Creek	M12 A2 (45-5-4748) / M12 A3 (45-5-4750) M12 A4 (45-5-4749) Updated AHIMS ID to be determined	Within	A large area on a rise and floodplain between Badgerys Creek and South Creek (sites BCE, SCW T1, SCW T2 and SCE). This landform has potential cultural sensitivity for burials and an abundance evidence of sustained occupation and use by past Aboriginal people. Historically, a natural spring fed watercourse was associated with Badgerys Creek East / M12 A3 (45-5-4750) which would have been an important water source for past communities during the drier cycles of seasonal variation. This natural spring has now been in-filled by land practices.
Cecil Hills Ridge Park (CHRP)	Updated AHIMS ID to be determined	Within	A prominent ridgeline overlooking the M7 motorway (site CHRP), it occupies an extraordinary vantage point in the landscape, affording views west to the Blue Mountains and east toward the mouth of Paramatta river and Sydney harbour. From this aspect Aboriginal people would have watched the encroaching European people and would have witnessed the landscape changing as the Cumberland Plains were developed. An artefact scatter (45-5-4022), situated on the same ridgeline approximately 500 m away, has evidence of knapped ceramics and flaked glass, indicating a rare and highly significant contact site where Aboriginal people manufactured traditional tool types from introduced materials.

7. Significance assessment

7.1 Overview

Significance assessments generally use a series of standard criteria to define why a site is important. The criteria used in this significance assessment are described in the Australia International Council On Monuments and Sites (ICOMOS) Burra Charter (Australia ICOMOS 2000). They are:

- Social value
- Historical value
- Scientific value
- Aesthetic value
- Spiritual value.

The individual criteria are applied to each of the Aboriginal sites that have been identified in the construction footprint. Spiritual value is not assessed as explained in **Section 7.1.5** below. An overall significance rating site is assigned to a site based on an average across the criteria. While this may oversimplify the significance of particular sites or their attributes to particular stakeholders, it does provide a consistent basis for comparing the relative significance of sites.

7.1.1 Social significance

The views of Aboriginal people, as the traditional custodians of all material and immaterial aspects of their culture, are the primary determinant of the social significance of Aboriginal cultural heritage. Aboriginal people's views on the significance of Aboriginal sites are usually related to traditional, cultural and educational values, although some Aboriginal people also value any scientific information a site may be able to provide.

Aboriginal cultural significance was assessed through consultation with the nominated site officers from the RAPs before, during and after the field work phase of the project. It should be noted that the information gained through this process may not reflect the views of all members of the local Aboriginal communities.

7.1.2 Historic significance

The historic value of a site is determined through its association with historically important people, events or activities.

7.1.3 Scientific significance

Attributes which contribute to scientific significance include:

- **Site integrity** – The integrity of a site refers to its state of preservation, or condition. A site can be disturbed through a number of factors including natural erosion processes, destructive land use practices or repeated use of a site in the past by both humans and animals
- **Site structure** – Structure refers to a site's physical dimensions, that is, size and stratigraphy. A large site or a site with stratified deposits has more research potential than small sites and/or surface scatters. Sometimes however, specific research questions may be aimed at smaller sites in which case they would be rated at a higher significance than normal. Site structure cannot be assessed for scarred trees or isolated artefacts
- **Site contents** – This category refers to the range and type of occupation debris found in a site. Generally, complex art sites, extensive quarries with associated debris and surface sites that contain a large and varied amount of organic and non-organic materials are considered to have greater research potential than those sites with small, uniform artefacts, single motif art sites and small quarries with little or no debris. For scarred trees, contents may refer to the size and type of scar and/or how many scars there are on the one tree
- **Representativeness and rarity** – Representativeness refers to how much variability exists between the subject site and others inside or outside the subject area. It also considers the types of sites already conserved in the area and how much connectivity between sites exists. Rarity considers how often a particular site type occurs in an area. Assessment of representativeness and rarity requires some knowledge of the background archaeology of the area or region in which a study is being undertaken. Rarity also relates to whether the subject site or area is important in demonstrating a distinctive way of life, custom, process, land use, function or design which is no longer practiced (OEH 2011).

The scientific significance of each of the Aboriginal sites has been assessed as high, moderate or low.

A rating of 'high scientific significance' is reserved for those sites, the loss of which would represent an unrecoverable opportunity for future generations which cannot be mitigated by reference to other local and securely protected sites. All sites of high significance warrant management priority. This might entail extra protection measures if direct impacts can be avoided, or further investigation through archaeological salvage if impacts are unavoidable.

Sites of moderate scientific significance are considered to have important contributions to make to knowledge, but not in a unique manner. A sample of sites of moderate significance should be salvaged if impacted.

A rating of low scientific significance does not diminish the inherent significance of a site as a representation of Aboriginal life which is important to Aboriginal people. Sites of low significance may comprise a small number of artefacts that do not offer new insights when considered in the context of the regional archaeological resource.

7.1.4 Aesthetic significance

Aesthetic significance refers to the sensory value of a place, and can include aspects such as form, texture, and colour, and can also include the smell and sound elements associated with use or experience of a site. Aesthetic significance is often closely linked to the social value of a site.

7.1.5 Spiritual significance

The views of Aboriginal people, as the traditional custodians of all material and immaterial aspects of their culture, are the primary determinant of the spiritual significance of Aboriginal cultural heritage. The level of spiritual significance for individual sites and places is cultural information that is not generally disclosed to persons who are not traditional knowledge holders. For this reason, a significance level has not been assigned for spiritual values in the significance assessments that follow.

7.2 Site significance assessments

To summarise, following the test excavation program, there are:

- Nineteen Aboriginal sites within the construction footprint
- Seven Aboriginal sites within the detailed investigation area.

Several Aboriginal sites occur in close proximity and appear to be associated with a specific landform feature, either creek or a ridgeline. These sites have been considered as part of a 'site complex' on the basis of distinctive landform, soils and archaeological characteristics. The grouping of individual sites into site complexes enables all of the cultural materials at a location be assessed in the context of all available information.

Based on test excavations, five 'site complexes' associated with particular creek systems have been identified within the detailed investigation area, including:

- Cosgroves Creek complex
- Badgerys Creek Upstream complex
- South Creek complex
- Kemps Creek complex
- Cecil Hills complex.

The Aboriginal sites within the construction footprint that have been grouped into site complexes are described in **Table 7-1** and demonstrated in **Figure 7-1**.

The significance assessment focuses on the sites within, or with a portion of the site boundary within the construction footprint or where the potential for inadvertent impacts warrants management measures for to be developed to minimise impacts to these sites. The significance assessment does not include sites which have been recorded outside the construction footprint but within the detailed investigation area (**Table 7-2**) as these sites are not expected to be impacted by the project. However, environmental management measures have been considered for these sites (**Section 10**) given their proximity to the construction footprint.

Table 7-1 Identified Aboriginal sites in the construction footprint

Site Complex	Site Name	AHIMS sites incorporated	Location	Site type
Cosgroves Creek	CCW		Cosgroves Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
Cosgroves Creek	CCE T1		Cosgroves Creek	Continuous area with Aboriginal objects in sub-surface deposits
Cosgroves Creek	CCE T2		Cosgroves Creek	Continuous area with Aboriginal objects in sub-surface deposits
Cosgroves Creek	CCE T3		Cosgroves Creek	Continuous area with Aboriginal objects in sub-surface deposits
Badgerys Creek Upstream	BWB		Badgerys Creek Upstream	Continuous area with Aboriginal objects in sub-surface deposits
South Creek	BCW		South Creek	Continuous area with Aboriginal objects in sub-surface deposits
South Creek	BCE	45-5-0528 (Fleurs 2)/45-5-4750 (M12 A3); 45-5-4748 (M12 A2)	South Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
South Creek	SCW T1	45-5-0496/45-5-4749; 45-5-0528/45-5-4750	South Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
South Creek	SCW T2		South Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
South Creek	SCE	45-5-0496 (Fleurs 1)/45-5-4749 (M12 A4)	South Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
Kemps Creek	KNW		Kemps Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
Kemps Creek	KCW		Kemps Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
Kemps Creek	KCE		Kemps Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
Cecil Hills	PCP8	45-5-2308	Cecil Hills	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
Cecil Hills	CHRP	45-5-4935	Cecil Hills	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
N/A	RR	45-5-4937/ 45-5-4007	Cecil Park	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
N/A	M12A1	45-5-4747	Badgerys Creek	Surface stone artefact site
N/A	Isolated artefact 4	45-5-3804	Luddenham	Stone artefact site (single artefact)
N/A	TNR-AFT-14	45-5-4786	Luddenham	Stone artefact site (single artefact)

Table 7-2 Identified Aboriginal sites within detailed investigation area (outside construction footprint)

Site Complex	Site Name	AHIMS sites incorporated	Location	Site type
N/A	CP AS1	45-5-4374	Cecil Park	Stone artefact site
N/A	P-CP9	45-5-2307	Cecil Park	Stone artefact site
N/A	PAD-OS-7	45-5-2721	Cecil Park	Stone artefact site: initially a PAD with artefacts discovered in test excavation
N/A	PAD-OS-5	45-5-2723	Cecil Park	Stone artefact site: initially a PAD with artefacts discovered in test excavation
N/A	DLC 2	45-5-2563	Cecil Park	Stone artefact site
N/A	M12A5	45-5-4767	Kemps Creek	Stone artefact site
N/A	KC/ED2	45-5-2310	Kemps Creek	Stone artefact site

7.2.1 Cosgroves Creek complex

Four separate sites have been identified at Cosgroves Creek, these are:

- CCW
- CCE T1
- CCE T2
- CCE T3.

The landform and archaeological characteristics that have been used to define each of the sites are described in **Annexure C**.

Figure 7-1 Aboriginal site complexes

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 7-1 Aboriginal site complexes

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 7-1 Aboriginal site complexes

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

CCW: Cosgroves Creek West

Description: A continuous area of alluvial deposits on the western side of Cosgroves Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits aligned roughly east - west and perpendicular to the creek. The full area of the site was not established; however, it extends for at least 240 metres on an east - west axis (ie the full length of the line of test pits). A total of 69 flaked stone artefacts were recovered from the site. The significance assessment for this site is presented in **Table 7-3**.

Table 7-3 Cosgroves Creek West significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, historical significance is considered **low to moderate**.
Scientific significance	The deep alluvial soils at CCW offer the opportunity to investigate the distribution of artefacts in a deep soil profile, particularly the area close to the creek where there is less evidence of extensive ground disturbance. The integrity of the site overall is low-moderate as a result of historical and ongoing disturbance by agricultural activities. The site had moderate representativeness/rarity as a sub-surface distribution of stone artefacts, a common type of site on the Cumberland Plain, particularly in close proximity to major water sources. Cosgroves Creek West is assessed as being of **moderate scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform and its connection to the riparian corridor along Cosgroves Creek. The site is considered of **moderate aesthetic significance**.
Summary statement of significance	Overall, Cosgroves Creek West is of **moderate significance** at a local level as it provides evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate as the site is likely to have been subject to disturbance as a result of being located within an agricultural environment. However, the site has moderate representativeness/rarity due to its location within the agricultural environment. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

CCE T1: Cosgrove Creek East T1

Description: A continuous area of alluvial deposits and residual soils on the eastern side of Cosgroves Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits aligned roughly east - west and perpendicular to the creek. The full area of the site was not established however it extends for at least 400 metres on an east - west axis (ie the full length of the line of test pits). A total of 45 flaked stone artefacts were recovered from the site. The significance assessment for this site is presented in **Table 7-4**.

Table 7-4 CCE1 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The residual soils that occur across the undulating slopes of CCE1 contain a variable, low density distribution of sub-surface artefacts. The site has potential for research into dispersed patterns of artefact discard associated with hunting areas. However, the presence of a low density of artefacts beyond the high-activity areas typically associated with reliable water is more illustrative of a general archaeological pattern than offering a rare research opportunity. The integrity of the site overall is low-moderate as a result of historic and ongoing disturbance by agricultural activities. The site has moderate representativeness/rarity value as an extensive sub-surface distribution of stone artefacts, a common type of site on the Cumberland Plain. CCE T1 is assessed as being of **moderate scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform. The site is considered of **low aesthetic significance**.
Summary statement of significance	Overall, CCE T1 is of **moderate significance** at a local level as it provides evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate as the site is likely to have been subject to disturbance as a result of being located within an agricultural environment. However, the site has moderate representativeness/rarity due to its location within the agricultural environment. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

CCE T2: Cosgrove Creek East T2

Description: A continuous area of residual soils between Cosgroves Creek and Badgerys Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits aligned roughly east - west and perpendicular to the two creeks. The full area of the site was not established however it extends for 200 metres on an east - west axis (ie the full length of the line of test pits). A total of 82 flaked stone artefacts were recovered from the site. The significance assessment for this site is presented in **Table 7-5**.

Table 7-5 CCE T2 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The residual soils that occur across the undulating slopes of CCE2 contain a variable, low density distribution of sub-surface artefacts. The site has potential for research into dispersed patterns of artefact discard associated with hunting areas. However, the presence of a low density of artefacts beyond the high-activity areas typically associated with reliable water is more illustrative of a general

Criterion	Assessment
	archaeological pattern than offering a rare research opportunity. The integrity of the site overall is low-moderate as a result of historic and ongoing disturbance by agricultural activities. The site has moderate representativeness/rarity value as an extensive sub-surface distribution of stone artefacts, a common type of site on the Cumberland Plain. CCE T2 is assessed as being of **moderate scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform. The site is considered of **low aesthetic significance**.
Summary statement of significance	Overall, CCE T2 is of **moderate significance** at a local level as it provides evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate as the site is likely to have been subject to disturbance as a result of being located within an agricultural environment. However, the site has moderate representativeness/rarity due to its location within the agricultural environment. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

CCE T3: Cosgrove Creek East T3

Description: A continuous area of residual soils between Cosgroves Creek and Badgerys Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits aligned roughly east - west and perpendicular to the two creeks. The full area of the site was not established during the test excavations however it extends for at least 1200 metres on an east - west axis (ie the full length of the line of test pits). A total of 14 flaked stone artefacts were recovered from the site. The significance assessment for this site is presented in **Table 7-6**.

Table 7-6 CCE3 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The residual soils that occur across the undulating slopes of CCE3 contain a variable, low density distribution of sub-surface artefacts. The site has potential for research into dispersed patterns of artefact discard associated with hunting areas. However, the presence of a low density of artefacts beyond the high-activity areas typically associated with reliable water is more illustrative of a general archaeological pattern than offering a rare research opportunity. The integrity of the site overall is low-moderate as a result of historic and ongoing disturbance by agricultural activities. The site has moderate representativeness/rarity value as an extensive sub-surface distribution of stone artefacts, a common type of site on the Cumberland Plain. CCE T3 is assessed as being of **moderate scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform. The site is considered of **low aesthetic significance**.

Criterion	Assessment
Summary statement of significance	Overall, CCE T3 is of **moderate significance** at a local level as it provides evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate as the site is likely to have been subject to disturbance as a result of being located within an agricultural environment. However, the site has moderate representativeness/rarity due to its location within the agricultural environment. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

7.2.2 Badgerys Creek upstream

One site has been identified in the upstream section of Badgerys Creek; BWB. The landform and archaeological characteristics that have been used to define each of the sites are described in **Annexure D**.

BWB: Badgerys West B

Description: A continuous area of alluvial deposits on the western side of Badgerys Creek, approximately 1.6 kilometres upstream of the South Creek complex (see below). The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits aligned roughly east - west and perpendicular to the creek. The full area of the site was not established during test excavations however it extends for at least 520 metres on an east - west axis (ie the full length of the line of test pits). A total of 72 flaked stone artefacts were recovered from the site. A small knoll immediately to the west of Badgerys Creek is considered to be an area of high cultural significance by the community. The significance assessment for this site is presented in **Table 7-7.**

Table 7-7 BWB significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The alluvial soils at BWB offer the opportunity to investigate the distribution of artefacts in a moderately deep soil profile at varying distances from reliable water. However, the integrity of the site is low as a result of historic and ongoing disturbance, including large scale earthworks associated with the construction of dams. The site had moderate representativeness/rarity as a sub-surface distribution of stone artefacts, a common type of site on the Cumberland Plain, particularly in close proximity to major water sources. Badgerys West B is assessed as being of **moderate scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land and heavily modified by the construction of dams and land surface contouring. The site is considered of **low aesthetic significance**.
Summary statement of significance	Overall, BWB is of **moderate significance** at a local level as it provides limited evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate as the site has been subject to disturbance as a result of being located within an agricultural environment. However, the site has moderate representativeness/rarity due to its location within the agricultural environment. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

7.2.3 South Creek complex

Five separate sites have been identified in the South Creek complex, these are:

- BCW
- BCE
- SCW1
- SCW2
- SCE

The landform and archaeological characteristics that have been used to define each of the sites are described in **Annexure D**.

The South Creek complex of sites represents a rare collection of archaeological features that include:

- A local source of silcrete cobbles with associated primary working of that material
- A dense concentration of artefacts on a low rise, possibly evidence of a base camp
- A hilltop site with a remarkable outlook over the South Creek catchment
- Deep alluvial deposits with the potential to investigate the presence of Pleistocene deposits
- Extensive distributions of stone artefacts across kilometres of creek valley floor.

BCW: Badgerys Creek West

Description: A continuous area of residual soils on a prominent ridge, hills and creek flat immediately to the west of Badgerys Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by two lines of test pits, one aligned roughly north-south and parallel to the creek and the other east –west and perpendicular to the creek. The full area of the site was not established however it extends for at least 400 metres on a north-south axis and 200 metres east- west (ie the full length of the lines of test pits). A total of 46 flaked stone artefacts were recovered from the site. The significance assessment for this site is presented in **Table 7-8.**

Table 7-8 BCW significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The hilltop sections of the site contain rare evidence of a basecamp activities on a rise immediately above one of the major waterways in the South Creek catchment. The integrity of the site overall is low-moderate as a result of historic and ongoing disturbance by agricultural activities. The site has high representativeness/rarity as a sub-surface distribution of stone artefacts in a gravel-rich soil remnant on an elevated location. BCW is assessed as being of **high scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform and its connection to the riparian corridor along Badgerys Creek. The site is considered of **moderate aesthetic significance**.

Criterion	Assessment
Summary statement of significance	Overall, BCW is of **high significance** at a local level as it has the potential to provide extensive evidence of the use of the area by Aboriginal people. The integrity and structure of the site is low-moderate as the shallower soils on the ridgeline have been subject to disturbance through historic and current agricultural activities. The site has high representativeness/ rarity value as a potential focus of activities on a rise immediately above a substantial waterway. The high overall significance rating of the site is a reflection of the exceptional research and educational potential of the South Creek complex as a group.

BCE: Badgerys Creek East

Description: A continuous area of alluvial deposits and residual soils on the eastern bank of Badgerys Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits, aligned roughly east –west and perpendicular to the creek. The full area of the site was not established however it extends for at least 600 metres on a north-south axis (ie the full length of the line of test pits). A total of 219 flaked stone artefacts were recovered from the site. The significance assessment for this site is presented in **Table 7-9.**

Table 7-9 BCE significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The site contains evidence of variations in the distribution of sub-surface artefacts with distance from one of the major waterways in the South Creek catchment. The site is the location of a natural spring fed watercourse that has now been in-filled by land practices. The integrity of the site overall is low-moderate as a result of disturbance by agricultural activities and run-off from an adjacent quarry. The site has high representativeness/rarity as a sub-surface distribution of stone artefacts associated with a natural spring. BCE is assessed as being of **high scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform and its connection to the riparian corridor along Badgerys Creek. A quarry immediately to the south detracts from the visual character. The site is considered of **moderate aesthetic significance**.
Summary statement of significance	Overall, BCE is of **high significance** at a local level as it has the potential to provide extensive evidence of the use of the area by Aboriginal people. The integrity and structure of the site is moderate as a result of disturbance through historic and current agricultural activities. The site has moderate representativeness/ rarity value as an opportunity to investigate the distribution of sub-surface artefacts associated with a substantial waterway. The high overall significance rating of the site is a reflection of the exceptional research and educational potential of the South Creek complex as a group.

SCW T1: South Creek West T1

Description: A continuous area of alluvial deposits and residual soils on the western side of South Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits, aligned roughly east –west and perpendicular to the creek. The full area of the site was not established however it extends for at least 560 metres on an east - west axis (ie the full length of the line of test pits). A total of 136 flaked stone artefacts were recovered from the site. The site incorporates the previously recorded AHIMS 45-5-0496/ 45-5-4749 and 45-5-0528/ 45-5-4750. The significance assessment for this site is presented in **Table 7-10.**

Table 7-10 SCW1 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The deep alluvial soils on the floodplain at SCW T1 offer the opportunity to investigate the distribution of artefacts in a deep soil profile, potentially one that includes Pleistocene age soils. The integrity of the site overall is moderate as a result of historic and ongoing disturbance by agricultural activities. The site had high representativeness/rarity value as a sub-surface distribution of stone artefacts, in close proximity to major water course and high value resource zone. The site is assessed as being of **high scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform and its connection to the riparian corridor along Badgerys Creek. The site is considered of **moderate aesthetic significance**.
Summary statement of significance	Overall, SCW T1 is of **high significance** at a local level as it has the potential to provide extensive evidence of the use of the area by Aboriginal people. integrity and structure of the site is moderate as a result of disturbance through historic and current agricultural activities. The site has high representativeness/ rarity value as an opportunity to investigate a deep alluvial soil profile immediately adjacent to a major waterway and resource zone. The high overall significance rating of the site is a reflection of the exceptional research and educational potential of the South Creek complex as a group.

SCW T2: South Creek West T2

Description: A continuous area of residual soils on a rise between Badgerys and South Creeks. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by two line of tests pits, one aligned roughly east –west and the other north-south. The full area of the site was not established however it extends for at least 320 metres east - west and 40 metres on a north-south axis (ie the full length of the lines of test pits). A total of 243 flaked stone artefacts were recovered from the site. The significance assessment for this site is presented in **Table 7-11.**

Table 7-11 SCW T2 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The site contains evidence of variations in the distribution of sub-surface artefacts over an elevated ridgeline overlooking the floodplain of the South Creek catchment and immediately adjacent to resource rich wetlands. The integrity of the site is moderate as a result of historic disturbance by agricultural activities and scientific facilities. The site has high representativeness/rarity to its location within the local catchment and proximity to high value resources. The site is assessed as being of **high scientific significance**.

Criterion	Assessment
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform and provides expansive views across the riparian corridor and associated floodplain of South Creek. The site is considered of **high aesthetic significance**.
Summary statement of significance	Overall, SCW T2 is of **high significance** at a local level as it has the potential to provide extensive evidence of the use of the area by Aboriginal people. The integrity and structure of the site is moderate as a result of disturbance through historic and current agricultural activities. The site has high representativeness/ rarity value as an opportunity to investigate the distribution of sub-surface artefacts on an elevated landform located between two major waterways and offering expansive views across the associated floodplain. The high overall significance rating of the site is a reflection of the exceptional research and educational potential of the South Creek complex as a group.

SCE: South Creek East

Description: A continuous area of alluvial deposits on the eastern side of South Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits, aligned roughly east - west and perpendicular to the creek. The full area of the site was not established however it extends for at least 360 metres on an east - west axis (ie the full length of the line of test pits). A total of 333 flaked stone artefacts were recovered, the majority from pits immediately adjacent to South Creek. The significance assessment for this site is presented in **Table 7-12.**

Table 7-12 SCE significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The alluvial soils on the banks of South Creek contain dense sub-surface distribution of stone artefacts associated with a local source of silcrete in the creek. This offer the opportunity to investigate the manufacture and reduction of artefacts in a well-developed soil profile. The integrity of the site overall is moderate as a result of historic and ongoing disturbance by agricultural activities. The site had high representativeness/rarity value as a sub-surface distribution of stone artefacts, in close proximity to major water course and stone resource. The site is assessed as being of **high scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is partly agricultural land, with mature trees retained along the creek banks. It retains an overall sense of the contours of the underlying landform and strong visual connections to South Creek and its floodplain. The site is considered of **high aesthetic significance**.
Summary statement of significance	Overall, SCE is of **high significance** at a local level as it has the potential to provide extensive evidence of the use of the area by Aboriginal people. The integrity and structure of the site is moderate to high as a result of limited disturbance through historic and current agricultural activities. The site has high representativeness/ rarity value as an opportunity to the manufacture of stone artefacts and their movements across the broader landscape. The high overall significance rating of the site is a reflection of the exceptional research and educational potential of the South Creek complex as a group.

7.2.4 Kemps Creek complex

Three separate sites have been identified at Kemps Creek complex, these are:

- KNW
- KCW
- KCE.

The landform and archaeological characteristics that have been used to define each of the sites are described in **Annexure D**.

KNW: Kemps North West

Description: A continuous area of alluvial deposits and residual soils on the western side of Kemps Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits, aligned roughly east - west and perpendicular to the creek. The full area of the site was not established however it extends for at least 400 metres on east - west axis (ie the full length of the line of test pits). A total of 53 flaked stone artefacts were recovered from the site. The significance assessment for this site is presented in **Table 7-13.**

Table 7-13 KNW significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	This site contains a low-density distribution of sub-surface stone artefacts in shallow alluvial soils. The integrity of the site is low- moderate as a result of historic and ongoing agricultural activities. The site has low to moderate representativeness/rarity value as low density sub-surface distribution of stone artefacts. The site has **moderate scientific significance** at a local level.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform and its connection to Kemps Creek. The site is considered of **moderate aesthetic significance**.
Summary statement of significance	Overall, KNW is of **moderate significance** at a local level as it provides evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate due to disturbance as a result by agricultural activities. The site has moderate representativeness/rarity due to the presence of stone artefacts in an alluvial profile. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

KCW: Kemps Creek West

Description: A continuous area of alluvial deposits on the western side of Kemps Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by two lines of test pits, aligned roughly east –west (perpendicular to the creek) and north-south (parallel with the creek). The full area of the site was not established however it extends for at least 220 metres north-south and 200 metres east- west (ie the full length of the lines of test pits). A total of 53 flaked stone artefacts were recovered from the site. The significance assessment for this site is presented in **Table 7-14.**

Table 7-14 KCW significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	This site contains a low-density distribution of sub-surface stone artefacts in deep alluvial soils. The integrity of the site is low- moderate as a result of historic and ongoing agricultural activities. The site has low to moderate representativeness/rarity value as low density sub-surface distribution of stone artefacts. The site has **moderate scientific significance** at a local level.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is heavily modified agricultural land with the visual character dominated by a trotting track and high voltage power lines. The site is considered of **low aesthetic significance**.
Summary statement of significance	Overall, KCW is of **moderate significance** at a local level as it provides evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate due to disturbance as a result by agricultural activities. The site has moderate representativeness/rarity due to the presence of stone artefacts in a deep alluvial profile. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

KCE: Kemps Creek East

Description: A continuous area of alluvial deposits and residual soils on the eastern side of Kemps Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a discontinuous line of test pits, aligned roughly east –west (perpendicular to the creek). The full area of the site was not established however it potentially extends over least 180 metres east- west (ie the full length of the line of test pits). A total of eight flaked stone artefacts were recovered from the site. The significance assessment for this site is presented in **Table 7-15.**

Table 7-15 KCE significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	This site contains a very low-density distribution of sub-surface stone artefacts. The integrity of the site is low as a result of historic and ongoing agricultural activities. The site has low representativeness/rarity value as very low density sub-surface distribution of stone artefacts. The site has **low scientific significance** at a local level.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared and heavily modified agricultural land, which retains some visual connection to Kemps Creek. The site is considered of **low aesthetic significance**.

Criterion	Assessment
Summary statement of significance	Overall, KCE is of **low significance** at a local level as it provides limited evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate due to disturbance as a result by agricultural activities. The site has moderate representativeness/rarity due to the presence of stone artefacts in a deep alluvial profile. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

7.2.5 Cecil Hills complex

Two separate sites have been identified at Cecil Hills, these are:

- PCP8
- CHRP.

The landform and archaeological characteristics that have been used to define each of the sites are described in **Annexure D**.

PCP8

Description: A continuous area of residual soils along a ridgeline in Cecil Hills. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits, aligned roughly north-south along the crest of the ridge. The full area of the site was not established however it potentially extends over least 80 metres east- west. A total of six flaked stone artefacts were recovered from the test pits. A single piece of ochre 'pencil' was also excavated. Another 11 stone artefacts were located on the surface when the site was originally recorded as AHIMS 45-5-2308 however these artefacts were not re-located during the test excavations. The significance assessment for this site is presented in **Table 7-16.**

Table 7-16 PCP8 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	This site exhibits a very low-density distribution of sub-surface stone artefacts. It includes one very rare find, an ochre pencil. The integrity of the site is moderate because of the ridgeline landform's unsuitability for agricultural activities and the retention of woodland vegetation. The low density sub-surface stone artefacts site has low representativeness/rarity value at the local level although the ochre pencil is a rare find on the Cumberland Plain. The site has an overall **moderate scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is an eroded track with visual connections to one of the largest remnants of Cumberland Plain woodland in the construction footprint. The site is considered of **moderate aesthetic significance**.
Summary statement of significance	Overall, PCP8 is of **moderate significance** at a local level as it provides limited evidence of the use of the area by Aboriginal people. The site has low-moderate scientific significance due to the overall paucity of cultural materials with a single rate object and good structural integrity. The site has moderate representativeness/rarity value, largely due to the presence of a single ochre pencil. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

CHRP: Cecil Hills Ridgetop Place

Description: A continuous area of residual soils along an elevated and highly prominent ridgetop on the eastern flank of the Cecil Hills. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by two lines of test pits, one aligned north-south up the ridge-slope and the other east - west along the crest of the ridge. The full area of the site was not established however it potentially extends over least 120 metres east- west and 20 metres north-south. A total of 16 flaked stone artefacts were recovered from the test pits. One additional stone artefact was located on the surface when the site was originally recorded as AHIMS 45-5-4935. The significance assessment for this site complex is presented in **Table 7-17**.

Table 7-17 CHRP significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. This site is of high social and cultural significance as it occupies a unique location on the highest point in the surrounding landscape, offering unsurpassed views to the east and south. The site occupies an extraordinary vantage point in the landscape, affording views west to the Blue Mountains and east toward the mouth of Paramatta river and Sydney harbour. From this aspect Aboriginal people would have watched the encroaching European people and would have witnessed the landscape changing as the Cumberland Plains were developed. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	This site has moderate integrity with the potential for extensive areas of relatively intact sub-surface deposit. The prominent ridgetop position provides a unique viewpoint to the east and south. The landscape context warrants a high representativeness/rarity value for the site, despite the relative abundance of sub-surface artefact distributions on the Cumberland Plain. Ridgetop artefact exposures to the west contain glass artefacts, which if also present at the site would provide rare material evidence of the contact period. The site has **high scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is an elevated ridge offering expansive views to the east and south of the construction footprint, including remnants of Cumberland Plain woodland. The site is considered of **high aesthetic significance**.
Summary statement of significance	The site has **high significance** at a local level as it has the potential to provide extensive evidence of the use of the area by Aboriginal people. An associated artefact scatter (45-5-4022), situated on the same ridgeline approximately 500 m away, has evidence of knapped ceramics and flaked glass, indicating a rare and highly significant contact site where Aboriginal people manufactured traditional tool types form from introduced materials. The CHRP site has high scientific significance as it has good integrity and high research and educational potential, offering the opportunity for unique insight into how Aboriginal populations lived in the area.

7.2.6 Other sites

RR: Range Road

Range Road is a low relief, undulating extension of the Cecil Hills landform dissected by poorly defined drainage lines. A more detailed account of the landform and archaeological characteristics that have been used to define the Range Road site are described in **Annexure D**.

Description: A continuous area of residual soils along a minor drainage line. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by two lines of test pits, one aligned north-south and the other east west across the undulating site. The full area of the site was not established however it potentially extends over least 200 metres east- west and 200 metres north- south. A total of nine flaked stone artefacts were recovered from the test pits. An additional three flakes were found on the surface when the site was originally recorded as AHIMS 45-5-4937/ 45-5-4007. The significance assessment for this site complex is presented in **Table 7-18.**

Table 7-18 RR significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	This site contains a very low-density distribution of sub-surface stone artefacts. The integrity of the site is low as a result of historic and ongoing agricultural activities. The site has low representativeness/rarity value as very low density sub-surface distribution of stone artefacts. The site has **low scientific significance** at a local level.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is partially cleared agricultural land, with visual connections largely limited to heavily modified surrounding landscapes. The site is considered of **low aesthetic significance**.
Summary statement of significance	Overall, RR is of **low significance** at a local level as it provides limited evidence of the use of the area by Aboriginal people. The site has low scientific significance as the integrity and structure of the site is low due to past and ongoing agricultural activities, including extensive modification of the ground surface. The site has low representativeness/rarity value due to the paucity of cultural materials and the high levels of disturbance. The site has low research and educational potential about the manner in which Aboriginal populations lived in the area.

M12A1 (AHIMS 45-5-4747)

Description: Stone artefact site near Badgerys Creek. Three flaked stone artefacts exposed on the upper slope of ridge overlooking Badgerys Creek. The significance assessment for this site is presented in **Table 7-19.**

Table 7-19 45-5-4747 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low**.
Scientific significance	The site has low integrity and structure due to the instability of the ground surface exposure. The small number of artefacts has very limited capacity for further research or educational purposes. The site is assessed as having **low scientific significance**.
Aesthetic significance	The artefact was located on an unformed vehicular track. As a result of the highly degraded landscape setting the site is of **low aesthetic significance**.
Summary statement of significance	The site has very limited capacity for further research or educational purposes. The main value lies in its' contribution to the regional pattern of site distributions across the South Creek catchment. The site has **low significance**.

Isolated artefact 4 (AHIMS 45-5-3804)

Description: Stone artefact site near Luddenham. The single silcrete artefact was exposed on a knoll above the confluence of two creeks. The significance assessment for this site is presented in **Table 7-20.**

Table 7-20 45-5-3804 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low**.
Scientific significance	The site has low integrity and structure due to the instability of the ground surface exposure. The single artefact has very limited capacity for further research or educational purposes. Excavations demonstrated the absence of subsurface artefacts in the area near the artefact. The site is assessed as having **low scientific significance**.
Aesthetic significance	The artefact was located on a small knoll within a paddock. As a result of the unexceptional paddock setting the site is of **low aesthetic significance**.
Summary statement of significance	The site has very limited capacity for further research or educational purposes. The main value lies in its' contribution to the regional pattern of site distributions across the South Creek catchment. The site has **low significance**.

TNR-AFT-14 (AHIMS 45-5-4786)

Description: Stone artefact site near Luddenham. The single silcrete artefact was exposed on the crest of a ridge line. The significance assessment for this site is presented in **Table 7-21.**

Table 7-21 45-5-4786 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low**.
Scientific significance	The site has low integrity and structure due to the instability of the ground surface exposure. The single artefact has very limited capacity for further research or educational purposes. The site is assessed as having **low scientific significance**.
Aesthetic significance	The artefact was located on an unformed vehicular track. As a result of the highly degraded landscape setting the site is of **low aesthetic significance**.
Summary statement of significance	The site has very limited capacity for further research or educational purposes. The main value lies in its' contribution to the regional pattern of site distributions across the South Creek catchment. The site has **low significance**.

7.3 Summary of significance

A summary of the assessments of significance for individual sites and site complexes discussed in this chapter is presented in **Table 7-22**.

Table 7-22 Summary of significance

AHIMS ID	Site name	Social significance	Historical significance	Scientific significance	Aesthetic significance	Overall significance
To be issued	CCW	High	Low-moderate	Moderate	Moderate	Moderate
To be issued	CCE T1	High	Low-moderate	Moderate	Low	Moderate
To be issued	CCE T2	High	Low-moderate	Moderate	Low	Moderate
To be issued	CCE T3	High	Low-moderate	Moderate	Low	Moderate
To be issued	BWB	High	Low-moderate	Moderate	Low	Moderate
To be issued	BCW	High	Low-moderate	High	Moderate	High
Incorporates 45-5-0528; 45-5-4750; 45-5-4748	BCE	High	Low-moderate	High	Moderate	High
Incorporates 45-5-0496/45-5-4749; 45-5-0528/45-5-4750	SCW T1	High	Low-moderate	High	Moderate	High
To be issued	SCW T2	High	Low-moderate	High	High	High
To be issued	SCE	High	Low-moderate	High	High	High
To be issued	KNW	High	Low-moderate	Moderate	Moderate	Moderate
To be issued	KCW	High	Low-moderate	Moderate	Low	Moderate
To be issued	KCE	High	Low-moderate	Low	Low	Low
Incorporates 45-5-2308	PCP8	High	Low-moderate	Moderate	Moderate	Moderate
Incorporates 45-5-4935	CHRP	High	Low-moderate	High	High	High
Incorporates 45-5-4937/ 45-5-4007	RR	High	Low-moderate	Low	Low	Low
45-5-4747	M12A1	High	Low	Low	Low	Low
45-5-3804	Isolated artefact 4	High	Low	Low	Low	Low
45-5-4786	TNR-AFT-14	High	Low	Low	Low	Low

8. Impact assessment

This section describes the impacts on Aboriginal cultural heritage associated with the project. It also describes the project development and impact consideration, as well as, cumulative impacts in consideration of other projects occurring in the broader area.

8.1 Project development and impact consideration

A comprehensive route options and selection process was carried out to identify feasible route options to connect the M12 Motorway between the M7 at Cecil Hills and the Northern Road at Luddenham. This process culminated in the M12 Strategic Route Options Analysis, which included a Heritage Working Paper and a consideration of values in a multi-criteria analysis (Aurecon 2016).

A value management process was used to bring together a wide range of stakeholder interests and expertise to review the revised shortlisted alignment options being put forward for evaluation. One of the key issues to consider in the assessment included minimising the impact of the project on the natural, cultural and built environment. Technical, socio-economic and environmental considerations, while achieving a value for money solution for the community, have been at the forefront of decisions during project development.

The design outlined in the M12 Motorway EIS has changed from the original corridor as development has reconsidered key aspects such as project functionality and performance, key design and engineering lessons learnt such as constructing across floodplains and over waterways, and environmental impacts.

A principle of cultural heritage management is to avoid impact before applying mitigation. During project development, the following activities were carried out to identify Aboriginal cultural heritage so, where possible, strategies to avoid impacts could be developed:

- Consultation with relevant Aboriginal stakeholders and EESG (see **Chapter 4**)
- Site archaeological survey
- Assessment to identify regionally or nationally significant features.

Design and alignment refinements were made and the location of ancillary facilities were selected to avoid impacts to Aboriginal cultural heritage sites where possible, while considering engineering, environmental, social and economic requirements. For example, the design for the project has adopted as narrow a footprint as possible in all areas in order to minimise various impacts, including those to Aboriginal heritage sites. The design has also placed the alignment as close as practicable to existing development and infrastructure to limit regional fragmentation impacts by consolidating the project corridor with existing development, utilities and road corridors.

The ancillary sites in the South Creek area were located and sized to align with existing disturbed areas on farm land and to avoid adjacent undisturbed areas close to creek lines in this landform. A total of 19 Aboriginal sites may be directly impacted by the project. **Chapter 10** provides recommendations on impact avoidance, minimisation and mitigation.

8.2 Aspects of activity

Aboriginal heritage sites within the construction footprint would be impacted by ground disturbance works.

The construction footprint is indicative only and may be refined during detailed design. Factors that could affect the final footprint include the location and size of water quality basins, the construction methodology, and arrangements made with affected landowners. The detailed investigation area for this assessment is larger than the construction footprint in some areas and therefore provides some flexibility for minor amendments to the impact footprint.

Areas of fill over Aboriginal heritage are regarded as an impact adversely affecting heritage values. Any works on existing roads within the detailed investigation area are considered to be highly disturbed areas not affecting Aboriginal heritage.

8.3 Impacts

8.3.1 Definitions

The use of the term 'harm' in relation to Aboriginal objects and sites in this report reflects the terminology in the current EESG *Aboriginal Heritage Impact Permit* application form. It is noted that these terms are not defined in EESG guidelines. A reasonable interpretation based on common usage is provided below, however they may be interpreted differently by EESG.

Types of harm are categorised as:

- 'Would not be harmed', meaning no movement or other alteration of any Aboriginal object from, or within, a site
- 'Movement (collection) only', meaning surface artefacts may be moved within, but not moved from, a site
- 'Excavation', meaning that Aboriginal objects may be removed from a site by archaeological excavation
- 'Community collection', meaning that Aboriginal objects may be removed by members of the local Aboriginal community
- 'Directly harmed', meaning that Aboriginal objects may be removed or destroyed.

The 'degree of harm' is categorised as:

- "Total", meaning the entire site would be harmed
- 'Partial', meaning part of the site would be harmed
- 'None', meaning there would be no movement of any Aboriginal object from a site or within a site, including covering sites by burial or inundation.

The 'consequence of harm' makes reference to the loss of heritage value and is defined here as the loss of cultural significance taking into account the five heritage values under to the Burra Charter. Loss is categorised as:

- 'Total loss of value', meaning the site is destroyed to the extent that its embodiment of heritage value is irretrievably lost
- 'Partial loss of value', meaning the site is harmed to the extent that there is incomplete representation of its original fabric, retaining some potential for the site to be appreciated by present and future generation
- 'No loss of value', meaning that the site retains its full potential to be valued and enjoyed by present and future generations.

8.3.2 Impacts to identified sites

Many of the extensive artefact distribution sites defined through the test excavation encapsulate previously recorded surface sites. These combined sites are treated as single entities in the impact assessment (**Figure 7-1**).

Most of the Aboriginal sites listed below consist of broad distributions of Aboriginal stone artefacts associated with major creeks. These sites are expected to extend well into comparable landscapes outside of the construction footprint. For this reason, the degree of harm to sites whose boundaries likely extend beyond the construction footprint is listed as partial. This assessment is considered valid, notwithstanding the projected loss of the transects of test pits that were sampled in the test excavations.

As discussed in **Section 3.8.4** and **Chapter 7**, 19 Aboriginal sites are located within the construction footprint. It is assumed that all 19 Aboriginal sites and any portion of the site boundary within the construction footprint would be subject to direct harm. The location of the 19 Aboriginal sites (and complexes) subject to impact is presented in **Figure 7-1**.

The seven Aboriginal sites located outside of the construction footprint but within the detailed investigation area are not expected to be impacted as a result of the project (**Table 8-2**). However, environmental management measures have been considered for these sites (**Section 10**) given their proximity to the construction footprint.

Sites within the construction footprint are provided in **Table 8-1** and sites within the detailed investigation area (outside the construction footprint) are provided in **Table 8-2**.

Table 8-1 Aboriginal site impact assessment for sites within the construction footprint

Site Name	AHIMS ID	Previously recorded sites included	Assessed significance of site	Type of harm	Degree of harm	Consequence of harm
Sites within the construction footprint						
CCW	TBC	-	Moderate	Directly harmed (5 ha)	Partial	Partial loss of value; site estimated to extend to the north and south of the construction footprint for approximately 1 km
CCE T1	TBC	-	Moderate	Directly harmed (4.5 ha)	Partial	Partial loss of value; site estimated to extend to the north and south of the construction footprint for approximately 1 km
CCE T2	TBC	-	Moderate	Directly harmed (6.6 ha)	Partial	Partial loss of value; site estimated to extend to the north and south of the construction footprint for approximately 1 km
CCE T3	TBC	-	Moderate	Directly harmed (20 ha)	Partial	Partial loss of value; very diffuse background scatter estimated to extend to the north and south of the construction footprint for approximately 1 km
BWB	TBC	-	Moderate	Directly harmed (1.7 ha)	Partial	Partial loss of value; site estimated to extend to the north of the construction footprint several hundred metres
BCW	TBC	-	High	Directly harmed (1.4 ha)	Total	Total loss of value
BCE	TBC	45-5-0528 (Fleurs 2)/45-5-4750 (M12 A3); 45-5-4748 (M12 A2)	High	Directly harmed (5.8 ha)	Partial	Partial loss of value; site estimated to extend to the north of the construction footprint for approximately 800 metres
SCW T1	TBC	45-5-0496/45-5-4749; 45-5-0528/45-5-4750	High	Directly harmed (3.6 ha)	Partial	Partial loss of value; site estimated to extend to the north and south of the construction footprint for several hundred metres
SCW T2	TBC	-	High	Directly harmed (0.9 ha)	Partial	Partial loss of value; site estimated to extend to the north of the construction footprint for 200 metres
SCE	TBC	45-5-0496 (Fleurs 1)/45-5-4749 (M12 A4)	High	Directly harmed (5.6 ha)	Partial	Partial loss of value; site estimated to extend to the north of the construction footprint for several hundred metres; loss of silcrete source and associated quarrying evidence
KNW	TBC	-	Moderate	Directly harmed (11.4 ha)	Partial	Partial loss of value; site estimated to extend to the east and north of the construction footprint for several hundred metres
KCW	TBC	-	Moderate	Directly harmed (3.6 ha)	Partial	Partial loss of value; site estimated to extend to the east and north of the construction footprint for several hundred metres
KCE	TBC	-	Low	Directly harmed (1.5 ha)	Total	Total loss of value

Site Name	AHIMS ID	Previously recorded sites included	Assessed significance of site	Type of harm	Degree of harm	Consequence of harm
PCP8	45-5-2308	-	Moderate	Directly harmed (0.1 ha)	Total	Total loss of value
CHRP	45-5-4935	-	High	Directly harmed (0.4 ha)	Total	Total loss of value
RR	45-5-4937/ 45-5-4007	-	Low	Directly harmed (0.5 ha)	Total	Total loss of value
M12A1	45-5-4747	-	Low	Directly harmed (0.02 ha)	Total	Total loss of value
Isolated artefact 4	45-5-3804	-	Low	Directly harmed	Total	Total loss of value
TNR-AFT-14	45-5-4786	-	Low	Directly harmed	Total	Total loss of value

Table 8-2 Aboriginal site impact assessment for sites within the detailed investigation area (outside the construction footprint)

Site Name	AHIMS ID	Previously recorded sites included	Assessed significance of site	Type of harm	Degree of harm	Consequence of harm
Sites within the detailed investigation area (outside the construction footprint)						
CP AS1	45-5-4374	-	(not assessed)	No harm	None	No loss of value as this site is located over 200 m from the construction footprint
P-CP9	45-5-2307	-	(not assessed)	No harm	None	No loss of value as this site is about 140 m from the construction footprint
PAD-OS-7	45-5-2721	-	(not assessed)	No harm	None	No loss of value as this site is about 130 m from the construction footprint
PAD-OS-5	45-5-2723	-	(not assessed)	No harm	None	No loss of value as this site is about 200 m from the construction footprint
DLC 2	45-5-2563	-	(not assessed)	No harm	None	No loss of value as this site is about 50 m from the construction footprint and on private property that won't be impacted.
M12A5	45-5-4767	-	(not assessed)	No harm	None	No loss of value as this site is about 200 m from the construction footprint
KC/ED2	45-5-2310	-	(not assessed)	No harm	None	No loss of value as this site is 50 m from the construction footprint and is located on private property.

8.3.3 Impacts to cultural values

As discussed in **Section 6.5**, three areas associated with recorded sites are designated high Aboriginal cultural heritage significance and were identified by the RAPS during fieldwork (**Table 6-1, Table 8-1**): a small knoll immediately to the west of Badgerys Creek (site BCW); a large area on a rise and floodplain between Badgerys Creek and South Creek (sites BCE, SCW T1, SCW T2 and SCE); and a prominent ridgeline overlooking the M7 Motorway (site CHRP).

The three Aboriginal cultural values areas are not gazetted Aboriginal Places under S86(4) of the NPW Act, but values of local significance identified during this cultural values assessment. All three areas are located within the construction footprint and expected to be impacted by the project. During AFG 3 the RAPs expressed an interest in collecting silcrete cobbles and raw manuports from South Creek prior to construction and using some of the resources in knapping workshops for educational purposes (see **Section 10.2.4**)

All three of these cultural values areas are located within the project construction footprint and are all associated with Aboriginal archaeological sites identified during the archaeological assessment. Details of each of these cultural values and their locations are listed in **Table 6-1.**

Where feasible, impacts to the sites listed in **Table 8-1** would be minimised and/or avoided. This is discussed further in **Chapter 10**.

8.4 Justification of impacts

The impacts of development on the cultural landscape where the project is located range from historic clearing and land use practices to major infrastructure projects such as the M7 Motorway and the impacts from future projects such as the Western Sydney Airport. In this context any further impact on the remaining resource needs careful justification.

Alternative route options were evaluated in the strategic options assessment that preceded the current assessment (Aurecon 2016). This demonstrated that all potential alignments would impact on Aboriginal heritage values. Further detail on the strategic options selection process is discussed in more detail in Chapter 2 of the EIS.

The archaeological investigations reported in this document and the AAR presented in **Annexure C** confirm that there is a continuous but variable distribution of Aboriginal objects across the detailed investigation area and construction footprint. This conclusion is consistent with previous studies in comparable environment contexts on the Cumberland Plain. A key factor driving the ubiquitous distribution of cultural materials may be the close proximity of most of the construction footprint to high quality and reliable sources of freshwater.

The consequence is that, rather than defining discrete areas as Aboriginal sites, it is more appropriate to regard the construction footprint as being divided into a series of adjoining sites described as landform-scale distributions of cultural materials.

This situation suggests that design solutions such as re-routing the proposed motorway cannot avoid all impacts on Aboriginal heritage. Instead, the focus must be on minimising impacts on the areas of highest Aboriginal heritage significance. In the case of the construction footprint this includes the defined sites on either side of the proposed crossings of Badgerys (BCE and BCW) and South Creeks (SCW 1, SCW2 and SCE) and the elevated ridge overlooking the M7 Motorway (CHRP).

The Aboriginal sites along Badgerys and South Creeks appear to extend both upstream and downstream of the selected route. There is no reason to presume that the section of the sites potentially impacted by the route is of greater or lesser significance than comparable areas of creek bank to the north or south. Accordingly, it is concluded that there are no grounds for recommending a different crossing point for either creek.

A mitigation that could reduce the impact of the creek crossings would be to investigate design solutions that maximise the retention of intact top soils under bridge crossing. This might involve the judicious placement of pylons 25 metres or more from the alluvial flats above the creek banks. In order for such a measure to be effective it would need to be supported by active management measures (see below) such as fencing and installing a protective layer of geotextile fabric and clean fill.

The other high significance Aboriginal site is CHRP. This ridgetop site occupies a unique location on the highest point in the surrounding landscape, offering unsurpassed views to the east and south. While the feasibility of rerouting the construction footprint to avoid direct impacts on CHRP must consider constructability, existing infrastructure, threatened ecological species and cost, consideration on minimising the impact to this site where practicable should be considered.

A more detailed assessment of the comparative impacts of each of the alternative routes would need to employ a similar methodology and intensity of testing as was applied to the current project. However, the testing of the current construction footprint would suggest that such broad scale and intensive testing across a larger sample of landscape is unlikely to reveal areas where impacts on Aboriginal cultural heritage would be significantly lower.

The only strategy which would substantially reduce impacts on Aboriginal cultural heritage values would be to position the construction footprint on areas with existing high levels of ground surface disturbance, such as the existing Elizabeth Road corridor or over the operational quarries. This option was not considered operationally feasible in the strategic options assessment due to the unacceptable impacts on existing infrastructure, transport links and commercial operations.

9. Cumulative impacts

Cumulative Aboriginal cultural heritage impacts may arise from the interaction of construction and operation activities of the project and other approved or proposed projects in the area. When considered in isolation, specific project impacts may be considered minor. These minor impacts may be more substantial, however, when the impact of multiple projects on the same receivers is considered. As such, the Aboriginal cultural heritage impacts discussed in **Chapter 8**, above, were assessed in consideration of the following recently completed, ongoing and proposed projects:

- Western Sydney Airport
- Sydney Metro Greater West
- The Northern Road Upgrade
  - Stage 5 (Littlefields Road to Glenmore Park)
  - Stage 6 (Littlefields Road to Eaton Road)
- Other existing road network upgrades and potential road projects, including:
  - Elizabeth Drive Upgrade
  - Mamre Road Upgrade
  - Outer Sydney Orbital
- Major land releases, including:
  - Western Sydney Aerotropolis
  - South West Growth Area
  - Western Sydney Employment Area.

The above projects are in varying stages of delivery and planning. This chapter provides an assessment of cumulative Aboriginal cultural heritage impacts based on the most current and publicly available information on the above. In many instances this is a high-level qualitative assessment. The assessment of cumulative impacts per project is discussed in the sections that follow.

Since the early 1800s impacts to the land forms surrounding the M12 in the Cumberland Plains has been primarily agricultural, consisting of varied phases of stock grazing, cropping, orcharding, dairying and market gardening. In more recent times use of the land has intensified and a wide variety of activities have had substantial impacts on the land. The landscape has been subdivided into small holdings and agricultural blocks since WWII, with a wide variety of market gardening and farming uses in the last 50 years. As recently as 2009 a wide range of land use activities (including chicken farming, market gardening, horticulture, and nursery/garden plant production) were being undertaken on blocks within the areas surrounding the construction footprint (Balarinji 2018b).

All of these activities have had a substantial impact on the Aboriginal archaeological record, especially regarding artefacts in the top soil and the plough zone. Vegetation clearance and repeated ploughing and cropping have removed nearly all trees with the potential for Aboriginal scarring. Artefact occurrences have been impacted by soil loss, lateral and vertical soil movement across the land surface, and to a depth of the relevant plough zone.

Prior to the introduction of environmental and heritage legislation in NSW in the 1970s an unknown but presumably large number of Aboriginal cultural sites were likely to have been lost to development, particularly along transport corridors. In consideration of these historical matters, the design of the project has adopted as narrow a footprint as possible in all areas in order to minimise the impacts to sites. All identified Aboriginal archaeological sites within the project area have been considered in relation to the project. Some level of impact is unavoidable in relation to such a large project.

The test excavation program has allowed the description of extensive subsurface distributions of cultural materials in the construction footprint. These large sites compare to most of the sites in AHIMS which have been detected through surface exposures, where the size of the site is largely determined by the extent of exposure and erosion. In this situation it is not appropriate assess cumulative impacts on the basis of the number of Aboriginal sites that have been impacted across the region. A more appropriate measure of cumulative impact considers the project in terms of the proportion of archaeologically sensitive soils within the South Creek catchment that would potentially be impacted by the project in consideration of other projects in the wider area.

The construction footprint is 331 hectares in extent. The combined areas of Aboriginal sites is estimated as 48.6 hectares, or 14.7% of the construction footprint. This figure does not include the highly diffuse and discontinuous background scatter at CCW 3, which extends for another 20 hectares.

The most significant sites from an archaeological perspective occur within the South Creek alluvium along the major creeks in the local area. Development along the South Creek valley is constrained by the flood-prone nature of the land but can be subject to development pressures for playing fields and industrial development on filled land. A total of 40 hectares of artefact-bearing South Creek alluvium across Cosgroves, Badgerys, South and Kemps creeks would be impacted by the project along the construction footprint. There is over 1,000 hectares of South Creek alluvium on land north and south of the construction footprint in the South Creek valley alone, not including Cosgroves, Badgerys and Kemps Creeks. For example, the property bounded by Elizabeth Drive, South Creek, the Kemps Creek Waste Depot and the construction footprint boundary comprises over 125 hectares of archaeologically sensitive alluvium.

On land at the confluence of Badgerys and South creeks to the north of the construction footprint there is over 135 hectares of archaeologically sensitive alluvium. Between Elizabeth Drive and Catherine Field there is over 1,000 hectares of South Creek alluvium, not including tributary valleys. The impact on the potential archaeological resource within this area is accumulating as development continues. In this context the contribution of 40 hectares of South Creek alluvium in from the construction footprint is relatively minor.

There are over 140 SSI projects underway at various stages in Western Sydney, all of which would have some impact to Aboriginal heritage and the archaeological records. Combined, the cumulative impact of planned developments on landforms and waterways relevant to the project is substantial and difficult to quantify. Projects such as Badgerys Creek Quarry and Brickworks, the Northern Road upgrade, Oakdale South Industrial Estate and the North West Growth Centre would cause a massive cumulative impact to what is left of the archaeological remnants of Aboriginal life prior to European invasion. Heritage, for all its connection to a fixed past, is alive and dynamic and mutable; its significance changes with the times and from person to person, community to community. Critical infrastructure would seem more important than preserving heritage until what is left is precious enough to outweigh the benefit of its loss.

9.1 Western Sydney Airport

The Australian Government is currently constructing the Western Sydney Airport on the 1,780-hectare Commonwealth-owned land at Badgerys Creek. The Western Sydney Airport is directly related to the project and is identified as an additional contributor the sustained and cumulative loss of Aboriginal sites and cultural values in western Sydney and on the Cumberland Pain. The airport would service both domestic and international markets and development would be staged in response to ongoing growth in aviation demand. Stage 1 includes the establishment of the following to provide operational capacity for about 10 million passengers per year and freight traffic:

- A single 3,700 metre runway in the north-western portion of the site
- A terminal
- Other support facilities
- Foundation for further expansion.

It is anticipated that the demand in relation to this airport would reach about 82 million passengers a year by 2063. To cater for this, a second parallel runway would be constructed at a later stage.

The EIS for the Western Sydney Airport was placed on display in October 2015 and finalised on 15 September 2016 with a Revised Draft Airport Plan. The assessment found that the airport would result in some adverse impacts on the environment and community, particularly in relation to the following:

- Air quality
- Biodiversity
- Health
- Noise
- Water quality.

Mitigation measures were proposed to reduce these potential impacts during construction.

Construction of Western Sydney Airport is now under way and the airport is set to open in 2026. Construction activities for Stage 1 involve three major work phases:

- Site preparation works, including:
  - Securing the construction impact zone
  - Establishing site services and construction facilities
  - Clearing vegetation
  - Undertaking major earthworks
- Aviation infrastructure works, including construction of the:
  - Runway, taxiways and apron areas
  - Internal road network
  - Terminal complex
  - Air traffic control tower
  - Freight, cargo and maintenance facilities
  - Fuel farm
- Site commissioning activities at the completion of the aviation infrastructure works
  - Involves testing and commissioning of all facilities in readiness for the operation.

There would be moderate cumulative Aboriginal cultural heritage impacts associated with the project and the Western Sydney Airport. However, the full impact on alluvium within the Badgerys Creek valley has not been clearly defined in the Aboriginal heritage reports reviewed for the Western Sydney Airport (such as Godden Mackay 1997; Haglund 1978; Jacobs 2016; Navin Officer 2015; 2016; Roberts 2016; RPS Manidis Roberts 2016). A conservative estimate based on the extent of alluvium mapped on the 1:100,000 soil landscape data is that 150 hectares of archaeologically sensitive alluvium would be impacted by the Western Sydney airport. The area of alluvium with the Badgerys Creek valley to be impacted in the detailed investigation area is 6.6 hectares. The cumulative impact of the project on Aboriginal heritage is therefore not considered to be of a degree that represents an unacceptable impact on the Aboriginal cultural heritage of the study area.

9.2 Sydney Metro Greater West

Transport for NSW (TfNSW) recently identified recommended corridors for a rail option to provide a major transport link between the North West Growth Area, Western Sydney Airport, and the South West and Greater MacArthur Growth Area. This rail option would connect the existing Main South Line (T8) near Macarthur Station on the to the existing Main Western Line (T1) near St Marys Station, via the Western Sydney Airport.

This railway servicing the new Western Sydney Airport would be developed and delivered by Sydney Metro. It is referred to as the Sydney Metro Greater West. Planning for this project is currently underway and, as such, environmental assessment results are not yet available.

The magnitude of cumulative construction impacts will be dependent on the specific construction locations, activities and impacts which are yet to be determined for the Sydney Metro Greater West. However, moderate Aboriginal cultural heritage impacts are anticipated as the project will traverse the current project in areas where moderate to high significant sites and landscape features were identified.

Depending on the final design outcomes, this project may have a greater impact on Aboriginal heritage, in particular where impacts occur close to the waterway and creek complexes in the Cumberland Plain.

9.3 The Northern Road Upgrade

An upgrade of the Northern Road was approved in May 2018 as part of the Western Sydney Infrastructure Plan. The upgrade would improve the capacity of the existing road and create about eight kilometres of new road between Mersey Road, Bringelly and just south of the existing Elizabeth Drive, Luddenham to realign the section of The Northern Road that currently runs through the Western Sydney Airport site. Once the upgrade is complete, The Northern Road would connect the project and the M4 Western Motorway and improve connectivity with the Western Sydney Airport (Roads and Maritime 2017).

The upgrade is being carried out in six stages:

- Stage 1 – between The Old Northern Road, Narellan and Peter Brock Drive, Oran Park

  - Completed
- Stage 2 – between Peter Brock Drive, Oran Park and Mersey Road, Bringelly
  - Under construction
- Stage 3 – between Glenmore Parkway, Glenmore Park and Jamison Road, South Penrith
  - Under construction
- Stage 4 – between Mersey Road, Bringelly and Eaton Road, Luddenham
  - Under construction
- Stage 5 – between Littlefields Road, Luddenham and Glenmore Parkway, Glenmore Park
  - Construction to start early 2019
- Stage 6 – between Eaton Road, Luddenham and Littlefields Road, Luddenham
  - Construction to start mid-2019.

Stages 1 through 4 of The Northern Road upgrade would be completed by the time construction of the project commences. The construction for Stage 5 is scheduled for early 2019 to end of 2022. The construction for Stage 6 is scheduled for mid-2019 to end of 2021. Construction activities associated with these two stages may overlap with the project construction. Both these stages are in the vicinity of the project.

The Aboriginal cultural heritage assessment for The Northern Road upgrade identified 28 Aboriginal archaeological sites, all of which would be impacted at least partially by the project. Salvage excavation at 20 archaeological sites was recommended.

Only one of these heritage items will be impacted by the current project, the TNR-AFT-14 site (AHIMS ID: 45-5-4786). This site is of low scientific significance and does not have any cultural deposit associated with it.

9.4 Other road network upgrades

There are a number of other planned and potential road upgrade projects in the western Sydney area that may contribute to cumulative Aboriginal cultural heritage impacts. These potential projects include:

- Elizabeth Drive upgrade – Roads and Maritime has started site investigations, including preliminary engineering, preliminary/strategic designs, environmental field investigations, and strategic modelling. These investigations are expected to be completed by mid-2019
- Mamre Road upgrade – the NSW Government has started early planning for a future upgrade of a 10 kilometre section of Mamre Road, between the M4 Motorway and Kerrs Road to support economic and residential growth in the area
- Outer Sydney Orbital – a future north-south motorway and freight rail line in Sydney's West to support the growth of western Sydney and the distribution of freight across Sydney and regional NSW. While the Outer Sydney Orbital is in early stages of planning, it would provide connections to the Western Sydney Airport.

These projects are currently at varying stages of planning and no design or environmental assessment information is currently publicly available.

The timing for construction of the above projects has not yet been announced. However, there is potential for overlaps in construction timing between the project and some of these road upgrade works however as overlapping construction or operational timeframes do not usually add to the overall level of heritage impact.

As there has not been environmental assessment carried out for the planned and potential road upgrade projects in the western Sydney area, it is currently unknown whether there would be cumulative Aboriginal heritage impacts associated with the construction of the project and other road projects.

9.5 Growth areas

Western Sydney is the focus of a number of plans and policies to promote changes in land use and to increase employment opportunities (see **Figure 1-1**).

The land within the areas above would be developed by individual developers at varying timeframes. Each would be subject to their own environmental assessments, based on the scale and potential impact of each project. There are currently no defined plans available for the individual developments within these growth areas.

The project would traverse the South West Growth Area and service the Western Sydney Aerotropolis, and indirectly, the Western Sydney Employment Area. The project would serve and facilitate the growth by providing increased road capacity and reducing congestion and travel times in the area.

As there has not been environmental assessment carried out for the Growth Areas projects, it is currently unknown whether there would be cumulative Aboriginal heritage impacts associated with the construction of the project and the development associated with the nearby growth areas. However, it can be surmised that this area will undergo substantial changes in the near future.

While individual proposals will be subject to assessment for heritage impacts and other environmental assessments, there is likely to be long-term impacts that will change the landscape and the heritage character of this area substantially. Therefore, it is likely that there would be moderate cumulative Aboriginal cultural heritage impacts associated with the construction of the project and the development associated with the nearby growth areas.

9.6 Conclusion

Overall, the project would have moderate cumulative Aboriginal cultural heritage impacts associated with the project and the other ongoing and planned developments in the area.

9.7 Cumulative impacts to cultural values

Following European arrival, the Aboriginal population of NSW went into steep decline, and in less than a century many aspects of traditional Aboriginal life and society could no longer be practiced or were prevented by European policy. The Darug people were one of the first cultural groups to bear the initial impact of Sydney's European arrival due to their lands being situated on the Sydney peninsula and the adjoining hinterlands of the Cumberland Plain (Tindale 1974b). The Darug's neighbours also suffered from early incursions into their land as the Europeans searched for arable lands to feed the colony. While the coastal Sydney area and its embankments became the residential and commercial focus of the settlement, the fertile lowlands and woodland of the hinterland were developed for agricultural production and the granting of freehold lands.

The Cumberland Plain was an integral component of Darug Country and cultural identity from which they were incrementally excluded and dispossessed by European land use and occupation. Forced movement of people resulted in the loss of many aspects of Aboriginal culture and the emergence of new groups incorporating people from diverse areas and ensuring the preservation of the core cultural practices and knowledge in Aboriginal communities (Hinkson 2001).

The introduction of European land management practices and associated social disruption has had a substantial impact on the Aboriginal cultural values, especially regarding access to traditional lands and cultural practices. Large scale vegetation clearance and agricultural practices have removed nearly all Aboriginal scarred trees in the study area. The project would have a relatively small impact on this, but by implementing a cultural interpretation strategy and distributing the results of the archaeological investigations to the broader community, some of these cumulative impacts can be offset and ameliorated. These management measures are further discussed in **Section 10.2.**

10. Environmental management measures

This section describes the management measures developed to minimise impacts to Aboriginal cultural heritage impacted as a result of the project.

All identified Aboriginal sites within the construction footprint have been considered in relation to the project impacts, however limited impact may be unavoidable when delivering broad scale infrastructure.

Specific management measures that have been developed for each of the Aboriginal heritage items identified within the construction footprint are presented in **Table 10-1**. General requirements relating to the management and mitigation measures are also presented below in **Section 10.1**. The management measures proposed here respond to the:

- Impacts identified in **Chapter 8**
- Cultural values and assessed significance of each Aboriginal site
- Degree of impact to each Aboriginal site
- Need to address intergenerational equity in the experience of Aboriginal heritage
- Need to protect sites not impacted by the project but under the care of the proponent
- Need to mitigate the loss and disturbance of impacted Aboriginal sites.

Management of Aboriginal sites will include protection and salvage measures, development of a curation policy for salvaged Aboriginal objects and procedures for unexpected discovery of Aboriginal objects. Site specific management measures will be described in a Construction Cultural Heritage Management Plan (CCHMP) that will form part of the construction environmental management plan (CEMP) that will be developed for the project.

Management measures have been developed with the aim of protecting Aboriginal sites from impacts or minimising the impacts on those sites occurring within the construction footprint where feasible.

10.1 Management principles

Aboriginal heritage management is predicated on the principle of *intergenerational equity*. This means that the current generation should allow future generations the opportunity to enjoy the cultural legacy of past generations. Although total equity between generations is never possible, the intention of the principle is for present generations to consider future generations when making management decisions. For this reason, the principle of intergenerational equity is a core element of the notion of ecologically sustainable development (ESD) which commonly guides regulators in their review of Aboriginal heritage management.

Intergenerational equity may be achieved through a regional program of protection for representative cultural landscapes and sites. At a local level, the project achieves this by protection and salvage of Aboriginal sites. Both of these measures allow retention of cultural materials for the enjoyment and education of future generations. Measures which respond to development impacts on cultural heritage should be of a nature which passes on knowledge and access to Aboriginal cultural materials, allowing options for future experience, enjoyment, study and curation of those materials.

The management of Aboriginal cultural heritage values within the project is based on:

- The identification of Aboriginal heritage values
  - Aboriginal heritage values of the project are defined here as the extensive physical record of Aboriginal hunter-gatherer life demonstrating aspects of implement manufacture and maintenance, and strategic positioning of activities focused on the South Creek valley complex
- The extensive distribution of Aboriginal objects within defined landscapes
- The assessed significance of individual sites
- Avoidance of Aboriginal heritage through design, where feasible
- The nature of proposed project impacts on Aboriginal heritage values
- The views of the Aboriginal community, represented by RAPs.

Table 10-1 Management and mitigation strategies for Aboriginal heritage

Impact	Environmental management measure	Responsibility	Timing
General	A Construction Cultural Heritage Management Plan (CCHMP) will be developed in consultation with the RAPs to document standard procedures for: • Unexpected finds procedure for the discovery of Aboriginal ancestral remains, Aboriginal objects or new Aboriginal sites consistent with the Standard Management Procedure Unexpected Heritage Items (Roads and Maritime 2015) • Detailed site salvage strategy • Management and curation of salvaged Aboriginal objects • Detailed locations and installation procedures for fencing and protective coverings • Details of permissible activities and permissible vehicle access inside protected Aboriginal areas • Heritage components of induction package for construction workers and supervisors • Any other heritage matters addressed in Conditions of Approval for the project.	Contractor/ Roads and Maritime	Prior to construction
Opportunities to minimise impacts to CHRP site	Where feasible, detailed design will investigate options to minimise impacts to the CHRP site	Contractor	Detailed design
Impacts to Aboriginal heritage during construction	Construction works are closely confined to the minimum possible area required for construction activities. Haulage and other access roads should be designed and located to minimise potential disturbance of soils. Maximising the protection is particularly important in the zone within 100 m of creeks and may require covering the original cultural deposits in temporary protective barriers such as geotextile fabric and a layer of clean fill.	Contractor	Construction
CCW	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
	Salvage excavation (20 m^2) to define western limit of artefact distribution	Contractor/ Roads and Maritime	Prior to construction
CCE T1	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
CCE T2	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
CCE T3	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction

Impact	Environmental management measure	Responsibility	Timing
BWB	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
	Salvage excavation (20 m²) to define western limit of artefact distribution;	Contractor/ Roads and Maritime	Prior to construction
BCW	Investigate feasibility of retaining cultural deposits between the pylons of bridges or elevated structures	Contractor	Detailed design
	Temporary protective fencing of site along the construction footprint;	Contractor	Prior to construction
	Salvage excavation (100 m²) to recover area of artefact concentration	Contractor/ Roads and Maritime	Prior to construction
BCE	Investigate feasibility of retaining cultural deposits between the pylons of bridges or elevated structures	Contractor	Detailed design
	Temporary protective fencing of site along the construction footprint;	Contractor	Prior to construction
	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction
SCW T1	Investigate feasibility of retaining cultural deposits between the pylons of bridges or elevated structures	Contractor	Detailed design
	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
	Salvage excavation (20-50 m²) to investigate possible cultural stratification in deep alluvium; temporary protective fencing of site along construction footprint boundary;	Contractor/ Roads and Maritime	Prior to construction
SCW T2	Investigate feasibility of retaining cultural deposits between the pylons of bridges or elevated structures	Contractor	Detailed design
	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction
	Salvage excavation (140 m²) to recover artefact concentrations	Contractor/ Roads and Maritime	Prior to construction
SCE	Investigate feasibility of retaining cultural deposits between the pylons of bridges or elevated structures	Contractor	Detailed design
	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
	Salvage excavation (50 m²) to recover artefact concentrations and quarrying evidence	Contractor/ Roads and Maritime	Prior to construction
KNW	Temporary protective fencing of site along the construction footprint	Contractor	Prior to construction

Impact	Environmental management measure	Responsibility	Timing
KCW	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined.	Contractor/ Roads and Maritime	Prior to construction
	Salvage excavation (20-50 m² plus 190 m²) to investigate possible cultural stratification in deep alluvium.	Contractor/ Roads and Maritime	Prior to construction
PCP8	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction
CHRP	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined.	Contractor/ Roads and Maritime	Prior to construction
	Salvage excavation: Salvage excavation (100 m²) to investigate archaeological potential of this highly culturally significant site	Contractor/ Roads and Maritime	Prior to construction
RR	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction
M12A1	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction
Isolated artefact 4	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction
TNR-AFT-14	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction

10.2 Management measures

The management measures detailed below and summarised in **Table 10-1**, including timing of implementation and assigned responsibility.

10.2.1 Active avoidance

It is recommended that impacts to site CHRP be minimised where feasible. This site is located at a unique point in the landscape and has no alternative representation of such to mitigate the proposed impact.

It is recommended that the feasibility of retaining portions of that are located under elevated structures (bridges) over Badgerys and South Creeks be investigated as part of the detailed design process, including the following sites:

- BCW
- BCE
- SCW T1
- SCW T2
- SCE.

The objective will be to maximise the retention of intact, cultural deposits in the zone between bridge pylons. This strategy will depend upon the effectiveness of measures to protect the deposits during construction. Potential protective strategies might include fencing and covering the cultural deposits with geotextile fabric and clean fill to reduce the potential for inadvertent damage.

Another active avoidance strategy is to ensure that construction works are closely confined to the minimum possible area required for construction activities. Haulage and other access roads should be designed and located to minimise potential disturbance of soils. Maximising the protection is particularly important in the zone within 100 metres of creeks and may require covering the original cultural deposits in temporary protective barriers such as geotextile fabric and a layer of clean fill.

10.2.2 Passive avoidance

Sites that don't require active protection measures include:

- KCE
- CP AS1
- P-CP9
- PAD-OS-7
- PAD-OS-5
- DLC2
- M12A5
- KC/ED2.

One site within the construction footprint, KCE does not require active protection measures due to low archaeological significance primarily due to the disturbed nature of the Kemps Creek landform in that location. Several Aboriginal sites in the detailed investigation area are of sufficient distance from the construction footprint to not require active protection measures.

10.2.3 Aboriginal cultural values interpretation

A strategic objective for the project is to create a unique and distinct identity interpreting the rich sense of place, Aboriginal and cultural heritage. Celebration and interpretation of the project acknowledges the Aboriginal history of the local area and today's Aboriginal community that connects with the area. There is a growing global acknowledgement of the power of First Nations' knowledge for enriched placemaking, however this is not yet visible in major public projects in Australia. In relation to the project, there are opportunities to redress this invisibility with strong creation stories, song, dance and cultural practices embedded in the landscape and built forms, that tell the story of those who travelled the route long before us (Balarinji 2018a).

Balarinji conducted research into the Aboriginal history of the M12 corridor and tested and augmented this narrative through stakeholder consultation ((Balarinji 2018a; 2018b)). This process has seen Balarinji collaborate with artists, Elders and stakeholders within the Western Sydney Aboriginal community, to develop an Aboriginal narrative and indicative design concepts for the M12 corridor.

The project would be located on the land of the Mulgoa, Cabrogal and Cannemegal of the Darug (Dharug, Daruk) language group. It passes through the Deerubbin LALC area and the northern boundary of Gandangara LALC. The project operational footprint was traditionally the cornerstone of the three cultural groups from the area; Darug, Dharawal and Gandangara, and was a place where these groups will come together for ceremony (Balarinji 2018a). Aboriginal people lived a fluid, resilient existence. They travelled together, dictated by the rules of the land. There were also ancient protocols for crossing land and into another cultural group's boundary. These cultural protocols dictate how stories are shared and how people continue to interact with each other. It is the layers of knowledge and stories that are embedded in the community and the land that instil a strong sense of Interconnectedness (Balarinji 2018b). Interconnectedness celebrates the success of the culture and is holistic and enduring, linking people, spirit and land.

There is a growing global acknowledgement of the power of First Nations' knowledge for enriched placemaking, however this is not yet visible in major public projects in Australia. Through inclusive consultation with representatives and community members who originate from or live and work in the Aboriginal community, the project sets out to inspire and educate locals and tourists alike. Deep cultural stories and history can be experienced leisurely or at speed, on the ground or from the air, and from a range of views and perspectives. The corridor will bring stories to life in a celebration of culture and resilience. The Dreaming survives in ways we can all respect and appreciate (Balarinji 2018b).

Across the project, the following interpretation elements have been considered for design integration:

- Public works of art
- Interpretive signage
- Bridges
- Earthworks
- Plantings
- Noise walls.

The work aims to:

- Be appreciated at different scales, speeds and time of day depending on user type, which will include motorists, cyclists, pedestrians and aircraft passengers
- Respond to the context of the corridor being an international arrival and departure point.

The story, scale, form, placement, colour, lighting and materiality will be explored further in the next phase of the project. Further details are provided in Appendix G (Urban design, landscape character, and visual impact assessment report) of the EIS.

10.2.4 Active protection

Active protection is necessary on the boundaries of all Aboriginal sites that are partially impacted by the project. The intent is to limit impacts to the portion of the site inside the construction footprint. Protection will include suitable temporary fencing with signage notifying construction personnel to avoid ground impacts in protected areas. Details of fencing locations, permissible activities and permissible vehicle access inside protected Aboriginal areas should be documented in an AHMP.

Sites to be fenced along the boundary of the construction footprint include

- CCW
- CCE T1
- CCE T2
- CCE T3
- BWB
- BCW
- BCE
- SCW T1
- SCW T2
- SCE
- KNW
- KCW
- CHR.

10.2.5 Salvage collection

Salvage collection is warranted at those Aboriginal sites in the construction footprint where stone artefacts have been recorded on the surface. Salvage collection is to record MGA coordinates of each artefact by GPS and relevant artefact attributes consistent with the broader archaeological salvage analysis. The results of salvage collection should be collated in an Aboriginal Site Salvage Report (ASSR).

Salvage collection will be undertaken by a suitably qualified archaeologist.

Sites requiring salvage collection include:

- BCE (incorporating surface stone artefacts sites 45-5-528 (Fleurs 2)/45-5-4750 (M12A3) 45-5-4748 (M12A2)),
- SCW T2
- KCW
- PCP8 (45-5-2308)
- CHRP (incorporating 45-5-4935)
- RR (45-5-4937/45-5-4007)
- M12A1 (45-5-4747)
- Isolated artefact 4 (45-5-3804)
- TNR-AFT-14 (45-5-4786).

10.2.6 Salvage excavation

Salvage excavation is warranted at those Aboriginal sites that were assessed as having high scientific and high overall significance. Salvage excavation will be undertaken by a suitably qualified archaeologist. Sites requiring salvage excavation include:

- CCW
- BWB
- BCW
- SCW T1
- SCW T2
- SCE (incorporating site 45-5-0496 (Fleurs 1)/45-5-4749 (M12 A4)),
- KCW
- CHRP (incorporating 45-5-4935).

Salvage excavation will be conducted by appropriately qualified and experienced archaeologists (as per Section 1.6 of the Code of Practice) and nominated site officers for the relevant RAPs.

In general, it is proposed that an excavation team consisting of five field archaeologists and a maximum of eight nominated site officers conduct the open area excavation. Where additional resources are required, it is proposed that a ratio of three site officers to one field archaeologist is preferred, with a maximum of seven field archaeologists and 12 site officers engaged at any one time.

If required, a dedicated artefact specialist may also be engaged during the salvage excavation program to assist with the analysis of large volumes of artefacts. The artefacts will be analysed with assistance from nominated site officers for the RAPs (see **Section 10.2.7)**

The excavation strategy should address specific questions about each site and be elaborated in the AHMP. The extent of salvage excavation is estimated here subject to development of a detailed salvage methodology in the AHMP. Issues for investigation include:

- Potential cultural stratification in deep alluviums at SCW T1 and KCW through open plan excavation of one area at each site of at least 20 square metres in area subject to consistent identification of Aboriginal objects in the lower half of the topsoil profile and up to 50 metres if consistent numbers of Aboriginal artefacts are found in contiguous squares which are indicative of culturally stratified deposit ie having distinct technological or raw material characteristics

- Geomorphological analysis and dating of sediments associated with deep assemblages if archaeological results suggest older assemblages at depth
- The technological characteristics of artefact concentrations at SCE, SCW T2, KCW through excavation of an area sufficient to yield an artefact assemblage of 3,000 artefacts (following the PhD research findings of White 2018: 328 who concludes in part, “On the Cumberland Plain excavations should continue to seek to recover several thousand artefacts at least.”) which is estimated to be 50 metre squared at SCE, 140 metre squared at SCW T2 and 190 metre squared at KCW subject to broadly consistent artefact densities being identified in contiguous squares
- The characteristics of artefact assemblages in atypical elevated outlook areas at BCW and CHRP through excavation of 100 metre squared at each site
- The extent of artefact distribution away from creek systems in the Luddenham Rolling Hills at BCB and CCW through extension of the test pit transect to the west at 200 metre intervals for at least two kilometres or until no artefacts are found in four consecutive test pits, and with supplementary test pits where artefacts are found consistent with the methodology adopted for this project at CCE T3, being approximately 20 metre squared.

The results of salvage excavation and artefact analysis will be documented in an Archaeological Salvage Excavation Report.

Radiometric dating

During salvage excavation, samples of organic material suitable for radiometric dating (charcoal, bone, shell, wood) will be collected for the dating of archaeological deposits. The number of samples sent for dating will be determined on the suitability of the sample and the significance of the site. Samples will be collected as follows:

- Samples will be collected using clean nitrile gloves and placed in clean plastic sample bags
- Charcoal samples will also be wrapped in aluminium foil to prevent crushing
- Samples will be removed to the relevant temporary keeping place and dried out to avoid fungal growth during transport
- Samples will be packaged within hard plastic cases for transport to a radiocarbon dating laboratory.

Research questions

The results of the archaeological assessment suggest a series of research questions should be developed to guide any salvage excavations of the sites identified above. The principle questions relate to the types of information that could be gleaned from the analysis of stone tools, temporal changes within or between sites or proximity to certain resource areas or landscapes as they are encountered across the project.

Due to their durability and abundance throughout cultural deposits, stone tools are most often the principle evidence that informs analysis of past modes of behaviour and subsequently provide the greatest opportunity to delve deeper into archaeological analysis. The following key research question concentrated on the stone tool evidence that was revealed during test excavations:

1) Are there any variations in stone tool typologies across the different landscape regions, between sites or within sites?

The results of the archaeological assessment cast light on the types of questions that could be asked of the stone tool analysis during further salvage excavation including the following:

1a. Are there variations in cortex percentages on stone tools at sites east and west of the South Creek?

1b. Are these changes related to material types?

1c. If so, what do these variations suggest?

1d. Does previous research in the region inform on these results?

1e. Are there variations in the tool typology, density and distribution across sites in the study area and are these comparable to other sites in the broader region or variations in the Australian Small Tool Tradition / late Holocene assemblages?

1f. Is there evidence for intra-site temporal changes in tool typology?

1g. How does this inform on cultural changes in adaptations to the local environment?

A further key research question was posed that relates to temporal changes evidenced in sites as follows:

2) What is the chronology of the sites identified in the detailed investigation area and are there variations in stone tool typologies across time?

A further key research question was posed that attempts to explain site characteristics that are related to resource availability as follows:

3) Are there variations in site usage that relate to proximity to resource areas or water sources?
    a. Is there archaeological evidence (hearths, oven mounds) to suggest the area adjacent to the creeks were used for camping?

This led to a further subset of questions being posed as follows:

    b. Are there correlations between the intensity of site usage and distance to ephemeral and permanent water sources?
    c. Is there evidence for site use being seasonal, permanent or opportunistic?
    d. Can the evidence contribute information not available from any other source, location or environmental setting?

10.2.7 Artefact analysis

Recorded attributes – artefact class

Stone artefacts can be separated into four main categories; flakes, cores, tools, and angular fragments. It is from these four categories that further distinctions can be made based on identifying specific attributes relating to the reduction process (Holdaway and Stern 2008 p. 24).

Flakes

Flakes are defined through the presence of attributes relating to conchoidal fracture (Holdaway and Stern 2008). A conchoidal fracture originates from pre-existing flaws and creates what is known as a Hertzian cone (Clarkson and O'Connor 2006). Flakes maintain both a ventral and dorsal surface and can be further categorised based on the completeness of the flake. Flakes are generally described as complete, proximal, medial, distal, complete split flakes, longitudinally split flakes and core rejuvenation flakes.

Cores

Cores are defined by the presence of negative flake scars, marking the location of previous flake removal (Holdaway & Stern 2008 p. 179). These flake scars can be used to describe the direction of flake removal (unidirectional, bi-directional, bifacial, multi-directional, and microblade). Cores also include the presence of one or more platforms and can exist as a complete core, or a core fragment, or broken core.

Tools

Tools maintain similar characteristics to flakes, but have evidence of retouch or use wear along lateral margins. Tools retain a ventral surface and can also be categorised based on completeness of artefact remaining, in a similar manner to flakes.

Angular fragments

Angular fragments are flaking debris with none of the above identifiable diagnostic features associated with stone reduction processes. Thus, the defining characteristics as detailed in the above three categories are missing on angular fragments (Hiscock 1988 p. 129).

Table 10-2 Definition of technical categories to be used

Technological category	Definition
Complete flake	Has a ventral surface that preserves a complete fracture plane, has a platform (or impact point), lateral margins and a termination
Proximal flake	A broken flake that lacks a termination but retains one or more of the following: platform and/or impact point, bulb of percussion, bulbar scar and fissures
Medial flake	Absence of proximal and distal margins but have an identifiable ventral surface
Distal flake	Presence of a termination and the absence of a platform or impact point
Longitudinal split flake	A break that runs parallel to the flaking axis. The flake preserves a portion of the platform and/or impact point and has an identifiable termination
Angular fragment	A flake fragment that cannot be identified in any more detail
Core	Negative flake scarring, no positive scars and therefore no ventral surface

Raw material

Artefact size and morphology are often closely linked to raw material (Hiscock 1988). As such it is important to identify the types of raw material present in the project area. Raw material types are expected to primarily include silcrete and silicified volcanic tuff, as identified via desktop review of previous test excavation results in the vicinity of the study corridor.

Cortex

Cortex will be recorded as a percentage of the artefact covered, the type of cortex and its location. The proportion of the artefact covered by cortex refers to the percentage of cortex located on the dorsal surface for flakes and tools. For cores and angular fragments, it refers to the percentage of the whole artefact. Percentages will be given as zero per cent, 1-50 per cent, 51-99 per cent, and 100 per cent. Cortex type will be defined as either cobble or slab. Cobble refers to water-rounded cortex and slab refers to cortex associated with exposed surfaces or outcrops.

Recording the percentage of remaining cortex on an artefact is important as cortex proportions in lithic assemblages are frequently used as an indicator to suggest reduction intensity (Andrefsky 1998 pp.101-2). They can also suggest distance from the raw material source (Andrefsky 1998 pp.101-2).

Termination

Flake or tool termination refers to the artefact's distal end. Terminations will be recorded as feather, hinge, step, plunge, and crushed. If the termination is not present it will be listed as absent. Differing terminations are the result of different applications of force during the flaking process. For example, a flake with a crushed termination is often the result of bipolar technology.

Platform

Platform types are useful as they indicate the level of work that has been dedicated to a core to enable flake detachment (Holdaway 2008 p. 28). As a result, it is possible to determine stage of reduction and provide information regarding the face of the core (Andrefsky 1998 pp. 89-96). Platforms will be as flaked, focal, and crushed. If the platform is not present it will be listed as absent.

Tools

Where required an analysis of formal tool types will be made to facilitate comparisons with assemblages previously excavated within or close to the project corridor

Cores

Artefacts with negative flake scars originating from one or more platforms were identified as cores (Holdaway and Stern 2008). As cores are used in the production of flakes, a different set of attributes will be used to describe them. Core scar direction will be detailed as uni-directional, bi-directional, or multidirectional. The number of core platforms, as well as the length of the biggest negative flake scar, will also be recorded.

Metrical attributes

The following metrical attributes will be recorded for all artefacts:

- Maximum dimension – Will be measured on all artefacts, irrespective of technological type. This is defined as the furthest points of division on the artefact. Maximum dimension is a useful concept in that all artefacts present have at least two attributes that can be measured; maximum dimension and weight, regardless of technological type.
- Weight – All artefacts will be weighed, irrespective of technological type. Artefact weight is probably the most reliable size characteristic for discriminating between reduction stages of stone artefacts. It is easy to take and is replicable and it correlates well with other linear dimensions which all relate to the size of the flake (Andrefsky 2005). Although small flakes may be removed early in the reduction sequence, the heavier material comes from the early stages of knapping and reduces thereafter.

10.2.8 Construction Cultural Heritage Management Plan

A Construction Cultural Heritage Management Plan (CCHMP) will be developed in consultation with the RAPs as part of the CEMP for the project. The AHMP will document:

- Unexpected finds procedure for the discovery of Aboriginal ancestral remains, Aboriginal objects or new Aboriginal sites consistent with the *Standard Management Procedure Unexpected Heritage Items* (Roads and Maritime 2015)
- Detailed site salvage strategy
- Management and curation of salvaged Aboriginal objects
- Detailed locations and installation procedures for fencing and protective coverings
- Heritage components of induction package for construction workers and supervisors
- Any other heritage matters addressed in Conditions of Approval for the project.

The CCHMP will be prepared prior to the commencement of any works that impact on the existing ground surface, including temporary roading, fencing and vegetation clearance works.

10.2.9 Residual impacts

It has been conservatively assumed that all of the land surfaces within the construction footprint will be impacted to the degree that none of the original soils or any identified Aboriginal objects (including those Aboriginal objects within complete Aboriginal sites or parts of Aboriginal sites falling within the construction footprint) will be retained. As a result, and despite the effective implementation of the environmental management measures discussed above, the residual impacts will be effectively the same as the initial impact.

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Annexure A. Consultation documents and log

Register of Aboriginal parties

Procedure for Aboriginal cultural heritage consultation and investigation – Resource 17

Project name: M12 Motorway
Register maintained by: Anthony Broekhuyse
Closing date for registration: 29 November 2017

DATE OF REGISTRATION	NAME	GROUP REPRESENTED AND POSITION (IF APPLICABLE)	ADDRESS / EMAIL ADDRESS	PHONE NO.	FAX NO.	Permission to give registration details to OEH and LALC(s) Y/N?
12/10/17	Anna O'Hara	Darug Land Observations Pty Ltd				
18/10/17	Scott Franks	Tocomwall				
03/11/17	Vicky Slater	Manager, Kawul Cultural Services				
03/11/17	Aaron Slater	Warragil Cultural Services				
15/11/17	Lilly Carroll	Didge Ngunawal Clan				
15/11/17	Pollowan Phillip Khan	Kamilaroi-Yankuntjatjara Working Group				
21/11/17	Uncle Des Dyer	Darug Aboriginal LandCare				
21/11/17	Darleen Johnson Ryan Johnson	Murra Bidgee Mullangari				
21/11/17	Cherie Carroll Turrise					
21/11/17	Jesse Carroll	Muragadi Heritage Indigenous Corporation				
21/11/17	Steven Hickey	Widescope				
21/11/17	Carolyn Hickey	A1 Indigenous Services				

DATE OF REGISTRATION	**NAME**	**GROUP REPRESENTED AND POSITION (IF APPLICABLE)**	**ADDRESS / EMAIL ADDRESS**	**PHONE NO.**	**FAX NO.**	Permission to give registration details to OEH and LALC(s) **Y/N?**
21/11/17	Amanda Hickey	Amanda Hickey Cultural Services				
21/11/17	Wendy Smith	Gulaga CHTS				
22/11/17		Murramarangs CHTS				
22/11/17		Biamangas CHTS				
22/11/17		Cullendullas CHTS				
22/11/17	Basil Smith	Goobah CHTS				
24/11/17	Kerrie Slater	Wurrumay Consultant				
27/11/17	Andrew Williams	Aboriginal Archaeology Service				
27/11/17	Leanne Watson Justine Coplin	DARUG CUSTODIAN ABORIGINAL CORPORATION				
30/11/2017	Hika Te Kowhai	Walbunja				
30/11/2017	Simalene Carriage	Wingikara				
30/11/2017	John Carriage	Tharawal				
30/11/2017	Karia Bond	Badu				
30/11/2017	Shaylee Henry	Munyunga				
30/11/2017	William Henry	Gunyuu				
30/11/2017	Thomas Tighe	Nundagurri				
30/11/2017		Murrumbul				
30/11/2017	Kim Carriage	Gangangarra				
30/11/2017	Ronald Stewart	Walgalu				
30/11/2017	Shakiha Archival	Bidawal				
30/11/2017	Kahu Brennan	EORA				
30/11/2017	Newton Bond	Ngarigo				

DATE OF REGISTRATION	**NAME**	**GROUP REPRESENTED AND POSITION (IF APPLICABLE)**	**ADDRESS / EMAIL ADDRESS**	**PHONE NO.**	**FAX NO.**	Permission to give registration details to OEH and LALC(s) **Y/N?**
30/11/2017	Criage Wellington	Gadung				
30/11/2017	Cyril Parsons	Curwur Murre				
30/11/2017	William Campbell	Walbunja Elders				
30/11/2017	William Bond	Wandandian				
30/11/2017	Adreian Connelly	Golangaya				
30/11/2017	Matthew Parsons	Gulla Gunar				
30/11/2017	Edward Stewart	Ngunawal				
30/11/2017	Tarlarra Te Kowhai	Murrin				
30/11/2017	Andrew Bond	Dharug				
30/11/2017	Lenard Nye	Elouera				
30/11/2017	Tony Brierley	Kuringgai				
30/11/2017	Shane Carriage	Thauaira				
30/11/2017	Blaan Davis	Yerramurra				
30/11/2017	Whane Carberry	Bulling Gang				
30/11/2017	Johnathan Morgan	Djanaba Gaxabara				
30/11/2017	Kylie Bell	Birrungal				
30/11/2017	DJ Walker	Barrabarrabarra				
30/11/2017	Tanya Mullet	Baruwaluwu				

Note: Only the names of the registered parties are to be sent to OEH and the Local Aboriginal land council(s). DO NOT send the personal contact details of any Aboriginal parties to a third party.

Log of Aboriginal Community consultation for M12 Motorway

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
15/11/17	Deerubbin Local Aboriginal Land Council/Kevin Cavanagh	RMS	Post	Request for registration of interest
15/11/17	Gandangara Local Aboriginal Land Council	RMS	Post	Request for registration of interest
15/11/17	Darug Custodian Aboriginal Corporation	RMS	Post	Request for registration of interest
15/11/17	Darug Tribal Aboriginal Corporation	RMS	Post	Request for registration of interest
15/11/17	Darug Aboriginal Cultural Heritage Assesments	RMS	Post	Request for registration of interest
15/11/17	Des Dyer	RMS	Post	Request for registration of interest
15/11/17	Cubbitch Barta	RMS	Post	Request for registration of interest
15/11/17	Cubbitch Barta	RMS	Post	Request for registration of interest
15/11/17	Gunjeewong Cultural Heritage	RMS	Post	Request for registration of interest
15/11/17	Merrigarn Indigenous Corporation	RMS	Post	Request for registration of interest
15/11/17	Murri Bidgee Mullangari Aboriginal Corporation	RMS	Post	Request for registration of interest

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
15/11/17	Muragadi Heritage Indigenous Corpopation	RMS	Email	Request for registration of interest
15/11/17	Bidjawong Aboriginal Corporation	RMS	Post	Request for registration of interest
15/11/17	Kamilaroi Yankuntjatjar Working Group	RMS	Email	Request for registration of interest
15/11/17	Wurrumay Consultancy	RMS	Email	Request for registration of interest
15/11/17	Amanda Hickey Cultural Services	RMS	Post	Request for registration of interest
15/11/17	Widescope Indigenous Group	RMS	Post	Request for registration of interest
15/11/17	HSB Consultants	RMS	Post	Request for registration of interest
15/11/17	Rane Consulting	RMS	Email	Request for registration of interest
15/11/17	Anthony Williams	RMS	Post	Request for registration of interest
15/11/17	Dhinawan-Dihigarra Culture & Heritage Pty Ltd	RMS	Email	Request for registration of interest
15/11/17	Dhinawan-Dihigarra Culture & Heritage Pty Ltd	RMS	Post	Request for registration of interest
15/11/17	Gunyuu	RMS	Email	Request for registration of interest
15/11/17	Walbunja	RMS	Email	Request for registration of interest
15/11/17	Badu	RMS	Post	Request for registration of interest
15/11/17	Goobah Developments	RMS	Post	Request for registration of interest
15/11/17	Wullung	RMS	Post	Request for registration of interest

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
15/11/17	Yerramurra	RMS	Email	Request for registration of interest
15/11/17	Nundagurri	RMS	Email	Request for registration of interest
15/11/17	Murrumbul	RMS	Email	Request for registration of interest
15/11/17	Jerringong	RMS	Email	Request for registration of interest
15/11/17	Pemulwuy CHTS	RMS	Email	Request for registration of interest
15/11/17	Bilinga	RMS	Email	Request for registration of interest
15/11/17	Munyunga	RMS	Email	Request for registration of interest
15/11/17	Wingikara	RMS	Email	Request for registration of interest
15/11/17	Minnamunnung	RMS	Post	Request for registration of interest
15/11/17	Gundungurra Tribal Technical Services	RMS	Email	Request for registration of interest
15/11/17	Walgalu	RMS	Email	Request for registration of interest
15/11/17	Thauaira	RMS	Email	Request for registration of interest
15/11/17	Dharug	RMS	Email	Request for registration of interest
15/11/17	Bilinga Cultural Heritage Technical Services	RMS	Email undelivered	Request for registration of interest
15/11/17	Gunyuu Cultural Heritage Technical Services	RMS	Email undelivered	Request for registration of interest
15/11/17	Munyunga Cultural Heritage Technical Services	RMS	Email undelivered	Request for registration of interest
15/11/17	Murrumbal Cultural Heritage Technical Services	RMS	Email undelivered	Request for registration of interest
15/11/17	Wingikara Cultural Heritage Technical Services	RMS	Email undelivered	Request for registration of interest
15/11/17	Gulaga	RMS	Email	Request for registration of interest
15/11/17	Biamanga	RMS	Email	Request for registration of interest
15/11/17	Callendulla	RMS	Email	Request for registration of interest

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
15/11/17	Murramarang	RMS	Email	Request for registration of interest
15/11/17	DJMD Consultancy	RMS	Email	Request for registration of interest
15/11/17	Butucarbin Aboriginal Corporation	RMS	Email	Request for registration of interest
15/11/17	Didge Ngunawal Clan	RMS	Email	Request for registration of interest
15/11/17	Ginninderra Aboriginal Corporation	RMS	Email	Request for registration of interest
15/11/17	Garrara Aboriginal Corporation	RMS	Email	Request for registration of interest
15/11/17	Nerrigundah	RMS	Email	Request for registration of interest
12/10/17	RMS	Darug Land Observations Pty Ltd/Anne O'Hara	Email	Response to ad
18/10/17	RMS	Scott Franks/ Tocomwall	Email	Response to ad
03/11/17	RMS	Vicky Slater/ Manager, Kawul Cultural Services	Email	Response to ad
03/11/17	RMS	Aaron Slater/ Warragil Cultural Services	Email	Response to ad
15/11/17	RMS	Lilly Carroll/ Didge Ngunawal Clan	Email	Registration of interest
15/11/17	RMS	Pollowan Phillip Khan/ Kamilaroi-Yankuntjatjara Working Group	Email	Registration of interest

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21/11/17	RMS	Uncle Des Dyer/ Darug Aboriginal LandCare	Email	Registration of interest
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21/11/17	RMS	Cherie Carroll Turrise	Email	Registration of interest
21/11/17	RMS	Jesse Carroll/ Muragadi Heritage Indigenous Corporation	Email	Registration of interest
21/11/17	RMS	Steven Hickey/ Widescope	Email	Registration of interest
21/11/17	RMS	Carolyn/ A1 Indigenous Services	Email	Registration of interest
21/11/17	RMS	Amanda Hickey/ Amanda Hickey Cultural Services	Email	Registration of interest
21/11/17	RMS	Wendy Smith/ Gulaga CHTS	Email	Registration of interest
22/11/17	RMS	Murramarangs CHTS	Email	Registration of interest
22/11/17	RMS	Biamangas CHTS	Email	Registration of interest
22/11/17	RMS	Cullendullas CHTS	Email	Registration of interest
22/11/17	RMS	Basil Smith/ Goobah CHTS	Email	Registration of interest

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
24/11/17	RMS	Kerrie Slater/ Wurrumay Consultant	Email	Registration of interest
27/11/17	RMS	Andrew Williams/ Aboriginal Archaeology Service	Email	Registration of interest
27/11/17	RMS	Leanne Watson Justine Coplin/ DARUG CUSTODIAN ABORIGINAL CORPORATIO N	Email	Registration of interest
21/12/17	Darug Land Observations Pty Ltd Anna O'Hara	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Tocomwall Scott Franks	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Kawul Cultural Services Vicky Slater	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Warragil Cultural Services Aaron Slater	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Kamilaroi-Yankuntjatjara Working Group Pollowan Phillip Khan	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Didge Ngunawal Clan Lilly Carroll	RMS	Email	Aboriginal Focus Group 1 invitation

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
21/12/17	Darug Aboriginal LandCare Uncle Des Dyer	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Gunjeewong Cultural Heritage Cherie Carroll Turrise	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Murra Bidgee Mullangari Darleen and Ryan Johnson	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Widescope Steven Hickey	RMS	Email	Aboriginal Focus Group 1 invitation
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21/12/17	A1 Indigenous Services Carolyn	RMS	Email	Aboriginal Focus Group 1 invitation
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21/12/17	Wurrumay Consultant Kerrie Slater	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Aboriginal Archaeology Service Andrew Williams	RMS	Email	Aboriginal Focus Group 1 invitation

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
21/12/17	Darug Custodian Aboriginal Corporation Leanne Watson	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Darug Custodian Aboriginal Corporation Justine Coplin	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Tharawal John Carriage	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Wingikara Simalene Carriage	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Badu Karia Bond	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Munyunga Shaylee Henry	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Gunyuu William Henry	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Nundagurri Thomas Tighe	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Murrumbul	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Walgalu Ronald Stewart	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Gangangarra Kim Carriage	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Bidawal Shakiha Archival	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	EORA Kahu Brennan	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Ngarigo Newton Bond	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Gadung Criage Wellington	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Curwur Murre Cyril Parsons	RMS	Email	Aboriginal Focus Group 1 invitation

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
21/12/17	Wandandian William Bond	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Walbunja Elders William Campbell	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Gulla Gunar Matthew Parsons	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Golangaya Adreian Connelly	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Murrin Tarlarra Te Kowhai	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Ngunawal Edward Stewart	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Dharug Andrew Bond	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Kuringgai Tony Brierley	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Elouera Lenard Nye	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Bulling Gang Whane Carberry	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Thauaira Shane Carriage	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Yerramurra Blaan Davis	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Birrungal Kylie Bell	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Djanaba Gaxabara Johnathan Morgan	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Barrabarrabarra DJ Walker	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Baruwaluwu Tanya Mullet	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Gadung Criage Wellington	RMS	Email	Aboriginal Focus Group 1 invitation

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
21/12/17	Golangaya Adreian Connelly	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Curwur Murre Cyril Parsons	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Gulla Gunar Matthew Parsons	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Deerubbin Local Aboriginal Lands Council Kevin Cavanagh & Steve Randall	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	Gandangara Local Aboriginal Lands Council Brad Maybury	RMS	Email	Aboriginal Focus Group 1 invitation
21/12/17	RMS	Paul Boyd / Didge Ngunawal Clan	Email	Registration of interest for AFG 1
21/12/17	RMS	Steven Hickey	Email	Registration of interest for AFG 1
21/12/17	RMS	Cullendullas Corey Smith	Email	Registration of interest for AFG 1
21/12/17	RMS	Roxanne Smith Murramarangs	Email	Registration of interest for AFG 1
21/12/17	RMS	Biamangas Seli Storer	Email	Registration of interest for AFG 1
21/12/17	RMS	Goobah Basil Smith	Email	Registration of interest for AFG 1
21/12/17	RMS	Gordon Workman Darug Land Observations	Email	Registration of interest for AFG 1

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
19/01/18	Darug Aboriginal Cultural Heritage Assessments	RMS	Letter	Registration to M12 Project – tracking number 605 26238694 092
29/01/18	Darug Land Observations Pty Ltd	RMS	Email	Copy of AFG Minutes
29/01/18	Tocomwall	RMS	Email	Copy of AFG Minutes
29/01/18	Kawul Cultural Services	RMS	Email	Copy of AFG Minutes
29/01/18	Warragil Cultural Services	RMS	Email	Copy of AFG Minutes
29/01/18	Didge Ngunawal Clan	RMS	Email	Copy of AFG Minutes
29/01/18	Kamilaroi-Yankuntjatjara Working Group	RMS	Email	Copy of AFG Minutes
29/01/18	Darug Aboriginal LandCare	RMS	Email	Copy of AFG Minutes
29/01/18	Murra Bidgee Mullangari	RMS	Email	Copy of AFG Minutes
29/01/18	Gunjeewong Cultural Heritage	RMS	Email	Copy of AFG Minutes
29/01/18	Muragadi Heritage Indigenous Corporation	RMS	Email	Copy of AFG Minutes
29/01/18	Widescope	RMS	Email	Copy of AFG Minutes
29/01/18	A1 Indigenous Services	RMS	Email	Copy of AFG Minutes
29/01/18	Gulaga CHTS	RMS	Email	Copy of AFG Minutes
29/01/18	Murramarangs CHTS	RMS	Email	Copy of AFG Minutes
29/01/18	Biamangas CHTS	RMS	Email	Copy of AFG Minutes

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
29/01/18	Cullendullas CHTS	RMS	Email	Copy of AFG Minutes
29/01/18	Goobah CHTS	RMS	Email	Copy of AFG Minutes
29/01/18	Wurrumay Consultant	RMS	Email	Copy of AFG Minutes
29/01/18	Aboriginal Archaeology Service	RMS	Email	Copy of AFG Minutes
29/01/18	Darug Custodian Aboriginal Corporation	RMS	Email	Copy of AFG Minutes
29/01/18	Darug Custodian Aboriginal Corporation	RMS	Email	Copy of AFG Minutes
29/01/18	Wingikara	RMS	Email	Copy of AFG Minutes
29/01/18	Tharawal	RMS	Email	Copy of AFG Minutes
29/01/18	Badu	RMS	Email	Copy of AFG Minutes
29/01/18	Munyunga	RMS	Email	Copy of AFG Minutes
29/01/18	Gunyuu	RMS	Email	Copy of AFG Minutes
29/01/18	Nundagurri	RMS	Email	Copy of AFG Minutes
29/01/18	Murrumbul	RMS	Email	Copy of AFG Minutes
29/01/18	Gangangarra	RMS	Email	Copy of AFG Minutes
29/01/18	Walgalu	RMS	Email	Copy of AFG Minutes
29/01/18	Bidawal	RMS	Email	Copy of AFG Minutes
29/01/18	EORA	RMS	Email	Copy of AFG Minutes
29/01/18	Ngarigo	RMS	Email	Copy of AFG Minutes
29/01/18	Gadung	RMS	Email	Copy of AFG Minutes
29/01/18	Curwur Murre	RMS	Email	Copy of AFG Minutes
29/01/18	Walbunja Elders	RMS	Email	Copy of AFG Minutes
29/01/18	Wandandian	RMS	Email	Copy of AFG Minutes
29/01/18	Golangaya	RMS	Email	Copy of AFG Minutes
29/01/18	Gulla Gunar	RMS	Email	Copy of AFG Minutes
29/01/18	Ngunawal	RMS	Email	Copy of AFG Minutes

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
29/01/18	Murrin	RMS	Email	Copy of AFG Minutes
29/01/18	Dharug	RMS	Email	Copy of AFG Minutes
29/01/18	Elouera	RMS	Email	Copy of AFG Minutes
29/01/18	Kuringgai	RMS	Email	Copy of AFG Minutes
29/01/18	Thauaira	RMS	Email	Copy of AFG Minutes
29/01/18	Yerramurra	RMS	Email	Copy of AFG Minutes
29/01/18	Bulling Gang	RMS	Email	Copy of AFG Minutes
29/01/18	Djanaba Gaxabara	RMS	Email	Copy of AFG Minutes
29/01/18	Birrungal	RMS	Email	Copy of AFG Minutes
29/01/18	Barrabarrabarra	RMS	Email	Copy of AFG Minutes
29/01/18	Baruwaluwu	RMS	Email	Copy of AFG Minutes
29/01/18	Deerubbin Local Aboriginal Lands Council	RMS	Email	Copy of AFG Minutes
29/01/18	Gandangara Local Aboriginal Lands Council	RMS	Email	Copy of AFG Minutes
24/7/2018	Amanda Hickey Cultural Services	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Darug Aboriginal Cultural Heritage Assesments	RMS	Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Warragil Cultural Services	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Golangaya	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Dharug	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Yerramurra	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
24/7/2018	Gadung	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Curwur Murre	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Ngunawal	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Tharawal	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Badu	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Gangangarra	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Elouera	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Gulla Gunar	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Ngarigo	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Bidawal	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Thauaira	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Murrin	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Kuringgai	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Bulling Gang	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Wandandian	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Walbunja Elders	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Darug Aboriginal LandCare	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
24/7/2018	Barraby Cultural Services	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Didge Ngunawal Clan	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	A1 Indigenous Services	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Widescope	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Kamilaroi-Yankuntjatjara Working Group	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Gandangara Local Aboriginal Lands Council	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Darug Land Observations Pty Ltd	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Murra Bidgee Mullangari	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Deerubbin Local Aboriginal Land Council	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Kawul Cultural Services	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Darug Custodian Aboriginal Corporation	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Darug Custodian Aboriginal Corporation	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Aboriginal Archaeology Service	RMS	Email and Post	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Goobah CHTS	RMS	Email	Invite to the second AFG meeting held on 7th August 2018

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
24/7/2018	Gunjeewong Cultural Heritage	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Barrabarrabarra	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Muragadi Heritage Indigenous Corporation	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Djanaba Gaxabara	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	EORA	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Wurrumay Consultant	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Birrungal	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Walgalu	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Tocomwall Pty Ltd	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Munyunga	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Wingikara	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Baruwaluwu	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Nundagurri	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Gulaga CHTS	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Gunyuu	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Murramarangs CHTS	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Biamangas CHTS	RMS	Email	Invite to the second AFG meeting held on 7th August 2018

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
24/7/2018	Cullendullas CHTS	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
24/7/2018	Murrumbul	RMS	Email	Invite to the second AFG meeting held on 7th August 2018
3/8/2018	Amanda Hickey Cultural Services	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Warragil Cultural Services	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Golangaya	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Dharug	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Yerramurra	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Gadung	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Curwur Murre	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Ngunawal	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Tharawal	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Badu	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Gangangarra	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Elouera	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Gulla Gunar	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Ngarigo	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Bidawal	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
3/8/2018	Thauaira	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Murrin	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Kuringgai	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Bulling Gang	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Wandandian	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Walbunja Elders	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Darug Aboriginal LandCare	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Barraby Cultural Services	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Didge Ngunawal Clan	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	A1 Indigenous Services	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Widescope	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Kamilaroi-Yankuntjatjara Working Group	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Gandangara Local Aboriginal Lands Council	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Darug Land Observations Pty Ltd	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Murra Bidgee Mullangari	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
3/8/2018	Deerubbin Local Aboriginal Land Council	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Kawul Cultural Services	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Darug Custodian Aboriginal Corporation	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Darug Custodian Aboriginal Corporation	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Aboriginal Archaeology Service	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Goobah CHTS	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Gunjeewong Cultural Heritage	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Barrabarrabarra	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Muragadi Heritage Indigenous Corporation	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Djanaba Gaxabara	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	EORA	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Wurrumay Consultant	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Birrungal	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Walgalu	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Tocomwall Pty Ltd	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
3/8/2018	Munyunga	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Wingikara	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Baruwaluwu	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Nundagurri	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Gulaga CHTS	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Gunyuu	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Murramarangs CHTS	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Biamangas CHTS	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Cullendullas CHTS	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
3/8/2018	Murrumbul	RMS	Email	Reminder of invitation to the second AFG meeting held on 7th August 2018
6/8/2018 3:43pm	RMS	Barry Gunther	Email	Subject: Concerns with M12 AFG 2 presentation • Duplication of data • Northern Rd Site status 'not a site'. Is there another name for this site? • Artwork for possible noise walls
8/8/18	Deanne Forrest, Lee Davison, cc: Denis Gojak (RMS)	Barry Gunther	Email	Requesting a phone call to discuss the M12 project and his concerns 'about the process of the Aboriginal heritage assessment and consultation is going for this project'
8/8/18 12:15pm	Barry Gunther	Lee Davison (RMS)	Phone call	Discuss Barry's concerns. Lee wrote down some of Barry's concerns and advised he would discuss with the project team and respond soon

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
8/8/18 4:14pm	Deanne Forest, Lee Davison, cc: Denis Gojak (RMS)	Barry Gunther	Email	Additional concerns 'that relate to the cultural assessments information and the formatting of the report' (AFG meeting 2 presentation on test excavation results). Barry suggested RMS discuss and contact him again.
9/8/18 7:28am	Barry Gunther	Lee Davison (RMS)	Email	In response to Barry's previous email and requesting specific details of his concerns so RMS can respond accurately.
9/8/18	Amanda Hickey Cultural Services	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Warragil Cultural Services	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Golangaya	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Dharug	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Yerramurra	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Gadung	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
9/8/18	Curwur Murre	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Ngunawal	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Tharawal	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Badu	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Gangangarra	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Elouera	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Gulla Gunar	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Ngarigo	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
9/8/18	Bidawal	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Thauaira	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Murrin	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Kuringgai	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Bulling Gang	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Wandandian	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Walbunja Elders	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Darug Aboriginal LandCare	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
9/8/18	Barraby Cultural Services	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Didge Ngunawal Clan	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	A1 Indigenous Services	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Widescope	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Kamilaroi-Yankuntjatjara Working Group	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Gandangara Local Aboriginal Lands Council	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Darug Land Observations Pty Ltd	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Murra Bidgee Mullangari	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
9/8/18	Deerubbin Local Aboriginal Land Council	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Kawul Cultural Services	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Darug Custodian Aboriginal Corporation	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Darug Custodian Aboriginal Corporation	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Aboriginal Archaeology Service	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Goobah CHTS	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Gunjeewong Cultural Heritage	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Barrabarrabarra	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
9/8/18	Muragadi Heritage Indigenous Corporation	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Djanaba Gaxabara	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	EORA	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Wurrumay Consultant	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Birrungal	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Walgalu	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Tocomwall Pty Ltd	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Munyunga	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
9/8/18	Wingikara	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Baruwaluwu	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Nundagurri	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Gulaga CHTS	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Gunyuu	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Murramarangs CHTS	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Biamangas CHTS	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
9/8/18	Cullendullas CHTS	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
9/8/18	Murrumbul	RMS	Email	Thank you for attendance at the AFG2, and for those who did not attend, RMS sent a copy of the presentation slides and the EOI invitation for local story workshops to be held by Balarinji
14/8/2018	Amanda Hickey Cultural Services	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Warragil Cultural Services	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Golangaya	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Dharug	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Yerramurra	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Gadung	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Curwur Murre	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Ngunawal	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Tharawal	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Badu	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Gangangarra	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Elouera	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Gulla Gunar	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Ngarigo	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Bidawal	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Thauaira	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Murrin	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Kuringgai	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Bulling Gang	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Wandandian	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Walbunja Elders	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Darug Aboriginal LandCare	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Barraby Cultural Services	RMS	Email	Circulation of AFG2 Minutes of Meeting

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
14/8/2018	Didge Ngunawal Clan	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	A1 Indigenous Services	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Widescope	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Kamilaroi-Yankuntjatjara Working Group	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Gandangara Local Aboriginal Lands Council	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Darug Land Observations Pty Ltd	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Murra Bidgee Mullangari	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Deerubbin Local Aboriginal Land Council	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Kawul Cultural Services	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Darug Custodian Aboriginal Corporation	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Darug Custodian Aboriginal Corporation	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Aboriginal Archaeology Service	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Goobah CHTS	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Gunjeewong Cultural Heritage	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Barrabarrabarra	RMS	Email	Circulation of AFG2 Minutes of Meeting

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14/8/2018	EORA	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Wurrumay Consultant	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Birrungal	RMS	Email	Circulation of AFG2 Minutes of Meeting
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14/8/2018	Wingikara	RMS	Email	Circulation of AFG2 Minutes of Meeting
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14/8/2018	Biamangas CHTS	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Cullendullas CHTS	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Murrumbul	RMS	Email	Circulation of AFG2 Minutes of Meeting
14/8/2018	Daniel Suwito (RMS)	Vicki Slater	Email	Acknowledgement of the receipt of minutes of meeting
15/8/2018	Daniel Suwito (RMS)	Barry Gunther	Email	Asking for the details of Joanne Nolan from TAFE NSW, who is looking after the Aboriginal student participation in field investigations
15/8/2018	Daniel Suwito (RMS)	Arika Jalomaki (Yulay Cultural Services)	Email	Expression of interest to register for Aboriginal community consultation for the M12 project in accordance with OEH's *Aboriginal Cultural Heritage Consultation requirements for proponents 2010*
15/8/2018	Daniel Suwito (RMS)	Bo Field (Yurrandaali)	Email	Expression of interest to register for Aboriginal community consultation for the M12 project in accordance with OEH's *Aboriginal Cultural Heritage Consultation requirements for proponents 2010*

DATE	TO	FROM	MEDIUM	BRIEF DESCRIPTION
16/8/2018	Arika Jalomaki (Yulay Cultural Services)	Daniel Suwito (RMS)	Email	Confirming that he/she has been included in the list for future consultation and confirming that RMS are not accepting any application for field work as the deadline for this was November last year. Also forwarded the updated EOI invite for the Aboriginal Local Story Workshop to be held Tuesday 21st August by Balarinji.
16/8/2018	Bo Field (Yurrandaali)	Daniel Suwito (RMS)	Email	Confirming that he/she has been included in the list for future consultation and confirming that RMS are not accepting any application for field work as the deadline for this was November last year. Also forwarded the updated EOI invite for the Aboriginal Local Story Workshop to be held Tuesday 21st August by Balarinji.
20/8/2018	Daniel Suwito (RMS)	Aaron Slater (Warragil)	Email	Acknowledgement of the receipt of minutes of meeting
15/8/2018	Barry Gunther	Lee Davison (RMS)	Email	Barry sent word document with his list of concerns regarding the methodology for PACHCI stage 3 provided by JAJV
16/8/2018	Lee Davison (RMS)	Barry Gunther	Email	Response to Barry cc'd Denis Gojakv
17/8/2018	Barry Gunther	Lee Davison (RMS)	Email	Another question – Were route options considered? · If No - why weren't they as this would of assisted in identifying and minimizing harm to Aboriginal objects. · If Yes – why were they not included in the methodology report.
17/8/2018	Lee Davison (RMS)	Barry Gunther	Email	Response to Barry's concerns, 'we will address your concerns and respond as soon as we can'
20/8/2018	Barry Gunther	Lee Davison (RMS)	Email	Acknowledgement of response

Aboriginal Heritage

M12 Motorway Development

Roads and Maritime Services invites Aboriginal people and Aboriginal groups, who hold cultural knowledge relevant to determining the significance of Aboriginal objects and places for the M12 Motorway, and for geotechnical investigations, to register to be consulted.

Roads and Maritime proposes the development and construction of a new east-west motorway between the M7 Motorway at Cecil Park, and The Northern Road at Luddenham, NSW.

The proposal may result in Roads and Maritime:

- applying for an Aboriginal Heritage Impact Permit (AHIP) under Part 6 of the *National Parks and Wildlife Act 1974*, and/or
- carrying out investigations in accordance with the *Code of practice for archaeological investigations in NSW 2010*, and/or
- carrying out an environmental impact assessment under the *Environmental Planning & Assessment Act 1979.*

To register your interest, please contact:

Lee Davison
Aboriginal Cultural Heritage Officer
Telephone: 1800 703 457 (toll free)
Email: m12.concept@rms.nsw.gov.au
Mail: M12 Project Team, Roads and Maritime Services, PO Box 973, Parramatta CBD, NSW 2124

General Notices

NSW GOVERNMENT

Roads and Maritime Services

Temporary traffic changes King Street, Rossmore

As part of the $509 million Bringelly Road upgrade, Roads and Maritime Services is carrying out work to upgrade the intersection of Bringelly Road and King Street, Rossmore. As part of this work, King Street will be **temporarily** reduced to one northbound lane for light vehicles to build the new eastbound traffic lanes on Bringelly Road.

Work will take place and detours will be in place from **Thursday 5 October 2017** to **Wednesday 11 October 2017** between **9am** and **5pm**, weather permitting.

King Street, from Bringelly Road and for approximately 150 meters north, will be reduced to northbound traffic for light vehicles only.

King Street access for **northbound** light vehicles will be switched to newly built lanes. A heavy vehicle detour will be in place via Fourth Avenue, Fifteenth Avenue and Devonshire Road.

Bringelly Road access for **southbound** heavy and light vehicles will be in place via Devonshire Road, Fifteenth Avenue and Fourth Avenue, Rossmore. Light vehicles may also use Wynyard Avenue and North Avenue, Rossmore.

Access for local residents and business will be maintained at all times.

Electronic message signs will be in place to advise road users of changes.

There may be some short delays to traffic along Bringelly Road as traffic controllers help trucks to safely enter and exit our construction site.

Thank you for your patience during this important work.

BLZ000000

For more information please contact our project team on 1800 199 009, bringellyroadupgrade@bmd.com.au or visit rms.nsw.gov.au/bringellyroad.

NSW GOVERNMENT

Aboriginal Heritage

M12 Motorway Development

Roads and Maritime Services invites Aboriginal people and Aboriginal groups, who hold cultural knowledge relevant to determining the significance of Aboriginal objects and places for the M12 Motorway, to register to be consulted.

Roads and Maritime proposes the development and construction of a new east-west motorway between the M7 Motorway at Cecil Park, and The Northern Road at Luddenham, NSW.

The proposal may result in Roads and Maritime:

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- carrying out investigations in accordance with the *Code of practice for archaeological investigations in NSW 2010*
- carrying out an environmental impact assessment under the *Environmental Planning & Assessment Act 1979*.

To register your interest, please contact:

Lee Davison
Aboriginal Cultural Heritage Officer

T 1800 703 457 (toll free)

E: m12.concept@rms.nsw.gov.au

M: M12 Project Team, Roads and Maritime Services, PO Box 973, Parramatta CBD, NSW 2124

Registrations must be received by phone or in writing by 3 November 2017.

V1 - LLGE01Z01MA

GENERAL FOR SALE

Garage Sales, Fetes & Markets

HAMMONDVILLE
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Sat 7th Oct.
8am-2pm
New/used items, furniture, plants, brick/brac.

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From 8 am - 4 pm

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ALL FETISH! 9693 7088 from 99c/min or 1902 250 609 $5.45/min pay/mob extra

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Indigenous health service in rorts probe

September 20, 2017

This article has been republished with permission from The Australian newspaper. A prominent indigenous health service is among the first to be targeted under a crackdown on Medicare rorts expected to recoup millions of dollars [...]

Queen adds royal nod to final farewell

September 20, 2017

Music legend Dr G Yunupingu, one of the most important voices in Australian music, was this week farewelled at a state memorial service in Darwin attended by celebrities and dignitaries — there was even a [...]

Incarceration solutions lie within communities

September 20, 2017

A lack of culturally appropriate diversionary and rehabilitation programs, inadequate funding for legal support and limited use of Circle Sentencing and Koori Courts are factors contributing to the disproportionately high incarceration rates of Aboriginal people. [...]

Homelessness fuels detention: Royal Commission

September 20, 2017

Homelessness rates 15 times higher than the national average could be behind the disproportionate number of Aboriginal children being placed in child protection and youth detention centres in the Northern Territory. That's the finding of [...]

Serendipity returns artefacts to owner

August 23, 2017

Treasures rich in historical significance have been returned to Gweagal woman Theresa Ardler and her family after a chance meeting led to an emotional reconnection with her past. Ms Ardler is from the Eora region [...]

Aboriginality today: it's not all black and white

August 18, 2017

By Alice Angelonis* "You'll notice I'm different, even in the corporate world, there's only one of me." He carries himself comfortably with an outward confidence; a navy T-shirt and jeans of a similar hue are [...]

MUSIC

Together we are strong, sings Shellie

TROY CASSAR-DALEY | THINGS I CARRY AROUND

ACHIEVEMENT

Trent reaps rewards of big-sky thinking

July 26, 2017

Life has come full circle for high school teacher Trent Lake. Mr Lake was a graduate of a ground-breaking Indigenous health and education program run for high school students on the New

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NATIONAL INDIGENOUS TIMES

Client: NSW Govt. Aboriginal Heritage 125704
Agency: Blaze
Date: October 04, 2017

SF2014/044836
A19043473

4 October 2017

General Manager
Native Title Services Corporation
PO Box 2105
Strawberry Hills NSW 2012

Dear Sir/Madam

To seek Aboriginal knowledge holders to assist Roads and Maritime Services (RMS) to prepare cultural heritage assessment reports for the M12 Motorway and geotechnical investigations.

The RMS is seeking the names of Aboriginal people who may hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places within the project area for M12 Motorway.

Aboriginal people identified by your agency will be notified of the project and invited to participate in the assessment process as described in OEH's requirements. Please forward the details of relevant Aboriginal people to the RMS before 19 October 2017

The contact details for this project are:

M12 Project Team
Roads & Maritime Services
PO Box 973
Parramatta CBD NSW 2124
Email m12.concept@rms.nsw.gov.au
Phone 1800 703 457 (toll free)

On behalf of the Australian and NSW governments, Roads and Maritime Services is planning the M12 Motorway as part of the $3.6 billion Western Sydney Infrastructure Plan. The M12 Motorway is a 16 kilometre (dual carriageway) motorway extending from the M7 Motorway, Cecil Hills to The Northern Road, Luddenham. The M12 Motorway is to provide the main access to the Western Sydney Airport at Badgerys Creek and to support increases in traffic demand due to land use change and residential growth.

The M12 Motorway is located within the Penrith, Liverpool and Fairfield local Government areas (LGA). The existing land uses within the project area are semi-rural residential, recreational, agricultural, commercial and industrial; and the main populations are Kemps Creek, Mount Vernon and Cecil Hills.

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[redacted]

SF2014/044836
A19043473

4 October 2017

General Manager
Native Title Tribunal – New South Wales Registry
GPO Box 9973
Sydney NSW 2001

Dear Sir/Madam

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[redacted]

SF2014/044836
A19043473

4 October 2017

The Registrar General Manager
Aboriginal Lands Right Act 1983
PO Box 112
Glebe NSW 2037

Dear Sir/Madam

To seek Aboriginal knowledge holders to assist Roads and Maritime Services (RMS) to prepare cultural heritage assessment reports for the M12 Motorway and geotechnical investigations.

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Legend
- M12 study area
- western Sydney airport at Badgerys Creek
- Notable facilities
- Creek
- Nature Reserve
- Western Sydney Parklands

This letter forms part of the RMS's commitment to actively identify relevant Aboriginal people in accordance with section 4.1.2 of the Office of Environment and Heritage (OEH) *Aboriginal cultural heritage consultation requirements for proponents* (2010).

[redacted]

SF2014/044836
A19043473

4 October 2017

General Manager
Manager Planning & Aboriginal Heritage Section – Metropolitan
Office Environment & Heritage
PO Box 668
Parramatta NSW 2124

Dear Sir/Madam

To seek Aboriginal knowledge holders to assist Roads and Maritime Services (RMS) to prepare cultural heritage assessment reports for the M12 Motorway and geotechnical investigations.

The RMS is seeking the names of Aboriginal people who may hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places within the project area for M12 Motorway.

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[redacted]

SF2014/044836
A19043473

4 October 2017

General Manager
Fairfield City Council
PO Box 21
Fairfield NSW 1860

Dear Sir/Madam

To seek Aboriginal knowledge holders to assist Roads and Maritime Services (RMS) to prepare cultural heritage assessment reports for the M12 Motorway and geotechnical investigations.

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[redacted]

SF2014/044836
A19043473

4 October 2017

General Manager
Penrith City Council
PO Box 60
Penrith NSW 2751

Dear Sir/Madam

To seek Aboriginal knowledge holders to assist Roads and Maritime Services (RMS) to prepare cultural heritage assessment reports for the M12 Motorway and geotechnical investigations.

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[redacted]

SF2014/044836
A19043473

4 October 2017

General Manager
Liverpool City Council
Locked Bag 7064
Liverpool BC, NSW 1871

Dear Sir/Madam

To seek Aboriginal knowledge holders to assist Roads and Maritime Services (RMS) to prepare cultural heritage assessment reports for the M12 Motorway and geotechnical investigations.

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[redacted]

SF2014/044836
A19043473

4 October 2017

Greater Sydney Local Land Services
PO Box 4515
Westfield Penrith 2790

Dear Sir/Madam

To seek Aboriginal knowledge holders to assist Roads and Maritime Services (RMS) to prepare cultural heritage assessment reports for the M12 Motorway and geotechnical investigations.

The RMS is seeking the names of Aboriginal people who may hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places within the project area for M12 Motorway.

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[redacted]

SF2014/044836
A19043473

4 October 2017

Gandangara Local Aboriginal Lands Council
Brad Maybury
PO Box 1038 Liverpool 2170
[redacted]

Dear Sir

To seek Aboriginal knowledge holders to assist Roads and Maritime Services (RMS) to prepare cultural heritage assessment reports for the M12 Motorway and geotechnical investigations.

The RMS is seeking the names of Aboriginal people who may hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places within the project area for M12 Motorway.

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[redacted]

SF2014/044836
A19043473

4 October 2017

Deerubbin Local Aboriginal Lands Council
Kevin Cavanagh
PO Box 40 Penrith BC 2751
Staff@Deerubbin.org.au

Dear Sir

To seek Aboriginal knowledge holders to assist Roads and Maritime Services (RMS) to prepare cultural heritage assessment reports for the M12 Motorway and geotechnical investigations.

The RMS is seeking the names of Aboriginal people who may hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places within the project area for M12 Motorway.

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[redacted]

[redacted]

From: [redacted]
Sent:
To:
Subject:
Attachments:

UNCLASSIFIED

Native title search – *NSW M12 Project Area Search extent within Penrith, Liverpool and Fairfield LGAs*
Your ref: *SF2014/0044836 (A19043473)* - Our ref: *SR3208*

Dear [redacted]

Thank you for your search request received on 16 October 2017 in relation to the above area, please find your results attached.

Please note: Where the area identified to be searched is indistinct, generalised, or is for a freehold parcel, the results provided may relate to the Local Government Area (LGA) or Local Aboriginal Land Council (ALC).

Search Results
The results provided are based on the information you supplied and are derived from a search of the following Tribunal databases:

- Schedule of Native Title Determination Applications
- Register of Native Title Claims
- Native Title Determinations
- Register of Indigenous Land Use Agreements
- Notified Indigenous Land Use Agreements

For more information about the Tribunal's registers or to search the registers yourself and obtain copies of relevant register extracts, please visit our website.

Please note: There may be a delay between a native title determination application being lodged in the Federal Court and its transfer to the Tribunal. As a result, some native title determination applications recently filed with the Federal Court may not appear on the Tribunal's databases.

The search results are based on analysis against external boundaries of applications only. Native title applications commonly contain exclusions clauses which remove areas from within the external boundary. To determine whether the areas described are in fact subject to claim, you need to refer to the "Area covered by claim" section of the relevant Register Extract or Schedule Extract and any maps attached.

Search results and the existence of native title
Please note that the enclosed information from the Register of Native Title Claims and/or the Schedule of Applications is not confirmation of the existence of native title in this area. This cannot be confirmed until the Federal Court makes a determination that native title does or does not exist in relation to the area. Such determinations are registered on the National Native Title Register.

Tribunal accepts no liability for reliance placed on enclosed information
The enclosed information has been provided in good faith. Use of this information is at your sole risk. The National Native Title Tribunal makes no representation, either express or implied, as to the accuracy or suitability of the information enclosed for any particular purpose and accepts no liability for use of the information or reliance placed on it.

If you have any further queries, please do not hesitate to contact me on the number below or on the free call number 1800 640 501.

Regards,

Enquiries
Public enquiry hours are 8.30am to 4.30pm
National Native Title Tribunal | Perth
Email enquiries@nntt.gov.au
Freecall 1800 640 501 | www.nntt.gov.au
Shared Country Shared Future
Celebrating 25 Years of Native Title Recognition www.nativetitle25.gov.au

OFFICE OF THE REGISTRAR
ABORIGINAL LAND RIGHTS ACT 1983 (NSW)

11-13 Mansfield Street
Glebe NSW 2037
PO Box 112, Glebe NSW 2037
P. 02 9562 6327 F. 02 9562 6350

18 October 2017

M12 Project Team
Roads and Maritime Services
P.O Box 973
PARRAMATTA CBD NSW 2124

Dear

Re: Request - Search for Registered Aboriginal Owners

I refer to your letter dated 4 October 2017 regarding an Aboriginal Cultural Heritage Assessment of the proposed M12 Motorway within the area of Cecil Hills, NSW through to and including the Northern Road Luddenham, NSW

I have searched the Register of Aboriginal Owners and the project area described does not have Registered Aboriginal Owners pursuant to Division 3 of the Aboriginal Land Rights Act 1983 (ALRA).

I suggest that you contact the Gandangarra Local Aboriginal Land Council on 02 9602 5280, and also the Deerubbin Local Aboriginal Land Council on 02 4724 5600. They may be able to assist you in identifying other Aboriginal stakeholders for this project.

Yours sincerely

Jodie Rikiti
Administration Officer
Office of the Registrar, ALRA

From: [redacted]

Sent: [redacted]
To:
Subject:

Thanks Andrew.

Regards

Barry

GLALC Cultural Heritage and Land Management Officer
103 Moore Street Liverpool NSW 2150
Ph: 9602 5280
Fax: 9602 2741
[redacted]

[redacted]

Hi Barry,

I will send you a copy of the archaeological and survey methodology via a file transfer process, as it is too large to attach to an email.

I look forward to seeing you at the AFG.

Regards,

[redacted]

I acknowledge the Traditional Owners of Country upon which I work, and pay my respects to them, their culture and their Elders past, present and emerging

[redacted]

Hi Daniel,

Thanks. Just wanted to clarify things.

For the M12 project there have been test excavations and the upcoming AFG will discuss the findings from the excavations therefore a Draft CHAR methodology for those test excavations would have been sent to stakeholders for comment prior to any excavation being done.

That is the report I am after not the final CHAR but the methodology one sent out for consultation as I cannot find one here at GLALC. I wanted to familiarize myself with the projects Aboriginal cultural assessments so far.

Do you have that Methodology report so I can review please.

Regards

Barry

GLALC Cultural Heritage and Land Management Officer
103 Moore Street Liverpool NSW 2150
Ph: 9602 5280
Fax: 9602 2741
[redacted]

[redacted]

Hi Barry,

Thank you for your email. The Draft CHAR is currently being worked on, so it is not available just yet.
I will let you know any update prior to the meeting.

Kind Regards,

[redacted]

[redacted]

Hi Daniel,

Thank you for the offer to attend the AFG for the proposed M12 project.

I will be attending the AFG representing Gandangara LALC and possible another rep may attend.

The invitation was addressed to Brad Maybury whom does not work for GLALC at this time.

I could not locate the CHAR for this project to review prior to the meeting however I am confident it was sent.

Could you please email me a copy of the Draft CHAR for the M12 proposal so I can review prior to the AFG.

Regards

[redacted]

[redacted]

Before printing, please consider the environment

[redacted]

Hello Fran,

On **Wednesday 21 February 2018** Jacobs Arcadis Joint Venture (JAJV) intend to commence archaeological test excavation under the code of practice on behalf of Roads and Maritime Services. We expect the test excavation program to conclude on May 30 2018. Neville Baker will be the Excavation Director and I will be the Project Manager for the JAJV-M12 archaeological program.

The project will connect the new Western Sydney Airport at Badgerys Creek with regional development centres, and the broader Sydney region via The Northern Road and the Westlink M7 motorway.

Please find the list of Registered Aboriginal Parties (RAP) for project and the archaeological methodology including the sampling strategy for test excavation attached. A link with a version including maps has been sent to your email address as it is too large for an email. A copy of the methodology was sent to the RAPs on the 12 December 2017, with an Aboriginal Focus Group Meeting held at Kemps Creek Bowling Club on January 17 2018. To date several positive approvals of the methodology have been received (two are attached) and the period for comments was closed on 31 January 2018.

During the test excavation program all artefacts recovered will be stored in a secure location at Level 7, 177 Pacific Highway, North Sydney.

The RMS project manager details are as follows:

[redacted]

[redacted] *I acknowledge the Traditional Owners of Country upon which I work, and pay my respects to them, their culture and their Elders past, present and future.*

[redacted]

Hi

Thank you for registering your interest in the M12 Motorway Project. Please find attached the minutes from the AFG held on 17 January 2018.

A reminder that the comments period for the archaeological survey methodology for the project closes on Wednesday 31 January, so please submit any further comments as soon as possible to the project mailbox (m12.concept@rms.nsw.gov.au)

Thanks

[redacted]

[redacted]

Hi Anthony,
I'm not sure if i sent anything for this
so the Darug Aboriginal Land care agrees with your
Methodology in your report
Des

[redacted]

Hi

Thank you for registering your interest in the M12 Motorway Project. Please find attached the minutes from the AFG held on 17 January 2018.

A reminder that the comments period for the archaeological survey methodology for the project closes on Wednesday 31 January, so please submit any further comments as soon as possible to the project mailbox (m12.concept@rms.nsw.gov.au)

Thanks

[redacted]

NSW GOVERNMENT Transport Roads & Maritime Services

NSW GOVERNMENT Transport Roads & Maritime Services

MURAGADI HERITAGE INDIGENOUS CORPORATION

ICN NO: 8284

29/01/2018

[redacted]

Jacobs
7/177 Pacific Hwy,
North Sydney NSW 2060

Dear Andrew,

Re: Archaeological Methodology and Environmental Impact Statement M12 Motorway

I have read the proposed Archaeological methodology, Environmental impact statement and the approach to the Aboriginal Cultural Heritage assessment including the protocols for the management of sensitive cultural information for the M12 Motorway. I endorse the proposed approach, methods and recommendations made Jacobs. I look forward to hearing from you shortly.

[redacted]

5 Hession Road, Nelson NSW 2765
Email: muragadi@yahoo.com.au

Murra Bidgee Mullangari

Aboriginal Corporation Cultural Heritage
ICN: 8112

Date: 24/01/2018

[redacted]

Jacobs
Level 7, 177 Pacific Hwy,
North Sydney NSW 2060

Dear Andrew,

Re: Archaeological methodology and Environmental Impact Statement for the M12 Motorway

I have read the Environmental impact statement, proposed methodology review and the approach to the protocols for the management of sensitive cultural information for the above project. I endorse the proposed approach and method recommendations by Jacobs.

If you require further details please feel free to contact me either by mobile or email. I look forward to hearing from you.

Kind regards

[redacted]

Murra Bidgee Mullangari
Aboriginal Corporation Cultural Heritage
A: PO Box 246, Seven Hills, NSW, 2147
E: murrabidgeemullangari@yahoo.com.au

NSW GOVERNMENT | Department of Industry

Murra Bidgee Mullangari Aboriginal Corporation support their community in financial hardship with Energy Assistance packages. We are a NSW Government approved EAPA voucher distributor

[redacted]

Dear Anthony,
Please find attached letter for the M12 Motorway.
Thanks

[redacted]

[redacted]

Hi Anthony,

I have reviewed and support the archaeological survey methodology for the M12 Motorway Project.

I have completed and returned Site officer Application for the M12 Motorway Project on the 16/12/17

Thank you
Steven Hickey

[redacted]

Hi

Thank you for registering your interest in the M12 Motorway Project. Please find attached the minutes from the AFG held on 17 January 2018.

A reminder that the comments period for the archaeological survey methodology for the project closes on Wednesday 31 January, so please submit any further comments as soon as possible to the project mailbox (m12.concept@rms.nsw.gov.au)

Thanks

[redacted]

NSW GOVERNMENT | Transport Roads & Maritime Services

Before printing, please consider the environment

MINUTES

Meeting title	M12 Aboriginal Focus Group 3
Date and time	27 February 2019 Time: 10:00 – 12:00
Venue	Kemps Creek Bowling Club
Chairperson	RMS
Attendees	Neville Baker, Andrew Costello, Melissa Laginha, Lee Davison, Mark Lester, Suzette Graham, Kristen Foley, Daniel Suwito, Michael Finch, Steven Hickey, Amanda Dezwart, Carolyn Hickey, Wendy Miell (on behalf of Paul Boyd), Philip Khan, Steve Randall, Aaron Slater, Vicky Slater, Jamie Eastwood, Danny Eastwood, Justine Coplin, John Phillips Ros Moriarty, Rachel Taylor
Apologies	Tim Colman, Paul Boyd, Darren Duncan (Gandangarra LALC)

		Responsible person / Due date
1.	**Welcome Acknowledgment to Country and people** (Lee Davison)	
2.	Agenda for Meeting (Lee Davison)	Note
3.	**RMS Project Overview** (Michael Finch): • Project description summary • 80% Concept Design has been prepared • Concept Design is being progressed to 100% • EIS on track for August 2019 exhibition • Stakeholder engagement ongoing • Submissions report – end 2019/ early 2020 • Planning approval – expected Mid 2020 • Anticipated completion and opening 2025 (6-months prior to Western Sydney Airport (WSA) opening)	
4.	**Balarinji** (Rachel Taylor): • Summary of process – desktop research and consultation with community **'Body of story'** workshop was held with a community group to identify key themes. Key themes and significant items identified included: • Local totems for the area associated with the Dreaming • Materials found in local area (red silcrete) and significance of associated colours • Significance of native flora and fauna (e.g. seasonal indicators) • Natural resources and reading the landscape • Aboriginal astronomy	Note

		Responsible person / Due date
	• Creek and freshwater places **'Body of art' workshop –** artists using storyboards to develop concepts working with key themes: (Jamie Eastwood/ Danny Eastwood) • Group/community discussing ideas • Different artists, different backgrounds, different stories/cultural knowledge • Discussion of concepts including different elements of the overall environment; flora, creeks etc; Aboriginal culture and rock carvings, tree carvings, paintings, etc. • Creation of individual and combined group artworks • Involved a combination of contemporary and traditional Aboriginal art. **Video of workshops –** a short video was shown of the workshop process and interviews of artists involved, including the following important elements: • Flora and fauna tell the story of the place • We are from the land, we care for the land and the land cares for us • The use of contemporary and traditional art in the artworks • Education and reconciliation - displaying public art will help to educate and tell the story of Aboriginal culture **Concept ideas** (Ros Moriarty) • People and country are interconnected through seasons, flora and fauna, communication, etc. • There was a need to collaborate (not 'consult') with Aboriginal groups to depict stories that they want to tell • Part of the workshop was to source examples to activate thinking (e.g. art depicting the natural world, and examples of sculptures) • Concept ideas were developed with a view to further developing in detailed design • Priority concepts include: o Emu in the sky-theme: Emu in the sky which would be a landscape sculpture on a big scale, providing views from the air (e.g. take-off and landing), transient views from vehicles and users of active transport network, and be reflective at night to reflect the Aboriginal cosmology o Emu footprints: Need to be large scale, option to be moulded into the landscape o Way-finding, signage on overbridges, on road ways, adjacent to cycleways, on adjacent land o Potential for practicality – shade structures (e.g. eucalyptus leaf structures over cycle path) etc o Interconnectedness o Earth layers o Mariong (sprit ancestor) o Smoke on country telling of communication between people across country and caring for the land o Freshwater places: tree sculpture that can emit mist o Native plants, scarred trees ***Comment from group:*** Mark Lester: Commendation to Balarinji, very impressive and far and above other interpretation proposals seen by RMS	

		Responsible person / Due date
5.	**TAFE NSW** (Andrew Costello): TAFE NSW is working with Andrew to devise a program for work in the field by Registered Aboriginal Parties who enrol in TAFE to be assessed as part of a Certificate 2 in Infrastructure. • Some people missed out on modules due to rotating site roster • Narimba TAFE to run modules on certain dates to get everyone certified ***Comment from the group:*** Hard to predict when people can attend to complete modules due to work commitments. Is there a potential for night-time classes? *Response:* We will discuss with TAFE the potential for night-time classes.	**Action (AC):** Discuss potential for night-time modules with TAFE
6.	Noted that some people didn't receive ACHAR via link. Those who didn't receive to be given a hard copy or USB Extension of consultation period to **27th March 2019 for those people that didn't receive the document.**	**Action (RMS/ JAJV):** RAPs that did not receive documents to receive a hardcopy or USB of the ACHAR
7.	Introduction of Neville Baker to discuss ACHAR, salvage, inputs from community regarding research questions (Andrew Costello)	
8.	Fieldwork summary, test excavation results, proposed impacts and management/salvage strategy (Neville Baker): • Refer to slide for fast statistics (1519 artefacts, 73m^3 of material excavated) • Most items were found near water with South Creek and Badgerys Creek main hotspots • Significance of outlook sights on rises • Natural spring on-site which may be another source of Aboriginal activity during previous drought periods • Extensive areas not previously recorded in AHIMS • Artefacts material mostly red silcrete • Artefact types mainly flakes • Red silcrete discovered was locally sourced. Indication of dynamic society, potential exchange with areas down south from analysis of silcrete • Potential for visual interpretation/public display of artefacts at WSA, prison depending on RAP feedback • Request for feedback in ACHAR to better understand the impacts. Salvage program: • Collect surface artefacts/ sites • Archaeological excavation to clarify how far these artefacts go/extent of sites (i.e. from creeks) • Deep alluvium or in deeper clay– potential chronology/stratigraphy of artefacts? • Desire for open area digs on ridge top sites Management measures: • Passive – far enough away to not impact. No need for fencing • Active – fencing, signage, induction to protect sites Cultural values assessment: • Values have been identified from the Balarinji process and feedback received from RAPs during fieldwork test excavations • Looking for further feedback and input from RAPs on cultural values to be	**Action (AC):** Investigate workshops for artefact analysis for site officers, particularly younger, trainee site officers to demonstrate knapping and educate on stone tool technology and classification.

		Responsible person / Due date
	included in the Aboriginal Cultural Heritage Assessment Report (ACHAR) **Comment from group:** Any problems exploring the rest of the creek beds? *Response:* Already done as part of the excavations. This is relating to follow up. For areas to be impacted, to understand the story better and why people were gathered there. Hoping to find some artefacts or soils to date and evidence of cooking/camping i.e. hearths. Artefacts appear to be from the last 5000 years. **Comment from group:** Curious if the landscape been used and occupied continuously over time or different levels of occupation over different times. *Response:* Hopefully salvage excavation can provide further details surrounding periods of occupation within the study area through OSL or radiocarbon dating. **Comment from group:** Potential for residue analysis and scientific analysis of the artefacts. *Response*: Opportunity to get a selection of used tools for residue analysis. Potential use of 3D modelling and printing technology. **Comment:** Where will the artefacts end up? *Response:* This has not been resolved, RMS open to discussion. Currently in locked cabinet at Neville's storage. We are looking for a local keeping place. Previously discussed to be kept on Darug country. However, there may be opportunities to have them visually presented at WSA. We can work with OEH to form a Care and Control agreement. Put back to the group to give feedback and voice a preference. **Comment:** Silcrete resource – is that a site to be impacted? Potential for protection? *Response:* Would be impacted by project. However, there are areas north of project along the watercourses and ridges, and by the road near Kemps Creek / Elizabeth Drive that have the same red silcrete cobbles that would not be impacted. Red silcrete resources are important to Aboriginal people. There is an option to discuss with OEH what options are available for using that resource. **Comment:** Has all the artefact analysis been done on all the recovered artefacts? *Response: Yes* **Comment:** Can we be a part of the future artefact analysis ? *Response:* Artefact analysis is a tedious and time-intensive job however this would be a good opportunity for some workshops *to assist with some of the artefact analysis on a voluntary basis.* **Comment:** Potential on-site training with younger community members rather than just excavating pits?	

		Responsible person / Due date
	Response: Potential for a weekend workshop - (knapping) / flaking.	
9.	What's next • No control over the exact timing of the next phase, as it depends on project approval however tentative program has been given to the group at the beginning of presentation. • Still running TAFE • Consultation still open with comment on ACAHR from RAPs until 27 March 2019 • Circulation of Balarinji video	**Update – Intellectual Property issues prevent circulation of Balarinji content. A summary has been provided in the ACHAR**
	Next meeting	

[redacted]

Hi Mel/Tim,

Please see a response below from Vicki Slater in regards to the ACHAR and AAR for the M12. RMS have received no other responses via email or phone.

Kind regards,

[redacted]

[redacted]

Response to the Draft CHAR and AAR from Kawul Cultural Services below.

[redacted]

Roads and Maritime Services
Level 3, 27-31 Argyle Street Parramatta 2150

I acknowledge the traditional custodians of the land on which I live and work.
I pay respect to their ancestors, country and cultural values, many of which continue today.

[redacted]

Sent: Wednesday, 27 March 2019 4:42 PM

To: DAVISON Lee
Subject: Re: M12 Project- ACHAR & AAR

Dear Lee

Re: Comments for the Draft ACHAR & AAR

Kawul Cultural Services having worked on the project.

We have read the ACHAR & AAR and agree with the process at this

Prior with the test pitting we were using a 5mm Seive

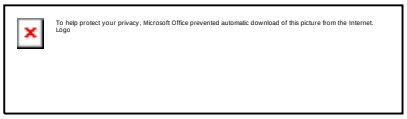
I would like to see a 3mm under the 5mm due to the decapage and small flakes in the the Salvage.

The south creek highly Cultural significance with Aboriginal occupation in the areas of the project & Waterways.

Kind Regards

[redacted]

Kawul Cultural Services



Text Message
Yesterday 10:32 am

M12 Project:
Re: Comments for the ACHAR & AAR

Dear [redacted]

Warragil C.S has read and agrees with the Draft ACHAR & AAR at this stage.

I would like to add that with the Wet Seiving not to be sourced from the dams.

Regards

[redacted]

Annexure B. Archaeological methodology

M12 MOTORWAY
CONCEPT DESIGN AND ENVIRONMENTAL IMPACT STATEMENT

Roads & Maritime Services

M12 Motorway Concept Design and Environmental Impact Statement

Archaeological Methodology

Roads & Maritime

JACOBS

ARCADIS Design & Consultancy for natural and built assets

Contents

1. Introduction

This document presents an archaeological methodology for the investigation of Aboriginal objects and sites for the proposed M12 Motorway (the project). The project will connect the new Western Sydney Airport at Badgerys Creek with regional development centres, and the broader Sydney region via The Northern Road and the Westlink M7 motorway. The project is expected to be declared state significant infrastructure and will require an environmental assessment in accordance with Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This archaeological methodology applies to the Stage 2 geotechnical investigation (GI) program and the potential impacts to Aboriginal objects throughout the course of the project. The Stage 1 GI program will not require investigation as it has been assessed and determined to avoid areas of cultural heritage sensitivity or archaeological potential.

Where hand excavation is prescribed, the methodology is designed to be in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (Code of Practice) (DECCW 2010c). The methodology for mechanical excavation will be further developed once the Secretary's Environmental Assessment Requirements (SEARs) for the project become available.

This archaeological methodology is also designed in accordance with the requirements of stage Three of NSW Roads and Maritime Services (Roads and Maritime) *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) (NSW Roads and Maritime, 2011). The purpose of this methodology is to describe the implementation of recommendations to identify, investigate and where possible, minimise harm to Aboriginal cultural heritage, as outlined within the *M12 Archaeological Survey Report – Aboriginal* (JAJV 2017).

The methodology presented in this document comprises three categories:

- A project specific test excavation methodology for investigation of Aboriginal sites and areas of potential archaeological deposit (PAD) identified within the study corridor (**Section 2**)
- A small number of control investigations to confirm areas of low archaeological potential and test predictions of PAD occurrence within the study corridor (**Section 2**)
- A description of how Geotechnical Investigation locations will be selected and assessed to avoid harm to Aboriginal cultural heritage values within the study corridor (**Section 3)**.

The study corridor comprises a broad construction corridor spanning hills, slope and major creeks in the heart of the Cumberland Plain (**Figure 2.1**). South Creek runs through the middle of the study corridor, as well as major tributary creeks in the South Creek catchment: Cosgroves Creek, Badgerys Creek and Kemps Creek. These creeks provide permanent water sources and riparian flora and fauna resources. The flat and sometime very broad creek valleys provide a contrasting ecological resource zone to the surrounding Luddenham Hills to the west and Cecil Hills to the east.

2. Further investigation

As detailed in the *M12 Archaeological Survey Report – Aboriginal* (JAJV 2017), desktop assessment and archaeological field survey of the study corridor has been undertaken. The desktop portion of the assessment identified 25 AHIMS records within the study corridor. The 25 AHIMS site records were examined in further detail, resulting in a reduction to 16 discrete Aboriginal sites that can be reliably mapped to locations within the study corridor (**Table 2.1**, **Figure 2.1**). The number of AHIMS sites within the study corridor were reduced due to the following factors:

- AHIMS site ID: 45-5-4049 is an AHIMS record with incorrect coordinates for a site/PAD located in Rossmore to the south (outside study corridor).
- AHIMS site ID: 45-5-2748 is an AHIMS record with incorrect coordinates for a dead scarred tree in a water body. Air photos place the water body 100 metres further east and outside the corridor (outside study corridor).
- Four AHIMS sites ID: 45-5-2468, 45-5-2476, 45-5-2477 and 45-5-2722 have been destroyed by construction of the Westlink M7 Motorway (destroyed no longer within study corridor).
- AHIMS site ID: 45-5-3804 has AHIMS coordinates placing it just north of the corridor, but the site card maps it as 218 m south west, falling within the corridor (within study corridor).
- Two sites have been recorded twice. AHIMS sited ID: 45-5-0496 (Fleurs 1) and 45-5-528 (Fleurs 2) has been inadvertently re-recorded as 45-5-4749 and 45-5-4750 by Navin Officer (2015). The Navin Officer coordinates vary only slightly, but they are clearly ground exposures that have been there for decades and therefore can be attributed to the 1985 Fleurs 1 & 2 recordings (duplicates no longer included in study corridor).

Table 2.1 : List of existing AHIMS within the study corridor identified during desktop assessment

AHIMS ID	Site Name	Assessment area	Site type	Type of impact
45-5-4786	TNR-AFT-14	Luddenham	Isolated artefact	Direct
45-5-3804	Isolated artefact 4	Luddenham	Isolated artefact find	Direct
45-5-2563	DLC 2	Cecil Park	Isolated artefact	Direct
45-5-4747	M12A1	Badgerys Creek	Artefact scatter	Direct
45-5-4748	M12A2	Badgerys Creek	Isolated artefact	Direct
45-5-0528/45-5-4750	Fleurs 2	Badgerys Creek	Open campsite	Direct
45-5-0496/45-5-4749	Fleurs 1	Kemps Creek	Artefact scatter	Direct
45-5-4767	M12A5	Kemps Creek	Isolated artefact	Direct
45-5-2310	KC/ED2	Kemps Creek	Artefact scatter	Direct
45-5-4007/45-5-4937	Artefact Scatter 2008-4	Kemps Creek	Artefact scatter	Direct
45-5-4374	CP AS1	Cecil Park	Artefact scatter	Direct
45-5-2307	P-CP9	Cecil Park	Artefact scatter	Direct

AHIMS ID	Site Name	Assessment area	Site type	Type of impact
45-5-2308	P-CP8	Kemps Creek	Open camp site	Direct
45-6-2561/45-5-4022	GLC1/2023-846	Cecil Park	PAD	Direct
45-5-2721	PAD-OS-7	Cecil Park	Open camp site	Direct
45-5-2723	PAD-OS-5	Cecil Park	PAD	Direct

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 2.1 AHIMS sites within and overlapping M12 study corridor

During the archaeological survey of the study corridor, an additional four Aboriginal sites **(Table 2.2)** and fourteen areas of PAD were identified **(Table 2.4** : PADs identified during archaeological survey within the study corridor **).** However, critical evaluation of site mapping determined 45-5-4937 is a duplicate of 45-5-4007. The coordinates of 45-5-4007 were incorrectly recorded originally and this led to subsequent re-recording of the site as 45-5-4937 during the survey component of this assessment. Therefore, only three additional Aboriginal sites were identified during the survey (**Figure 2.2**). All sites and PADs that are within the study corridor which will be impacted by the project require further investigation in the form of test excavation to confirm the presence of archaeological deposits and determine the nature, extent and significance of these deposits to inform the development of appropriate management recommendations. Where hand excavation is proposed these investigations shall be conducted in accordance with the Code of Practice (DECCW 2010c). The methodology for mechanical excavation will be further developed and executed under the Secretary's Environmental Assessment Requirements (SEARs) for the project when they become available. The PADs requiring investigation are listed in Table 2.4 : PADs identified during archaeological survey within the study corridor . Mapping with the location and extent of each PAD can be found in **Figure 2.3**.

Table 2.2 : List of Aboriginal sites recorded during archaeological survey within the study corridor

AHIMS ID	Site Name	Assessment area	Site type	Overall significance	Type of impact	Comments
45-5-4936	M12-AS-02	Luddenham	Artefact scatter	Moderate	Direct	
45-5-4937/45-5-4007	M12-AS-01/ Artefact Scatter 2008-4	Kemps Creek	Artefact scatter	Moderate	Direct	Duplicate of existing AHIMS
41-5-0014	M12-AS-04	Kemps Creek	Isolated find	Moderate	Direct	
45-5-4935	M12-AS-03	Cecil Park	Artefact scatter	Moderate	Direct	

2.1 Summary of critical evaluation of AHIMS and PADS within study corridor

Following critical desktop and survey examination of the AHIMS and PADS within the study corridor 19 registered AHIMS sites and 14 PADS were confirmed to still exist within the study corridor. The summary critical evaluation of site presence is detailed in **Table 2.3.**

Table 2.3 : Critical evaluation summary of AHIMS and PADS within the study corridor

Assessment Component	Critical examination component	Number of sites
Desktop AHIMS sites	Initial sites	25
	Duplicate sites	2
	Site with incorrect coordinates (within)	1
	Site with incorrect coordinates (outside)	2
	Destroyed	4
	Total AHIMS sites ground-truthed to still exist within study corridor	**16**
Survey AHIMS sites	Initial sites	4
	Duplicate sites	1

Assessment Component	Critical examination component	Number of sites
	Total ground-truthed sites identified during survey	3
Total sites (ground-truthed to exist within study corridor)		19
PADS within corridor to be tested		14

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Figure 2.2 Aboriginal heritage sites identified during the M12 survey

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Figure 2.2 Aboriginal heritage sites identified during the M12 survey

Table 2.4 : PADs identified during archaeological survey within the study corridor

PAD name	(AHIMS ID)	Assessment area	Likelihood of archaeological deposits	Landform	Soil landscape
M12-TNR_PAD	TBC	Luddenham	High	Gentle Slopes	Blacktown
M12-Cosgroves West PAD	TBC	Luddenham	High	Gentle Slopes	South Creek with inclusions of Blacktown
M12-Cosgroves East PAD	TBC	Luddenham	High	Gentle Slopes	Blacktown
M12-Badgerys West PAD A	TBC	Badgerys Creek	High	Luddenham Rolling Hills	South Creek
M12-Badgerys West PAD B	TBC	Badgerys Creek	High	Creek Flats	South Creek
M12-Badgerys East PAD	TBC	South Creek	High	Creek Flats	South Creek
M12 South Ck West PAD	TBC	South Creek	High	Creek Flats	Blacktown
M12 South Ck East PAD	TBC	South Creek	High	Creek Flats	South Creek
M12 Kemps NW PAD	TBC	Kemps Creek	High	Luddenham Rolling Hills	Blacktown
M12 Kemps West PAD A	TBC	Kemps Creek	High	Creek flats	South Creek
M12 Kemps West PAD B	TBC	Kemps Creek	High	Creek flats	South Creek
M12 Kemps West PAD C	TBC	Kemps Creek	High	Creek flats	South Creek
M12 Kemps East PAD	TBC	Kemps Creek	High	Creek flats	South Creek
M12 Ropes Creek PAD	TBC	Cecil Hills	High	Creek flats	South Creek

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Figure 2.3 Areas of PAD identified from predictive model and archaeological survey

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Figure 2.3 Areas of PAD identified from predictive model and archaeological survey

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Figure 2.3 Areas of PAD identified from predictive model and archaeological survey

2.2 Aims

The aims of the archaeological test excavation program are to:

- Assess the presence of sub-surface archaeological deposits for all areas of PAD
- Identify the nature, depth, extent and indicative significance of archaeological deposits within the study corridor
- Undertake a small number of 'control' excavations outside areas of PAD to confirm areas of low archaeological potential as defined by the predictive model developed for archaeological sites
- Consult with registered Aboriginal parties (RAP) with regard to:
    - this methodology
    - Aboriginal site significance
    - test pit placement within the PADs being tested
    - recommendations for further archaeological investigation
    - recommendations for further community consultation
    - development of recommendations to minimise or mitigate potential impacts to any Aboriginal cultural heritage sites identified via the test excavation.

Preliminary management recommendations and Aboriginal cultural significance may be discussed informally in the field with nominated site officers, however, recommendations will be discussed more formally at a post-excavation Aboriginal Focus Group (AFG) meeting.

2.3 Desktop assessment and predictive model

A review of previous archaeological reports has been undertaken in the archaeological survey report (JAJV 2017). The assessment indicates that certain landscape contexts within the study corridor have a higher likelihood to contain archaeological sites and deposits than others. Predictive modelling was used to determine the archaeological sensitivity for Aboriginal cultural heritage of particular landforms within the proposed study corridor. Within the study corridor differing degrees of ground disturbance and development has resulted in fluctuations of disturbed archaeological integrity, mainly as an effect of alluvial, colluvial, agricultural and decreased preservation processes.

The archaeology of the study corridor is primarily found in stone artefact sites associated with watercourses, found within topsoil deposits on shale-based duplex soils and Quaternary alluvium. Scarred trees are rare and commonly problematic in identification due to the complications of potential natural causes of scarring. Sandstone-based sites such as axe grinding grooves and rockshelters with deposit or art are typically found at the margins of the Cumberland Plain and are not expected in the study corridor. The occurrence of sandstone outcrops with grinding grooves nearby the study corridor is a rare exception. At the south eastern end of the study corridor the Cecil Hills forms the watershed between the Hawkesbury-Nepean River and the Georges River catchments. The hills form a prominent outlook and may have been used to look out over country.

In summary the following archaeological predictions are made:

- stone artefact deposits will occur within the topsoil in creek valley areas within at least 300 metres of the major creeks concentrated close to the creek line and diminishing in density with increased distance from water

- stone artefact deposits will occur within the topsoil in prominently elevated landforms near, and with good outlook over, the major South Creek complex of creeks, diminishing rapidly in density with increased distance and obstructed outlook over the creek valleys
- stone artefacts are not anticipated to consistently occur in the Luddenham rolling hills other than as isolated random finds
- stone artefacts are not anticipated to occur in the gentle slopes rising from the creek valleys at a distance of more than 300 metres from the major creeks other than as isolated random finds
- scarred trees occur sporadically across the wider landscape. These will primarily occur on Eucalypt species and in alluvial flats or valley floor contexts
- outcrops of Minchinbury sandstone with grinding grooves may occur within 300 metres of one of the major creeks, next to solution pans or chemically weathered potholes in outcropping stone;
- stone artefacts may occur in an unknown density and unknown extent on the highest of the Cecil Hills adjacent the M7 motorway, but this may be limited to areas of suitable outlook over adjacent country
- stone artefacts are not anticipated to consistently occur through the Cecil Hills steeply sloping landscape other than on the eastern high outlook area
- stone artefact material types will likely include predominantly silcrete with some chert, quartz, tuff, mudstone and quartzite
- flakes and flaked pieces are the predicted stone artefact types that will characterise any further sites found while bipolar and multiplatform cores and other formal tool types may also be dispersed sporadically throughout the assemblages
- stone artefact surface material may reflect low artefact densities. However, high-density artefact densities may occur within subsurface deposits
- grinding grooves may also be located along shale based topography

3. Methodology

3.1 Introduction

The test excavation methodology has been designed to sufficiently test the primary hypothesis for site formation, preservation and extent within the study corridor. Surface survey is an inadequate method of identifying open stone artefact sites due to poor ground surface visibility and a tendency for archaeological evidence to be subsumed into the topsoil through various natural processes. Therefore, archaeological test excavation is recommended for all parts of the study corridor where Quaternary Alluvium is found intact in association with waterways (JAJV 2017). Additional test excavation on representative landforms in the surrounding hills and slopes will be conducted to contrast the results and to test the accuracy of the site prediction model (Section 2.3).

While a typical archaeological methodology in NSW prescribes hand excavation as the primary technique, this excavation methodology recommends mechanical excavation as the preferred method, because:

- The prodigious areas of PAD and sites to be tested
- The diffuse nature of archaeological deposit
- The comparable archaeological outcomes of stratigraphic integrity of mechanical and hand salvage
- Cost and time efficiencies

Our approach to investigation the archeological deposit within the study corridor will be structured around:

Hand / manual excavation – Section 3.3

Mechanical excavation – Section 3.4

Geotechnical and land contamination investigations program – Section 3.4.1

It is acknowledged that mechanical excavation is a departure from the hand excavation methods dictated by the Code of Practice (DECCW 2010) and therefore machine excavation could only be conducted under the SEARs for the project, which are yet to be issued. Mechanical test excavation should be undertaken in consultation with the RAPs, except in areas where sites of high scientific or cultural significance are encountered, at which point test excavation by hand is the appropriate method. The circumstances for conducting hand excavation will be determined by the archaeological excavation director in consultation with the RAPs. Further details concerning the methodology for both hand and machine excavation are provided in Section 3.2. A successful precedent for such mechanical test excavation has been established on projects such as Oran Park (Baker 2009).

The PADs within the study corridor have been described on the basis of comparable archaeological projects and archaeological landscape models (e.g. ENSR 2009, GML 2009).

The proposed archaeological test excavation unit spacing, number of transects and excavation units required to adequately investigate each PAD within the survey corridor is presented below in **Table 3.1**. The exact placement and number of excavation units will be determined by the supervising archaeologist in consultation with site officers for the relevant RAP. All test excavation units are 1 x 1 m unless specified otherwise.

The following test excavation methodology is generally accords with Requirement 16 of the Code of Practice (DECCW 2010c) where hand excavation is proposed. Mechanical excavation will be conducted under the SEARs.

3.2 General methodology for both hand and mechanical excavation:

- The fieldwork team must include a balance of trained archaeologists and Aboriginal community fieldworkers (See Section 3.5). Sufficiently trained and experienced archaeologists are needed to direct the activity, maintain records and identify cultural finds. Sufficient Aboriginal community fieldworkers are required to efficiently sieve, dig and experience all aspects of the work through a task rotation roster, according to experience and ability.
- Comparative measures for site description and context will be: assemblage content, spatial extent, density and continuity.
- When determining site extents, artefacts within 50 m of each other are to be recorded as a single site for management and reporting purposes. Test excavations are therefore prescribed at less than 50 m spacing.
- All recovered material will be catalogued in the field in order to track archaeological data in real time to guide continuation or cessation of excavation – for example if repeated archaeological test excavation units are found with negative results along a transect at increasing distances from a creek. In-field cataloguing will entail recording essential metrics, raw material and type.
- Manual field recording forms will be provided as a backup, however, digitised recording systems using a hand-held tablet will be the primary recording system. The digitised recording system will minimise transcription errors through standardised recording conventions and create efficiency in post-excavation reporting.
- A representative sample of artefacts will be further investigated by additional attribute recording or functional analysis, undertaken by an appropriately qualified archaeologist. During fieldwork, all cultural material will be accessible for inspection and comment by the RAPs. Contemporaneous results will be displayed by noticeboard and data made available through an online repository or regular online updates through a secure, online repository accessible to RAPs.
- The number of personnel will depend on the timing of fieldwork. A single team is preferred for logistical purposes and consistent recording.
- Test excavation units will only be placed within the study corridor.
- Any test excavation points will be separated by at least 5 m.
- Test excavations units may be combined and excavated as necessary to understand the characteristics of any site identified. In general, the maximum continuous surface area of a combination of test excavation units at a single excavation point will be no greater than 3 m^2.
- Test excavation units will not be placed in areas where significant ground disturbance has been determined in consultation with site officers for the relevant RAP.
- Excavation units will be placed outside defined PAD areas, within the study corridor, where required to further investigate the extent of an identified site or as ‘control excavations’ to confirm an area predicted to be of low archaeological potential. Where control excavations confirm that a particular landform is of low archaeological potential, additional excavation on that landform will cease. Proposed control excavations will be determined in the field by the supervising archaeologist in consultation with the RAP.
- Where required to test extent and nature of the PADs, a series of test excavations at cardinal compass points will be excavated to determine the extent of sub-surface deposit, establish the horizontal extent and confirm site dimensions within the study corridor.
- The maximum surface area of all test excavations will be no greater than 0.5 per cent of the PAD area being investigated (See **Table 3.1**).
- The first excavation unit will be excavated and documented in 50 mm spits at each PAD being investigated. Based on the evidence of the first excavation unit, 100 mm spits or sediment profile/stratigraphic excavation (whichever is smaller) may then be implemented.

- Test excavation units will be excavated to at least the base of the identified Aboriginal object-bearing units, and must continue to confirm the soils below are culturally sterile (B Horizon).
- Photographic and scale-drawn records of the stratigraphy/soil profile, features and informative Aboriginal objects will be made for each excavation points. This includes recording of the stratigraphy/soil profile of each distinct landform sampled and of each test excavation unit in which an archaeological feature or Aboriginal object were identified.
- Soil colour and type, texture, acidity and stratification will be recorded to increase understanding of the sub-surface conditions of PADs and how they may relate to site formation processes influencing the presence and condition of sub-surface archaeological deposits.
- Soil colours will be recorded from each soil strata identified, using a Munsell colour chart to ensure consistency.
- Soil acidity will be measured for each soil type identified using a pH testing kit.
- Test excavations units will be backfilled as soon as practicable.
- The location of each excavation unit will be recorded using a mobile GIS Unit (Trimble® GeoXH™ GeoExplorer® or the Trimble® Nomad). This allows for the spatial datasets collected in the field to be post-processed to sub-metre level accuracy once the GPS co-ordinates have been differentially corrected.
- All artefacts retrieved during test excavation will be double bagged and labelled with appropriate contextual information. Where practicable, artefacts will be analysed in the field with assistance from nominated site officers for the RAPs and stored in a secure location.
- The long term management arrangements for any recovered artefacts will be in consultation and agreement with the RAPs and in accordance with Section 3.7 of the Code of Practice (DECCW 2010c). The relevant LALC offices will be considered for the long term storage of recovered artefacts following the test excavation program.
- Following test excavation, an Aboriginal Site Impact Recording Form will be completed and submitted to the AHIMS Register as soon as practicable, for each PAD/site that has been the subject of test excavation.
- If any Aboriginal heritage items (including skeletal remains) are uncovered during test excavations, all works in the vicinity of the find will cease immediately.
- If suspected human skeletal remains are encountered, all works potentially affecting the find must cease immediately and *The Standard Management Procedure- Unexpected Heritage Items (Roads and Maritime, 2015)* will be followed.

3.3 Methodology for manual (hand) excavation

The following excavation methodology is designed to follow the Code of Practice (DECCW 2010c) where hand excavation is the proposed method:

- Test excavations units will be excavated using hand tools such as shovels, mattocks, trowels and brushes.
- Test excavation units will be placed on a single transect within a systematic grid appropriate to the scale of the area being investigated, for example 20 or 40 m intervals.
- Where test excavations identify sub-surface archaeological deposits, additional excavation units will be placed 5, 10, 20 or 40 m away on the four cardinal compass points in order to establish the horizontal extent of the site within the study corridor.
- For archaeological precision and comparison with other regional data, wet sieving through 5 mm aperture sieves is proposed. Wet sieving is required to find all fine debitage which may indicate artefact manufacturing or retouching areas. Where finer grade debitage or archaeological material less than 5mm is encountered during testing, a 3 mm sieve may be employed to capture finer resolutions of material.
- Test excavations by hand will be excavated in 500 mm x 500 mm or 1 m x 1 m stratigraphic units.

Figure 3.1 Proposed location of test pits

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3.4 Methodology for mechanical excavation

The following excavation methodology anticipates specific reference to archaeological investigation requirements in the project within the SEARs and will follow the SEARs where machine excavation is the proposed method. Mechanical test excavation is proposed to replace manual techniques for the efficient identification of relatively low density artefact scatters by significantly increasing the sample area of excavation units. For the identification of low density artefact scatters, 500 x 500 mm test excavation units are of reduced effectiveness (cf. Canning 2003).

Mechanical excavation techniques have been proposed for all PADs as they are characterised by significant areas cleared of heavy vegetation and evidence of some previous ground disturbance. Prior to mechanical excavation techniques being deployed, hand excavation units will be used to:

- establish the stratigraphy of archaeological deposit
- placed in areas considered to have the potential for higher significance or density
- placed in areas which are unsuitable for mechanical excavation, due to access, approvals or context.

Therefore, mechanical test excavation will be used in combination with manual excavations, generally adhering to the methodology outlined in Section 3.2 and 3.3. To ensure that mechanical test excavation methodology remains generally in accordance with Requirement 16 of the Code of Practice (DECCW 2010c), departures from the manual test excavation methodology have been minimised as much as practical considering mechanical excavation is the preferred method. Recording methods will remain the same regardless of the excavation method used.

- Test excavations units will be excavated using a mechanical excavator equipped with a mud-bucket 1.1 m or 1.2 m wide.
- Mechanical excavation units will be excavated using mechanical excavation and wet sieving. Excavation using hand tools only (for example shovels or trowels) will occur where interesting archaeological features are encountered (e.g. hearths, knapping floors).
- A minimum of one hand / manual excavation will be conducted at each discreet landform unit prior to mechanical excavation. Manual excvatoin shall be continued until sterile deposit is reach or a depth of 1.2 m is achieved.
- Once manual excavations has established the depth and stratigraphy of archaeological deposit within a landform, mechanical test excavation will be used in place of manual excavation.
- Mechanical test excavation units will be incorporated into the systematic grid established for manual test excavation. Due to their increased excavation area, mechanical excavation units will be spaced further apart, for example 20, 30 or 40 m intervals, or other justifiable and regular spacing.
- Mechanical excavation units will be placed outside defined PAD areas in the study corridor where required to further investigate the extent of an identified site. Any two mechanical test excavation points will be separated by at least 20 m.
- Where mechanical test excavations identify sub-surface archaeological deposits, additional mechanical excavation units will be placed 20 or 40 m away on the four cardinal compass points in order to establish the horizontal extent of the site. Manual excavation units may alternatively be used, at 5, 10 or 20 m distance.
- Test excavations will be excavated in 2 m x 1.1-1.2 m units.
- Mechanical test excavation units will be excavated and documented in 100 mm spits.

- Where an artefact concentration of greater than 20 artefacts per square metre (over all depths) is encountered, mechanical excavation within 20 m will cease and manual excavation will be undertaken.
- Mechanical excavation will also cease, to be replaced by manual excavation, where any of the following are identified:
  - *In situ* lithic flaking floors
  - Concentrations of non-Aboriginal heritage artefacts
  - Remains of a hearth in relatively *in situ* condition
  - *In situ* non-human bone relating to Aboriginal occupation
  - Midden deposit

3.4.1 Geotechnical and Land Contamination Investigation Program

Approximately 150 geotechnical investigation (GI) locations and land contamination investigations are proposed across a series of 14 PADs and 17 Aboriginal sites along the entirety of the study corridor. The number of GI location or sites may vary as the motorway design develops and the study corridor changes, or as new discoveries are made requiring further archaeological investigation. The locations of GI are illustrated on three maps covering the length of the study corridor (Figure 3.1). Further information regarding the detail of the GI program is presented in Section 4.

3.4.2 Radiometric dating

Samples of organic material suitable for radiometric dating (charcoal, bone, shell, wood) will be collected for the dating of archaeological deposits. The number of samples sent for dating will be determined on the suitability of the sample and the significance of the site. Samples will be collected as follows:

- Samples will be collected using clean nitrile gloves and placed in clean plastic sample bags
- Charcoal samples will also be wrapped in aluminium foil to prevent crushing
- Samples will be removed to the relevant temporary keeping place and dried out to avoid fungal growth during transport
- Samples will be packaged within hard plastic cases for transport to a radiocarbon dating laboratory.

Table 3.1 : Estimated transect and test pit numbers for each PAD

PAD name (AHIMS ID)	Proposed test excavation techniques	Transect type	Estimated excavation unit number (no. test pit)	Estimated Excavation unit spacing	Approximate area of PAD (hectares)	Total Estimated excavation area	Notes
M12-TNR PAD	Hand and mechanical excavation + wet sieving	Single transect 1 m² pits	6	At 20 m or 40 m spacing	2.39	6m²	100 m+ Lateral presence tested by 40 m spacing either side of 1st order watercourse
M12-Cosgroves West PAD	Hand and mechanical excavation + wet sieving	Single transect 1 m² pits	7	At 20 m or 40 m spacing	8.37	7 m²	200 m+ Lateral presence tested by 40 m spacing west side of major watercourse
M12-Cosgroves East PAD	Hand and mechanical excavation + wet sieving	Single transect 1 m² pits	9	At 20 m or 40 m spacing	33	9 m²	300 m+ Lateral presence tested by 40 m spacing east side of major watercourse
M12-Badgerys West PAD a	Hand and mechanical excavation + wet sieving	Perpendicular transects 1 m² pits	9	At 20 m or 40 m spacing	5.52	9 m²	Lateral presence on fringing high ground and comparative presence on floodplain
M12-Badgerys West PAD b	Hand and mechanical excavation + wet sieving	Single transect 1 m² pits	14	At 20 m or 40 m spacing	15.2	14 m²	300 m+ Lateral presence tested by 40 m spacing west side of major watercourse
M12-Badgerys East PAD	Hand and mechanical excavation + wet sieving	Single transect 1 m² pits	8	At 20 m or 40 m spacing	16.4	8 m²	Lateral presence/variability across South Creek Valley
M12 South Ck West PAD	Hand and mechanical	Single transect 1 m² pits	20	At 20 m or 40 m spacing	22	20 m²	Lateral presence/variability across South Creek Valley

PAD name (AHIMS ID)	Proposed test excavation techniques	Transect type	Estimated excavation unit number (no. test pit)	Estimated Excavation unit spacing	Approximate area of PAD (hectares)	Total Estimated excavation area	Notes
	excavation + wet sieving						
M12 South Ck East PAD	Hand and mechanical excavation + wet sieving	Single transect 1 m² pits	10	At 20 m or 40 m spacing	31.9	10 m^2	Lateral presence/variability across South Creek Valley
M12 Kemps NW PAD	Hand and mechanical excavation + wet sieving	Perpendicular transects 1 m² pits	25	At 20 m or 40 m spacing	34.5	25 m^2	Lateral presence/variability across Kemps Creek Valley
M12 Kemps West PAD a	Hand and mechanical excavation + wet sieving	Single transect 1 m² pits	5	At 20 m or 40 m spacing	5.36	5 m^2	Lateral presence/variability across Kemps Creek Valley
M12 Kemps West PAD b	Hand and mechanical excavation + wet sieving	Single transect 1 m² pits	5	At 20 m or 40 m spacing	9.16	5 m^2	Presence/variability close to Kemps Creek
M12 Kemps West PAD c	Hand and mechanical excavation + wet sieving	Single 1 m² pit	1	At 20 m or 40 m spacing	1.79	1 m^2	continuation of transect from PAD b
M12 Kemps East PAD	Hand and mechanical excavation + wet sieving	Single transect 1 m² pits	7	At 20 m or 40 m spacing	30.5	7 m^2	Lateral presence/variability across Kemps Creek Valley
M12_Ropes Creek PAD	Hand and mechanical	Single transect 1 m² pits	6	At 20 m or 40 m spacing	23.43	6 m^2	100 m+ Lateral presence tested by 40 m spacing either side of 2nd order watercourse

PAD name (AHIMS ID)	Proposed test excavation techniques	Transect type	Estimated excavation unit number (no. test pit)	Estimated Excavation unit spacing	Approximate area of PAD (hectares)	Total Estimated excavation area	Notes
	excavation + wet sieving						
45-5-4007/45-5-4937	Hand and mechanical excavation + wet sieving	Perpendicular transects 1 m² pits	8	At 20 m or 40 m spacing	N/A	8 m^2	Extent and variability of site
45-5-2308	Hand and mechanical excavation + wet sieving	Single transect of 1 m² pits	5	at 20 m spacing	N/A	5 m^2	Extent of site along narrow ridge top
45-5-4935	Hand and mechanical excavation + wet sieving	Perpendicular transects 1 m² pits	7	at 20 m spacing	N/A	7 m^2	Extent of site along narrow ridge top and down slope
45-5-2723	Hand and mechanical excavation + wet sieving	Single transect 1 m² pits	7	At 20 m or 40 m spacing	N/A	7 m^2	Lateral presence/variability across Hinchinbrook Creek Valley

3.5 Personnel

Test excavation will be conducted by appropriately qualified and experienced archaeologists (as per Section 1.6 of the Code of Practice) and nominated site officers for the relevant RAP. Where sub-surface Aboriginal objects are identified, nominated site officers will be consulted regarding preferred management measures.

In general, it is proposed that a test excavation team consisting of two field archaeologists and a maximum of six nominated site officers conduct the test excavation. Where additional resources are required, it is proposed that a maximum ratio of three site officers to one field archaeologist is maintained, with a maximum of four field archaeologists and 12 site officers engaged at any one time.

If required, a dedicated artefact specialist may also be engaged during the test excavation program to assist with the analysis of large volumes of artefacts. As per **Section 3** of this methodology, the artefacts will be analysed with assistance from nominated site officers for the RAPs.

3.6 Research questions

Where test excavation identifies a previously unknown Aboriginal cultural heritage value (site) or previously unidentified components of a previously known site, the stratigraphic and artefact analyses detailed above will be utilised to address the following research questions:

- What is the full spatial extent, including depth, of the archaeological deposits?
- What are the key characteristics of the archaeological deposits that constitute the site? Key characteristics might include:
    - Site type (for example artefact scatter, grinding grooves, bora/ceremonial site, burial)
    - Site preservation
    - Contents of the site, particularly the stone artefact assemblage (where present)
    - Site chronology
- How do the key characteristics of the site compare with other known sites in the region?
- Given the key characteristics of the site, what is the significance of the site? Significance assessment will be based upon the four values of the Australia ICOMOS *Burra Charter* (Australia ICOMOS 2013 - current edition):
    - Social values
    - Historical values
    - Scientific values. Scientific significance is based upon the following criteria:
        - Site integrity
        - Site structure
        - Site contents
        - Representativeness and rarity
    - Aesthetic values.

Depending upon the results of the test excavation and the nature of any archaeological deposits identified, the formulation of additional research questions may be required.

3.7 Artefact analysis

3.7.1 Recorded attributes – artefact class

Stone artefacts can be separated into four main categories; flakes, cores, tools, and angular fragments. It is from these four categories that further distinctions can be made based on identifying specific attributes relating to the reduction process (Holdaway and Stern 2008 p. 24).

Flakes

Flakes are defined through the presence of attributes relating to conchoidal fracture (Holdaway and Stern 2008 p. 34). A conchoidal fracture originates from pre-existing flaws and creates what is known as a Hertzian cone (Clarkson 2007 p. 27). Flakes maintain both a ventral and dorsal surface and can be further categorised based on the completeness of the flake. Flakes are generally described as complete, proximal, medial, distal, complete split flakes, longitudinally split flakes and core rejuvenation flakes.

Cores

Cores are defined by the presence of negative flake scars, marking the location of previous flake removal (Holdaway & Stern 2008 p. 179). These flake scars can be used to describe the direction of flake removal (unidirectional, bi-directional, bifacial, multi-directional, and microblade). Cores also include the presence of one or more platforms and can exist as a complete core, or a core fragment, or broken core.

Tools

Tools maintain similar characteristics to flakes, but have evidence of retouch or use wear along lateral margins. Tools retain a ventral surface and can also be categorised based on completeness of artefact remaining, in a similar manner to flakes.

Angular fragments

Angular fragments are flaking debris with none of the above identifiable diagnostic features associated with stone reduction processes. Thus, the defining characteristics as detailed in the above three categories are missing on angular fragments (Hiscock 1988 p. 129).

Table 3.2 : Definition of technical categories to be used

Technological category	Definition
Complete flake	Has a ventral surface that preserves a complete fracture plane, has a platform (or impact point), lateral margins and a termination
Proximal flake	A broken flake that lacks a termination but retains one or more of the following: platform and/or impact point, bulb of percussion, bulbar scar and fissures
Medial flake	Absence of proximal and distal margins but have an identifiable ventral surface
Distal flake	Presence of a termination and the absence of a platform or impact point
Longitudinal split flake	A break that runs parallel to the flaking axis. The flake preserves a portion of the platform and/or impact point and has an identifiable termination
Angular fragment	A flake fragment that cannot be identified in any more detail
Core	Negative flake scarring, no positive scars and therefore no ventral surface

3.7.2 Raw material

Artefact size and morphology are often closely linked to raw material (Hiscock 1988). As such it is important to identify the types of raw material present in the project area. Raw material types are expected to primarily include silcrete and silicified volcanic tuff, as identified via desktop review of previous test excavation results in the vicinity of the study corridor.

3.7.3 Cortex

Cortex will be recorded as a percentage of the artefact covered, the type of cortex and its location. The proportion of the artefact covered by cortex refers to the percentage of cortex located on the dorsal surface for flakes and tools. For cores and angular fragments, it refers to the percentage of the whole artefact. Percentages will be given as 0 per cent, 1-50 per cent, 51-99 per cent, and 100 per cent. Cortex type will be defined as either cobble or slab. Cobble refers to water-rounded cortex and slab refers to cortex associated with exposed surfaces or outcrops.

Recording the percentage of remaining cortex on an artefact is important as cortex proportions in lithic assemblages are frequently used as an indicator to suggest reduction intensity (Andrefsky 1998 pp.101-2). They can also suggest distance from the raw material source (Andrefsky 1998 pp.101-2).

3.7.4 Termination

Flake or tool termination refers to the artefact's distal end. Terminations will be recorded as feather, hinge, step, plunge, and crushed. If the termination is not present it will be listed as absent. Differing terminations are the result of different applications of force during the flaking process. For example, a flake with a crushed termination is often the result of bipolar technology.

3.7.5 Platform

Platform types are useful as they indicate the level of work that has been dedicated to a core to enable flake detachment (Holdaway 2008 p. 28). As a result, it is possible to determine stage of reduction and provide information regarding the face of the core (Andrefsky 1998 pp. 89-96). Platforms will be as flaked, focal, and crushed. If the platform is not present it will be listed as absent.

3.7.6 Tools

Where required an analysis of formal tool types will be made to facilitate comparisons with assemblages previously excavated within or close to the project corridor.

3.7.7 Cores

Artefacts with negative flake scars originating from one or more platforms were identified as cores (Holdaway and Stern 2008). As cores are used in the production of flakes, a different set of attributes will be used to describe them. Core scar direction will be detailed as uni-directional, bi-directional, or multidirectional. The number of core platforms, as well as the length of the biggest negative flake scar, will also be recorded.

3.7.8 Metrical attributes

The following metrical attributes will be recorded for all artefacts:

- Maximum dimension – Will be measured on all artefacts, irrespective of technological type. This is defined as the furthest points of division on the artefact. Maximum dimension is a useful concept in that all

artefacts present have at least two attributes that can be measured; maximum dimension and weight, regardless of technological type.

- Weight – All artefacts will be weighed, irrespective of technological type. Artefact weight is probably the most reliable size characteristic for discriminating between reduction stages of stone artefacts. It is easy to take and is replicable and it correlates well with other linear dimensions which all relate to the size of the flake (Andrefsky 1998 p. 96). Although small flakes may be removed early in the reduction sequence, the heavier material comes from the early stages of knapping and reduces thereafter.

4. Methodology at geotechnical locations

Geotechnical and land contamination investigations (GI) are proposed at approximately 262 locations along the study corridor. To adequately complete the concept design for the purpose of describing and assessing the proposal in an environmental impact statement, 23 boreholes and 25 test pits are required within PADs. The GI program has been reviewed and the number of GI locations within PADs and sites has been minimised to decrease potential risk of harm to heritage items.

Geotechnical investigations in PADs or sites will be carried out after archaeological test excavation of the proposed work location and access route has been completed. This section of the report sets out the methodology for the GI as it applies to Aboriginal cultural heritage impacts.

A separate minor works REF has been completed for all other locations where GI occurs in areas that do not contain PAD or are at beyond 20 m of an Aboriginal site. Another Minor Works REF will be completed for the remainder of the GI. The REF will state there is no harm to Aboriginal heritage because the following methodology described below will remove all artefacts from GI locations through excavation, with GI occurring only at locations that have been cleared and where there is no harm expected.

4.1 Geotechnical Works

The GI and contaminated land investigation works proposed for the project consist of potentially three different types of geotechnical excavation:

- Boreholes conducted with a drilling rig (generally mounted on a small truck)
- Cone Penetration Test (CPT) conducted with a CPT rig (generally mounted on a small truck). CPT are not currently proposed but will be used if required.
- Geotechnical investigation test pit (GITP) by backhoe.

The proposed Stage 1 and Stage 2 GI scope of works are as follows:

- Drilling 82 boreholes
- Installation of 20 groundwater standpipes to commence groundwater level monitoring.
- Excavation of 25 excavator test pits to obtain bulk samples for initial materials reuse laboratory testing.
- Excavation of 82 test pits
- Geotechnical and soil and rock laboratory testing
- Soil contamination testing
- Groundwater sampling and chemistry testing
- Acid sulfate soil/acid rock testing.

The proposed locations of GI works are depicted in Appendix B. The proposed work area for each of these geotechnical excavation methods is presented in **Table 4.1**. The potential impacts considered include:

- Surface impacts from accessing geotechnical locations
- Surface impacts in the works area at each location
- Sub-surface impacts from the bore-hole, CPT or augering.

The number and location of the contamination investigation test pits is still being assessed as part of environmental impact assessment land contamination studies and site investigation location plans will be updated accordingly as this is determined.

Table 4.1 : Geotechnical investigation impact areas

Test method	Maximum width of access track to test site (m)	Drilling and excavation maximum dimensions of work area (m)	Dimensions of sub-surface impacts (m)
Borehole	2.5	12.0 x 6.0	0.2 diameter
Cone penetration test	2.5	2.5 x 10.0	0.03 diameter
GITP (backhoe)	2.5	12.0 x 6.0	0.3 x 3.0*

4.2 Investigation location assessment and management

A desktop risk analysis of each geotechnical investigation location will be undertaken in relation to the Aboriginal cultural heritage values identified within the *M12 Archaeological Survey Report – Aboriginal* (JAJV 2017). This will follow the endorsement of the report by the project RAPs. The access routes proposed for each geotechnical investigation location will be included as part of this desktop assessment.

4.2.1 Locations within PADs, Sites or Buffers

Where geotechnical works and access routes are proposed within 20 m of identified Aboriginal cultural heritage sites or within a PAD boundary, there is a potential to cause impact to Aboriginal cultural heritage. In order to manage this, four measures to avoid, reduce or mitigate impacts may be implemented as described below:

1) Avoidance. Where feasible, GI locations and/or access routes have been moved to avoid impacts to PADs or sites. Due to the large area covered by some of the PADs avoidance will not be achievable at all PADs and sites. In this case the number of geotechnical investigations will be minimised as far as possible to the extent needed to achieve the required level of information to inform the concept design and completing the EIS.

2) Test excavation. Where avoidance cannot be achieved and GI is located on an identified PAD, archaeological test excavation will first be conducted to assess the presence and extent of any sub-surface archaeological deposits at the proposed GI location. Test excavation will be conducted in accordance with the archaeological sub-surface testing methodology above after it has been approved by the RAPs. Where test excavations identify sub-surface archaeological deposits, once the artefacts have been removed the GI excavation will be located directly in the site of the archaeological test excavation location. A visible marker such as a wooden stake or star picket will be left in the center of the archaeological test excavation to ensure it is discernible to the GI team.

3) Impact management via methodology. The objective of this mitigation measure is to reduce the likelihood of the proposed GI works causing impacts to sub-surface archaeological deposits and Aboriginal objects. The following measures must be followed during the proposed works:

    a) Use of established access tracks.

    b) Use of alternative access routes to avoid sites/PADs wherever possible.

    c) Use of temporary ground protection (such as geotextile fabric) where works are required over sub-surface archaeological deposits and PADs.

    d) Use of temporary ground protection where access over sub-surface archaeological deposits and PADs is required in wet weather or ground conditions.

    e) Artefact collection for the purposes of the GI (see item 4) below).

4) Artefact Collection. Where Aboriginal objects are identified within proposed GI locations, impacts will be mitigated by the methods above and the collection and safe storage of artefacts. Broadly these mitigation strategies fit into two categories:

   a) Collection of surface Aboriginal objects located within a GI location or located along an access route.

   b) Collection of sub-surface Aboriginal objects located within test units excavated at GI locations of all types.

As described in Section 3.2, all artefacts retrieved during test excavation will be double bagged and labelled with appropriate contextual information. Where practicable the artefacts will be analysed in the field with assistance from nominated site officers for the RAPs and stored in a secure location. The long term management arrangements for any recovered artefacts will be in consultation and agreement with the RAPs and in accordance with Section 3.7 of the Code of Practice (DECCW 2010). For all collected Aboriginal objects, analysis and temporary storage will be in a location pre-approved in consultation with the RAPs for the project and subject to OEH Care and Control documentation.

The relevant LALC offices will be contacted for the long term storage of recovered artefacts following the test excavation program.

Following completion of test excavation at GI locations and implementation of items 3 and 4, geotechnical investigations can proceed with caution. All sub-surface impacts will be restricted to the footprint of the archaeological excavation unit to avoid impacts to remaining sub-surface archaeological deposits.

4.2.2 Process for PADs tested and no Aboriginal objects found.

Where PAD has been subject to test excavation with no Aboriginal objects recovered, there are no further impediments to GI proceeding. Where any Aboriginal artefacts are found during GI investigation further manual test excavation must be undertaken as soon as practicable. The purpose of the testing will be to determine the nature and extent of the site

Data obtained via collection, test excavation or GI investigation will be included with that obtained through the test excavation program for the project. This will include a detailed analysis of all artefacts recovered during salvage combined with that already undertaken during other phases of the Aboriginal cultural heritage assessment for the project (survey and test excavation), including a detailed discussion and interpretation. The results of this analysis would be used to reconsider the research questions addressed following test excavation, and any further research questions formulated due to the nature of the site contents.

If skeletal remains are uncovered during the excavations, all works in the vicinity of the find will cease immediately. The *Standard Management Procedure- Unexpected Heritage Items (Roads and Maritime, 2015)* will be followed (refer Appendix A for related excerpt).

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Appendix A. The *Standard Management Procedure- Unexpected Heritage Items (Roads and Maritime, 2015) excerpt for dealing with human skeletal remains*

"3.3 Human skeletal remains Human skeletal remains can be identified as either an Aboriginal object or non-Aboriginal relic depending on ancestry of the individual (Aboriginal or non-Aboriginal) and burial context (archaeological or non-archaeological). Remains are considered to be archaeological when the time elapsed since death is suspected of being 100 years or more. Depending on ancestry and context, different legislation applies.

As a simple example, a pre-contact archaeological Aboriginal burial would be protected under the National Park and Wildlife Act 1974, while a historic (non-Aboriginal) archaeological burial within a cemetery would be protected under the Heritage Act 1977. For these cases, the relevant heritage approval and notification requirements described in the above sections 3.1 and 3.2 would apply. In addition to the National Park and Wildlife Act 1974, finding Aboriginal human remains also triggers notification requirements to the Commonwealth Minister for the Environment under s20(1) of the Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth). 8

IMPORTANT! All human skeletal remains are subject to statutory controls and protections. All bones must be treated as potential human skeletal remains and work around them must stop while they are protected and investigated urgently.

However, where it is suspected that less than 100 years has elapsed since death, the human skeletal remains come under the jurisdiction of the State Coroner and the Coroners Act 2009 (NSW). Such a case would be considered a 'reportable death' and under legal notification obligations set out in s35(2); a person must report the death to a police officer, a coroner or an assistant coroner as soon as possible. This applies to all human remains less than 100 years old10 regardless of ancestry (ie both Aboriginal and non-Aboriginal remains). Public health controls may also apply. Guidance on what to do when suspected human remains are found is provided in Appendix E" (Roads and Maritime, 2015).

Appendix B. PAD location mapping and geotechnical investigation locations

FIGURES REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Annexure C. Archaeological Assessment Report

Australian Government

BUILDING OUR FUTURE

NSW GOVERNMENT

M12 Motorway Environmental Impact Statement

Archaeological Assessment Report

Roads and Maritime Services | October 2019

Executive Summary

Background

Roads and Maritime Services (Roads and Martime) is seeking approval under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to construct and operate the M12 Motorway project to provide direct access between the Western Sydney Airport at Badgerys Creek and Sydney's motorway network (the project). The project has been determined to be a controlled action under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) (EPBC 2018/8286) for significant impact to threatened species and communities (Section 18 and Section 18A of the EPBC Act). As such, the project requires assessment and approval from the Commonwealth Government.

The M12 Motorway would run between the M7 Motorway at Cecil Hills and The Northern Road at Luddenham for a distance of about 16 kilometres and would be opened to traffic prior to opening of the Western Sydney Airport.

Purpose of this report

This report has been prepared to support the environmental impact statement (EIS) for the M12 Motorway project (the project). The EIS has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) for the project (SSI 9364) and to enable the NSW Minister for Planning and Public Spaces to make a determination on whether the project can proceed. The report presents an assessment of the construction and operational activities for the project that have the potential to impact Aboriginal objects and sites.

This report informs the *Aboriginal Cultural Heritage Assessment Report* (ACHAR) and presents the results of the Aboriginal archaeological assessment for the project. The study area has been occupied by Aboriginal people for millennia. Drawing upon existing site records and landforms a model to predict potential site locations was developed. The model suggested that landforms immediately adjacent to watercourses and ridgetops had the highest potential for Aboriginal cultural sites. An investigative program was developed to test the model through archaeological survey and excavation.

Overview of potential impacts

Archaeological survey was conducted with the Deerubin and Gundungarra Local Aboriginal Land Councils in 2017. The survey covered a sample of 153 hectares of the 331 hectare construction footprint.

Fourteen areas of Potential Archaeological Deposit (PAD) were selected for further investigation by archaeological test excavation (later increased to 17 PAD areas following test excavations). The draft excavation methodology was reviewed by the Registered Aboriginal Parties (RAP) for the project in January 2018. Excavations were conducted between February and June 2018. Linear transects of test pits were arranged across each of the PADs. A total of 166 one square metre test pits and 25 two to three square metre geotechnical test pits were excavated.

The excavations produced 1,509 Aboriginal objects (excluding gravel), of which 1404 were flaked stone artefacts and the remainder hammerstones, stone fragments and ochre. Aboriginal objects were found in 16 of the 17 excavated PADs. The excavations demonstrated that stone artefacts are widely distributed across the study area.

Nineteen Aboriginal sites would be impacted by the project, six of which were assessed as being of high overall heritage significance. The large sub-surface extent of these sites, as revealed through the testing program, suggests that most are likely to extend beyond the construction footprint.

Summary of environmental management measures

It is recommended that the adverse impacts of the project on Aboriginal heritage values be mitigated through a program of archaeological salvage, collection and protective fencing (see **Chapter 13**).

Conclusions

All of the Aboriginal sites in the construction footprint, including the three areas identified to be of high cultural and archaeological significance, would be significantly impacted by the project. This report outlines management measures for Aboriginal sites that may be impacted by the project, including protective measures to ensure that sites on the periphery of the construction footprint are not inadvertently impacted. These measures include protective fencing for 13 sites, salvage collection for nine sites and salvage excavations for eight sites to mitigate the irreversible loss of cultural value and scientific content.

Contents

Appendices

Tables

Figures

Abbreviations and acronyms

AAR	Archaeological Assessment Report
ACHAR	Aboriginal Cultural Heritage Assessment Report
AFG	Aboriginal Focus Group
AHIMS	Aboriginal Heritage Information Management System
BCE	Badgerys Creek East
BCW	Badgerys Creek West
BH	Borehole
BWB	Badgerys Creek West B
Code	Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW
CCE	Cosgroves Creek East
CCW	Cosgroves Creek West
CEMP	Construction Environmental Management Plan
CCHMP	Construction Cultural Heritage Management Plan
DACHA	Darug Aboriginal Cultural Heritage Assessments
DCAC	Darug Custodian Aboriginal Corporation
DECCW	Department of Environment, Climate Change and Water NSW
Deerubbin	Deerubbin LALC
DLO	Darug Land Observations
DNC	Didge Ngunawal Clan
DPIE	Department of Planning, Industry and Environment
EESG	Environment, Energy and Science Group of the DPIE
EIS	Environmental impact statement
ENSR AECOM	ENSR Australia Pty Ltd
EP&A Act	*Environmental Planning and Assessment Act 1979*
GTPs	Geotechnical test pits
ICOMOS	International Council on Monuments and Sites
IMT	Indurated Mudstone Tuff
Jacobs	Jacobs Group (Australia) Pty Ltd
JAJV	Jacobs Arcadis Joint Venture
Kawul	Kawul Cultural Services
KCE	Kemps Creek East
KCW	Kemps Creek West

KNW	Kemps Creek North West
KYWG	Kamilaroi-Yankuntjatjara Working Group
LALC	Local Aboriginal Land Council
LGA	Local Government Area
NOCH	Navin Officer Heritage Consultants
NPW	*National Parks and Wildlife Act 1974*
NSW	New South Wales
OEH	Office of Environment and Heritage
PACHCI	Procedure for Aboriginal cultural heritage consultation and investigation
PAD	Potential archaeological deposit
RAPs	Registered Aboriginal Parties
RR	Range Road
Roads and Maritime	Roads and Maritime Services
SCE	South Creek East
SCW	South Creek West
SEARs	Secretary's Environmental Assessment Requirements
SSI	State Significant Infrastructure
The project	M12 Motorway
TNR	The Northern Road
TPs	Test pits
TfNSW	Transport for NSW
WIG	Widescope Indigenous Group
WSA	Western Sydney International Airport

1. Introduction

1.1 Background

Roads and Maritime Services (Roads and Maritime) is seeking approval under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to construct and operate the M12 Motorway project to provide direct access between the Western Sydney Airport at Badgerys Creek and Sydney's motorway network (the project). In addition, the project has been determined to be a controlled action under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) (EPBC 2018/8286) for significant impact to threatened species and communities (Section 18 and Section 18A of the EPBC Act). As such, the project requires assessment and approval from the Commonwealth Government.

The M12 Motorway would run between the M7 Motorway at Cecil Hills and The Northern Road at Luddenham for a distance of about 16 kilometres and would be opened to traffic prior to opening of the Western Sydney Airport. The project would commence about 30 kilometres west of the Sydney central business district, at its connection with the M7 Motorway. The project traverses the local government areas of Fairfield, Liverpool and Penrith. The suburbs of Cecil Park and Cecil Hills are found to the east of the M12 Motorway, with Luddenham to the west.

The project is predominately located in greenfield areas. The topography in and around the project comprises rolling hills and small valleys between generally north–south ridge lines. The existing land uses are semi-rural residential, recreational, agricultural, commercial and industrial. The main residential areas are Kemps Creek, Mount Vernon and Cecil Hills.

The project is required to support the opening of the Western Sydney Airport by connecting Sydney's motorway network to the airport. The project would also serve and facilitate the growth and development of the Western Sydney which is expected to undergo significant development and land use change over the coming decades. The motorway would provide increased road capacity and reduce congestion and travel times in the future and would also improve the movement of freight in and through western Sydney.

The project location is shown in **Figure 1-1** in relation to its regional context.

1.2 Project overview

The project would include the following key features:

- A new dual-carriageway motorway between the M7 Motorway and The Northern Road with two lanes in each direction with a central median allowing future expansion to six lanes
- Motorway access via three interchanges/intersections:
  - A motorway-to-motorway interchange at the M7 Motorway (extending about 4 kilometres within the existing M7 Motorway corridor)
  - A grade separated interchange referred to as the Western Sydney Airport interchange, including a dual-carriageway four lane airport access road (two lanes in each direction; about 1.5 kilometres) connecting with the Western Sydney Airport Main Access Road
  - A signalised intersection at The Northern Road with provision for grade separation in the future
- Bridge structures across Ropes Creek, Kemps Creek, South Creek, Badgerys Creek and Cosgroves Creek
- Bridge structure across the M12 Motorway into Western Sydney Parklands to maintain access to the existing water tower and mobile telephone/other service towers on the ridgeline in the vicinity of Cecil Hills, to the west of the M7 Motorway
- Bridge structures at interchanges and at Clifton Avenue, Elizabeth Drive, Luddenham Road and other local roads to maintain local access and connectivity
- Inclusion of active transport (pedestrian and cyclist) facilities through provision of pedestrian bridges and an off-road shared user path including connections to existing and future shared user path networks
- Modifications to the local road network, as required, to facilitate connections across and around the M12 Motorway including:
  - Realignment of Elizabeth Drive at the Western Sydney Airport, with Elizabeth Drive bridging over the airport access road and future passenger rail line to the airport
  - Realignment of Clifton Avenue over the M12 Motorway, with associated adjustments to nearby property access

  - Relocation of Salisbury Avenue cul-de-sac, on the southern side of the M12 Motorway
  - Realignment of Wallgrove Road north of its intersection with Elizabeth Drive to accommodate the M7 Motorway northbound entry ramp
- Adjustment, protection or relocation of existing utilities
- Ancillary facilities to support motorway operations, smart motorways operation in the future and the existing M7 Motorway operation, including gantries, electronic signage and ramp metering
- Other roadside furniture including safety barriers, signage and street lighting
- Adjustments of waterways, where required, including Kemps Creek, South Creek and Badgerys Creek
- Permanent water quality management measures including swales and basins
- Establishment and use of temporary ancillary facilities, temporary construction sedimentation basins, access tracks and haul roads during construction
- Permanent and temporary property adjustments and property access refinements as required.

The project overview presented in this document represents the design outlined in the M12 Motorway EIS. If the project is approved, a further detailed design process would follow, which may include variations to the design. Flexibility has been provided in the design to allow for refinement of the project during detailed design, in response to any submissions received following the exhibition of the environmental impact statement (EIS), or if opportunities arise to further minimise potential environmental impacts.

The key features of the project are shown in **Figure 1-2.**

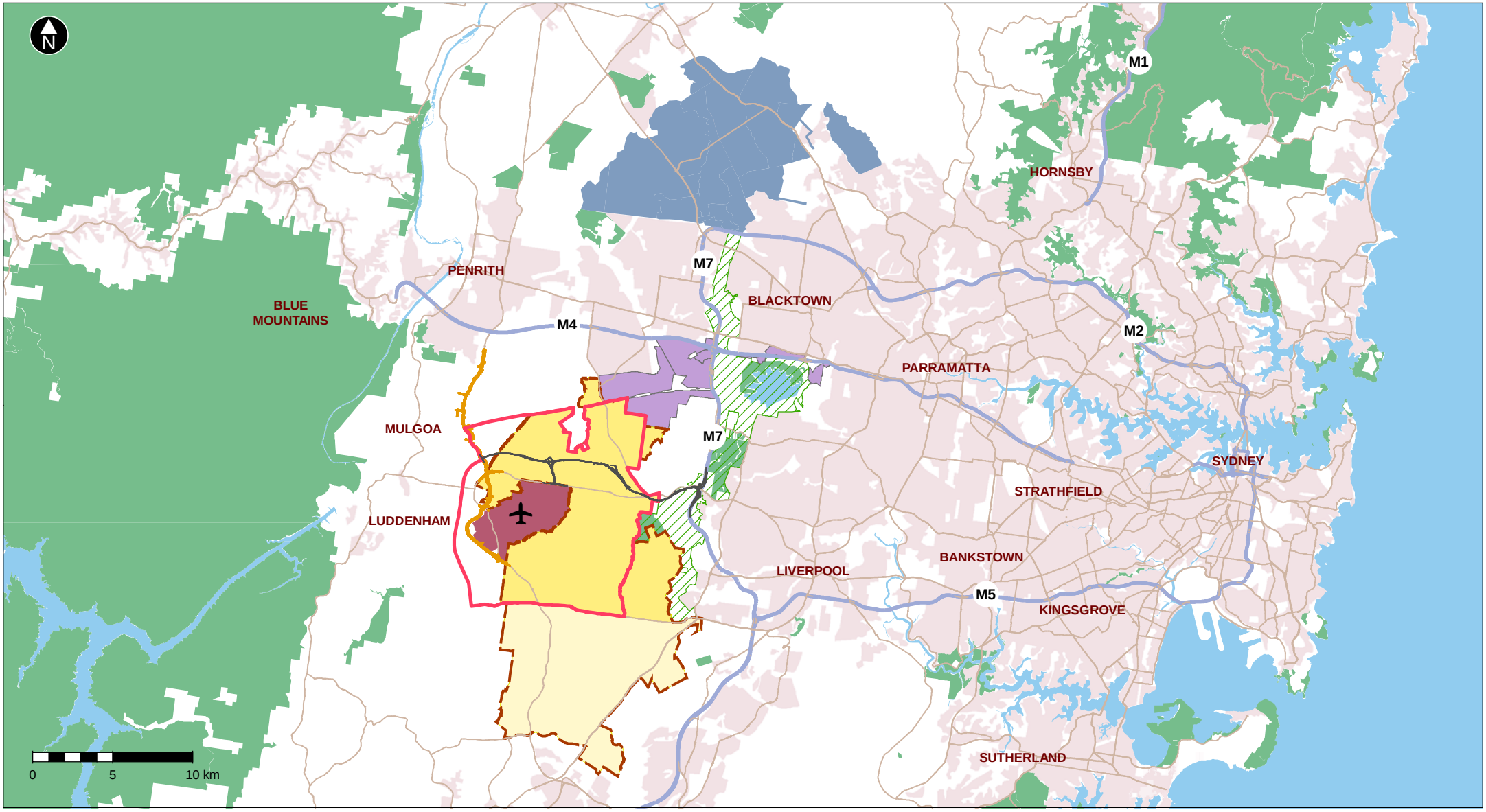
1.3 Purpose and scope of this report

This report has been prepared to support the EIS for the project. The EIS has been prepared to address the SEARs for the project (SSI 9364), as well as the Australian Government assessment requirements under the EPBC Act. The EIS for the project provides sufficient information to enable the NSW Minister for Planning and Public Spaces and the Commonwealth Minister of the Environment to make a determination on whether the project can proceed.

The SEARs for the project require the assessment of impacts upon Aboriginal cultural heritage and measures to avoid and minimise those impacts in accordance with current guidelines (DECCW 2010a; 2010b; 2011; OEH 2011, p 44; 2012a; 2012b). This report has been prepared to support the environmental impact statement (EIS) for the M12 Motorway project (the project). The EIS has been prepared to address the SEARs for the project (SSI 9364) and to enable the NSW Minister for Planning and Public Spaces to make a determination on whether the project can proceed.

This report describes the archaeological investigation of Aboriginal heritage in the detailed investigation area and informs the Aboriginal Cultural Heritage Assessment Report (ACHAR) for the project by detailing the results of archaeological testing and significance assessment of Aboriginal heritage within the detailed investigation area. It documents the various stages of the archaeological assessment process, including desktop assessment, archaeological survey, test excavation, significance assessment, impact assessment and management recommendations.

The archaeological assessment detailed in this report was undertaken in accordance with the Code and the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage* in NSW (Office of Environment and Heritage (OEH) 2011). While this report forms an Annexure to the ACHAR for the project, it is also required as a stand-alone technical report.



The project
Motorways
Existing main roads
The Northern Road upgrade (currently under construction)

Western Sydney Parklands
NPWS estate / reserve
Urban areas
Main waterbodies

Growth areas

Western Sydney Priority Growth Area
South West Priority Growth Area
South West Growth Area
Western Sydney Airport
Western Sydney Aerotropolis
Western Sydney Employment Area
North West Growth Area

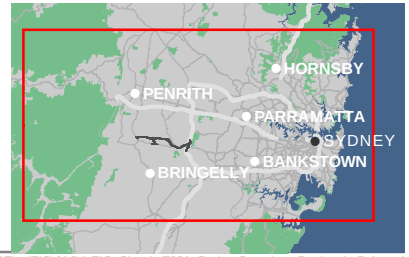


Figure 1-1 Project location (regional context)

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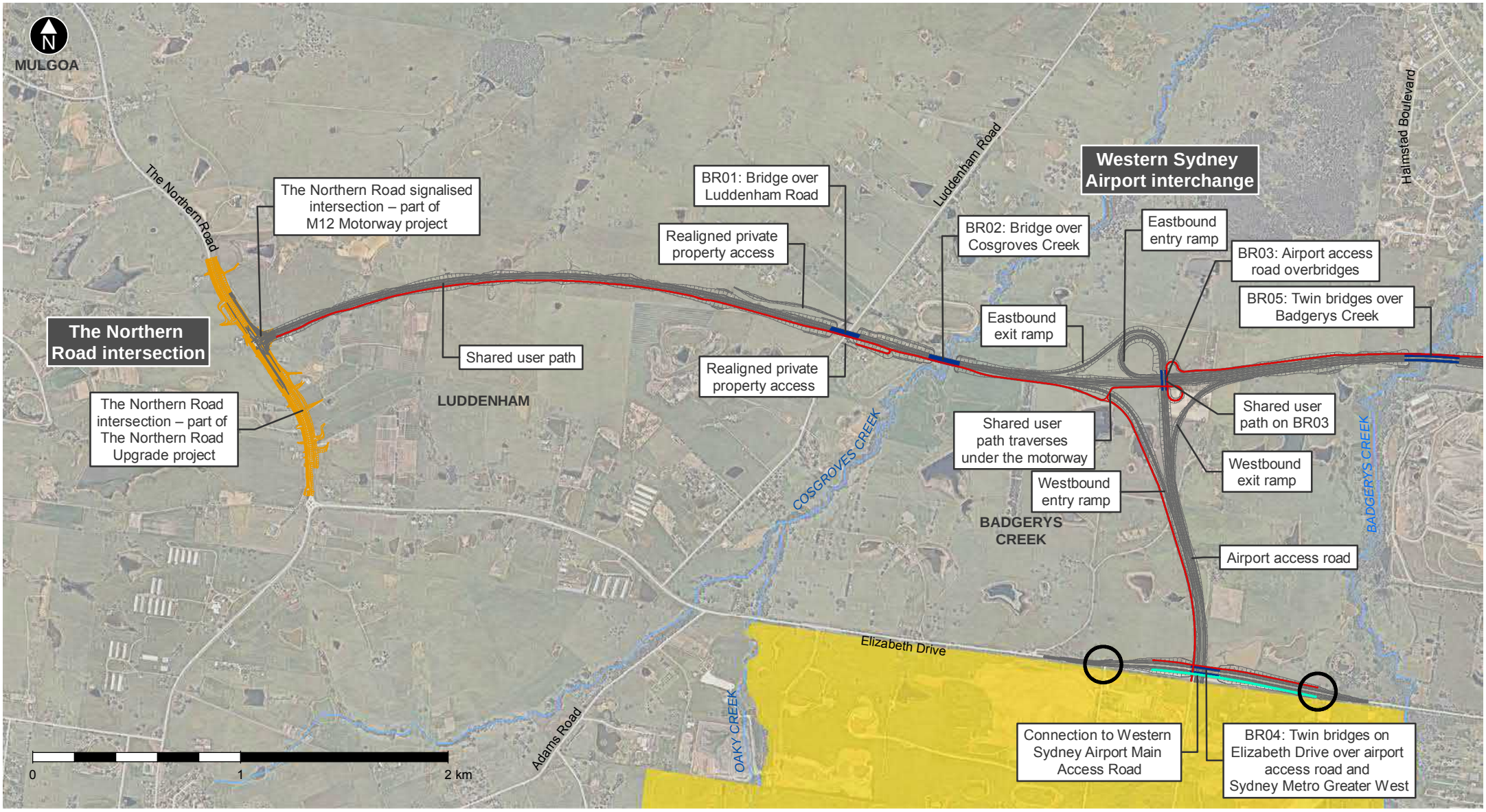

Figure 1-2 Key features of the project

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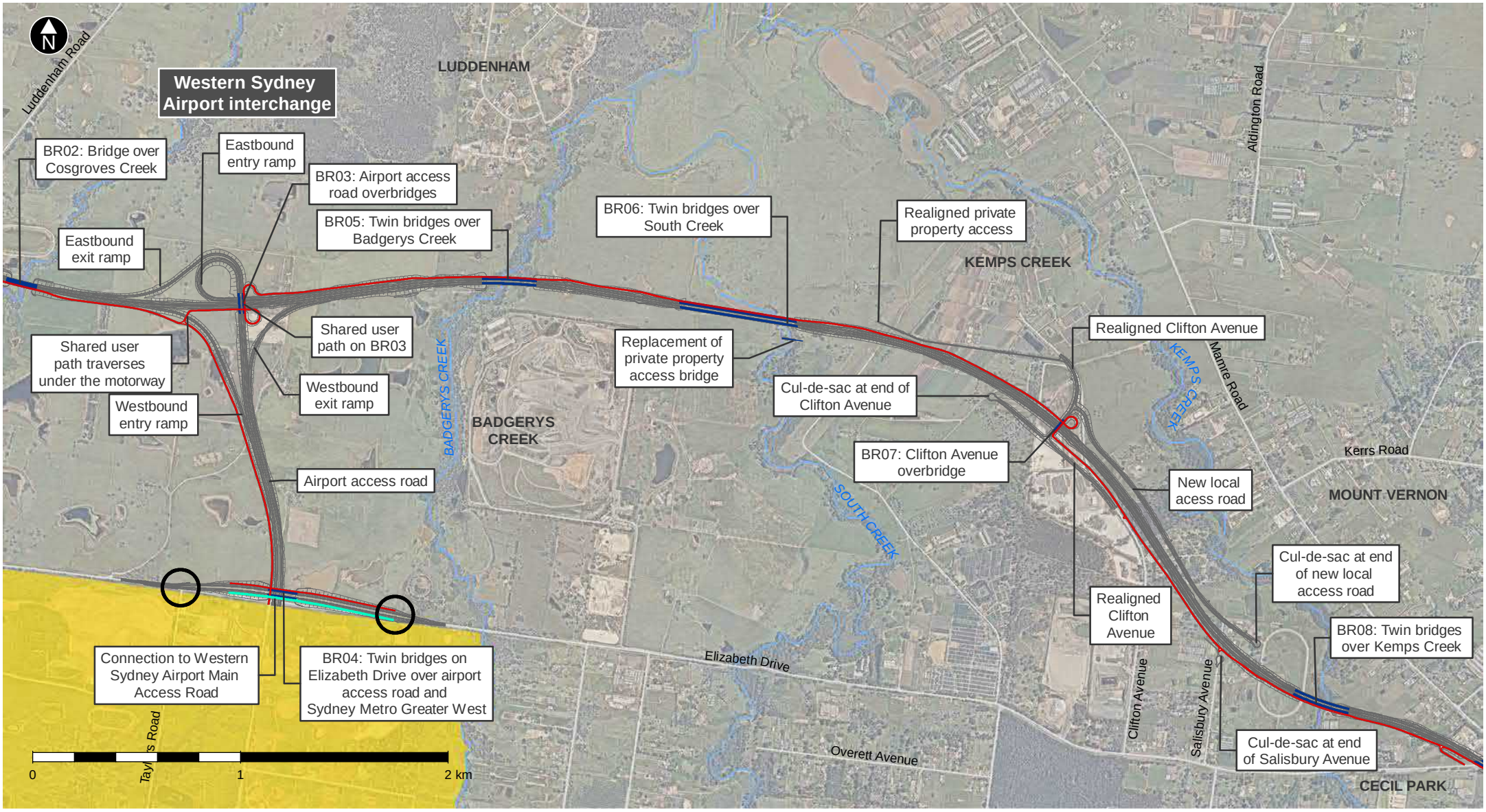


The project

Part of The Northern Road upgrade project

Shared user path

Future shared user path (by others)

Existing roads

Waterways

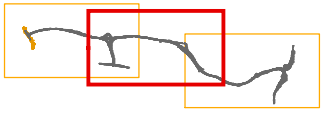
Bridges

Western Sydney Airport

Note. The roads within this zone are being removed as part of airport construction.

Potential future intersections (by others)

Note: Locations to be confirmed



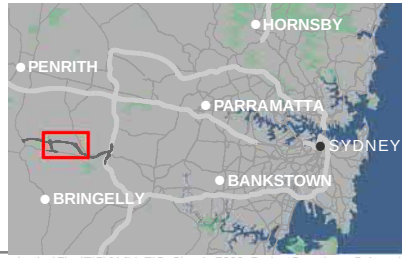


Figure 1-2 Key features of the project

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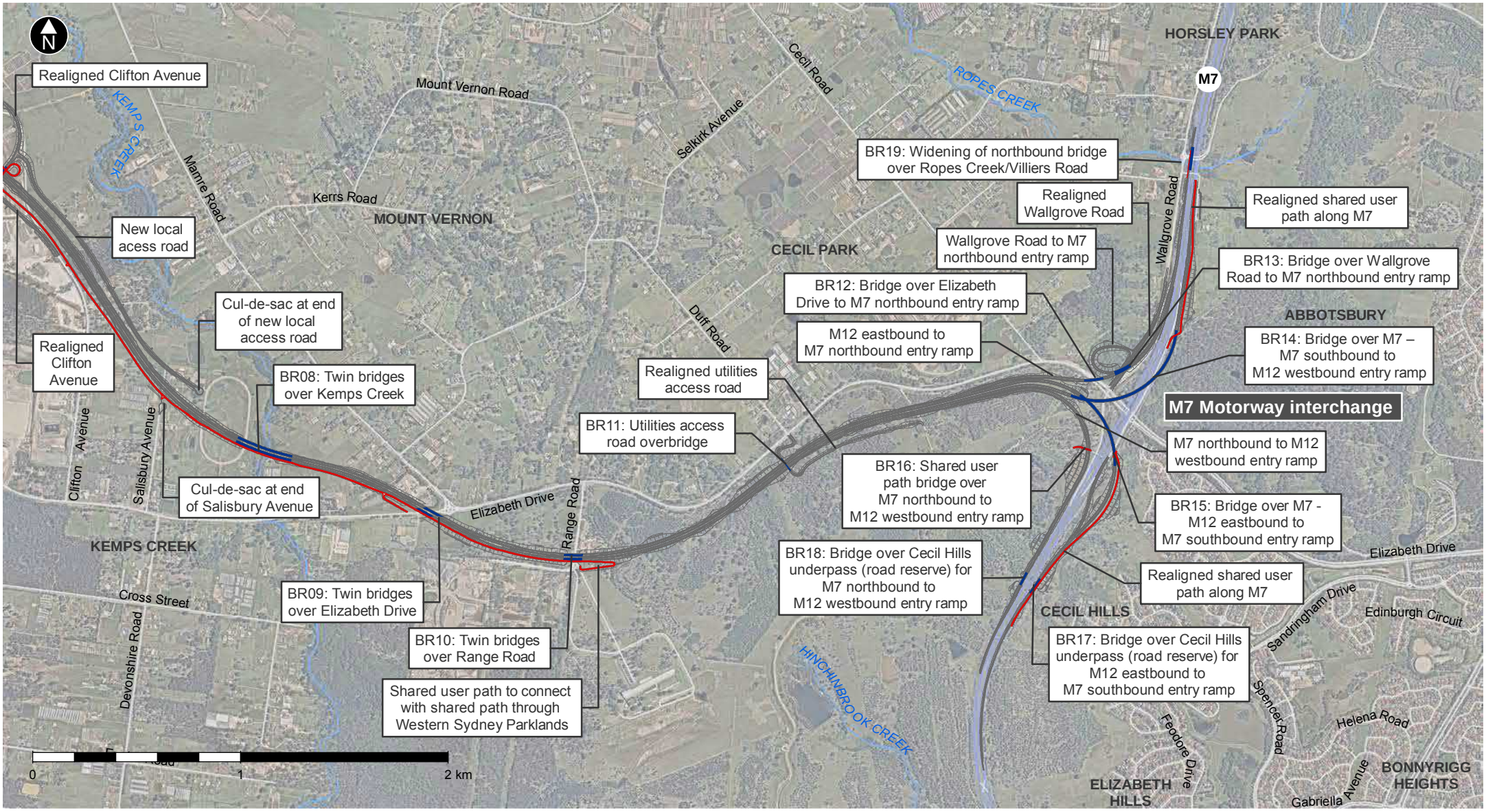
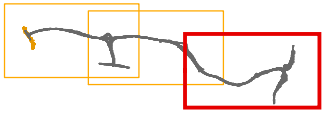


The project
Part of The Northern Road upgrade project
Shared user path
Future shared user path (by others)
Existing roads
Waterways
Bridges



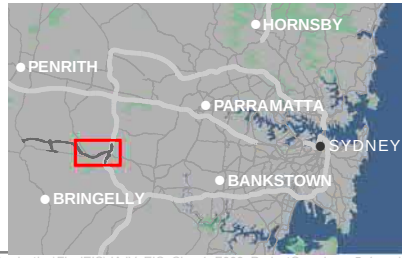


Figure 1-2 Key features of the project

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This assessment documents:

- A desktop assessment, involving a search of the Aboriginal Heritage Information Management System (AHIMS) and review of archaeological investigations, ethno-historic information and environmental characteristics, to identify previously recorded Aboriginal sites and potential archaeological deposits (PAD) within the detailed investigation area and enable the development of a predictive model that prioritises areas of archaeological potential within the construction footprint for further assessment.
- The results of archaeological site survey with nominated site officers from the Deerubin and Gundungarra local Aboriginal land councils (LALCs) to investigate previously recorded sites and other priority areas identified in the predictive model.
- The results of archaeological test excavations to establish the extent and nature of sub-surface cultural deposits in accordance with the outcomes of the site survey and predictive model.
- Consultation with registered Aboriginal party (RAP) site officers during field investigations.
- Assessments of the distribution, type, characteristics, regional context and significance of all Aboriginal sites and objects that have been identified within the study area. The significance assessment considers the social, historic, scientific and aesthetic values of each site or object.
- Impact mitigation strategies and management recommendations for Aboriginal cultural heritage in the detailed investigation area, including Aboriginal sites and objects that may be impacted by the construction footprint.

1.4 Objectives

The objectives of the assessment documented in this report are to:

- Comply with the legislative requirements, codes of practice and assessment procedures relevant to the project (see Chapter 2 of the ACHAR)
- Comply with the SEARs for the project, issued on 30 October 2018 (SSI 9364). Full details of the SEARs for the project relating to Aboriginal cultural heritage are provided in Chapter 2 of the ACHAR
- Comply with the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) (Roads and Maritime Service (Roads and Maritime) 2011). In particular, this report constitutes an archaeological report as required for Stage 3 of PACHCI.

1.5 SEARs

Section 86 of the *National Parks and Wildlife Act 1974* (NPW Act) forbids the harm or desecration of an Aboriginal object and/or place. Archaeological excavations fall within the meaning of “harm” and/or “desecration” unless they are undertaken pursuant to an Aboriginal Heritage Impact Permit (AHIP) (Section 87 NPW Act). However, the project is declared as State Significant Infrastructure (SSI) under Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Division 5.23 (1)(d) explicitly states that AHIPs are not required for SSI projects.

Despite this, SSI projects must conduct environmental investigations as part of the EIS as directed by the SEARs. The final SEARs for this project were released on 30 October 2018. This report details the results of the archaeological test excavations undertaken under the SEARs. The requirements set out in that document specifically for archaeological investigation are provided in **Table 1-1**.

Table 1-1 SEARs relating to Aboriginal heritage archaeological investigations

The Environmental Impact Statement (EIS) must address the following specific matters:	Addressed in AAR section
10. Heritage	
3. Where archaeological investigations of Aboriginal objects are proposed these must be conducted by a suitably qualified archaeologist, in accordance with section 1.6 of the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010c).	**Section 8; Section 13**

The assessments presented in this report are consistent with the SEARS, the PACHCI (Roads and Maritime 2011), the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (the Code) (DECCW 2010b) and the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011).

1.6 Authorship

This report was authored by:

- Andrew Costello (Senior Consultant, Jacobs). Andrew holds a Bachelor of Arts (Honours) from the University of Melbourne and has over fourteen years of experience as an archaeologist and cultural heritage advisor
- Neville Baker (Director, Baker Archaeology). Neville holds a Bachelor of Arts Honours degree in Anthropology-prehistory from the University of Sydney and has over 30 years of experience as an archaeologist and over 25 years as a consultant archaeologist.
- Gary Dunnett (Principal, Baker Archaeology). Gary has an honours degree in prehistory and historical archaeology from the University of Sydney. In addition to his work as a consultant he has more than 25 years of experience in State and Commonwealth agencies managing Aboriginal and historic places of State, National and World Heritage status.

The report was reviewed by Dr David Collard (Senior Consultant, Jacobs). David holds a Doctor of Philosophy in Archaeology from the University of Nottingham, a Master of Arts in Archaeology from the University of Melbourne and has over ten years of experience as an archaeologist and cultural heritage advisor.

2. Aboriginal consultation

A complete account of consultation with the Aboriginal community is provided in Section 3 of the accompanying ACHAR.

Consultative actions that relate specifically to the archaeological survey and test excavations include:

- July- September 2017 Deerubbin and Gandangara LALCs participate in archaeological surveys
- October 2017 Letters and advertisements invite potential RAP to register an interest
- October 2017 Registered Aboriginal Parties (RAPs) registered
- December 2017 RAPs nominate their Aboriginal Sites Officers (ASO) for the project
- January 2018 Aboriginal Focus Group (AFG) meeting to discuss draft methodology
- January 2018 Final methodology forwarded to RAPs
- February- June 2018 ASOs participate in archaeological fieldwork
- August 2018 Second AFG meeting to discuss fieldwork results
- February 2019 Draft ACHAR and Aboriginal Archaeological Report (AAR) issued to RAPs
- February 2019 Third AFG to discuss draft ACHAR and AAR, salvage program, the Aboriginal cultural heritage design process, and proposed management measures for potentially impacted sites

3. Previous archaeological work

This chapter presents AHIMS records and previous archaeological investigations to provide context and a baseline for what is already known about Aboriginal cultural heritage in the vicinity of the detailed investigation area and study area (see **Section 3.1**).

Western Sydney and the Cumberland Plain have been subject to intensive archaeological investigations over several decades. Previous investigations include an assortment of desktop studies, field survey, test excavation and large-scale salvage programs. This enables a detailed understanding of regional patterns in the distribution of Aboriginal cultural heritage sites across the Cumberland Plain.

Previous archaeological investigations in the vicinity of the detailed investigation area include large holdings such as the Western Sydney Airport site and Oran Park residential releases, as well as linear developments such as the M7 Motorway, The Northern Road upgrades and preliminary assessments of the M12 Motorway.

The review of past archaeological work has supported the development of a predictive model for the detailed investigation area. The predictive model has been tested through the field component of this assessment and supports the significance assessment for Aboriginal cultural heritage that may be impacted by the project.

3.1 Study area

In this report:

- Construction footprint: Defined as the zone in which construction activities would take place. The boundaries of this area shifted slightly during the assessment period, to the extent that some sections of the footprint are shown outside of the detailed investigation area as defined in this report. While outside the defined detailed investigation area, these sections of the construction footprint have been considered within the impact assessment.
- Detailed investigation area: Refers to the area where detailed investigations were undertaken as part of the archaeological assessment which covered an area that may be subject to ground disturbance. This area was set prior to confirmation of the design outlined in the M12 Motorway EIS and explains why the construction footprint extends beyond the detailed investigation area in some locations.
- Broader study area: Area surrounding the detailed investigation (and including the detailed investigation area) that was investigated as part of the desktop assessment, hereafter referred to as the 'study area'. This area was selected to include comparable archaeological situations in similar environmental settings along the greater South Creek catchment and the Mulgoa Creek headwaters.

These defined areas are shown on **Figure 3-1**.

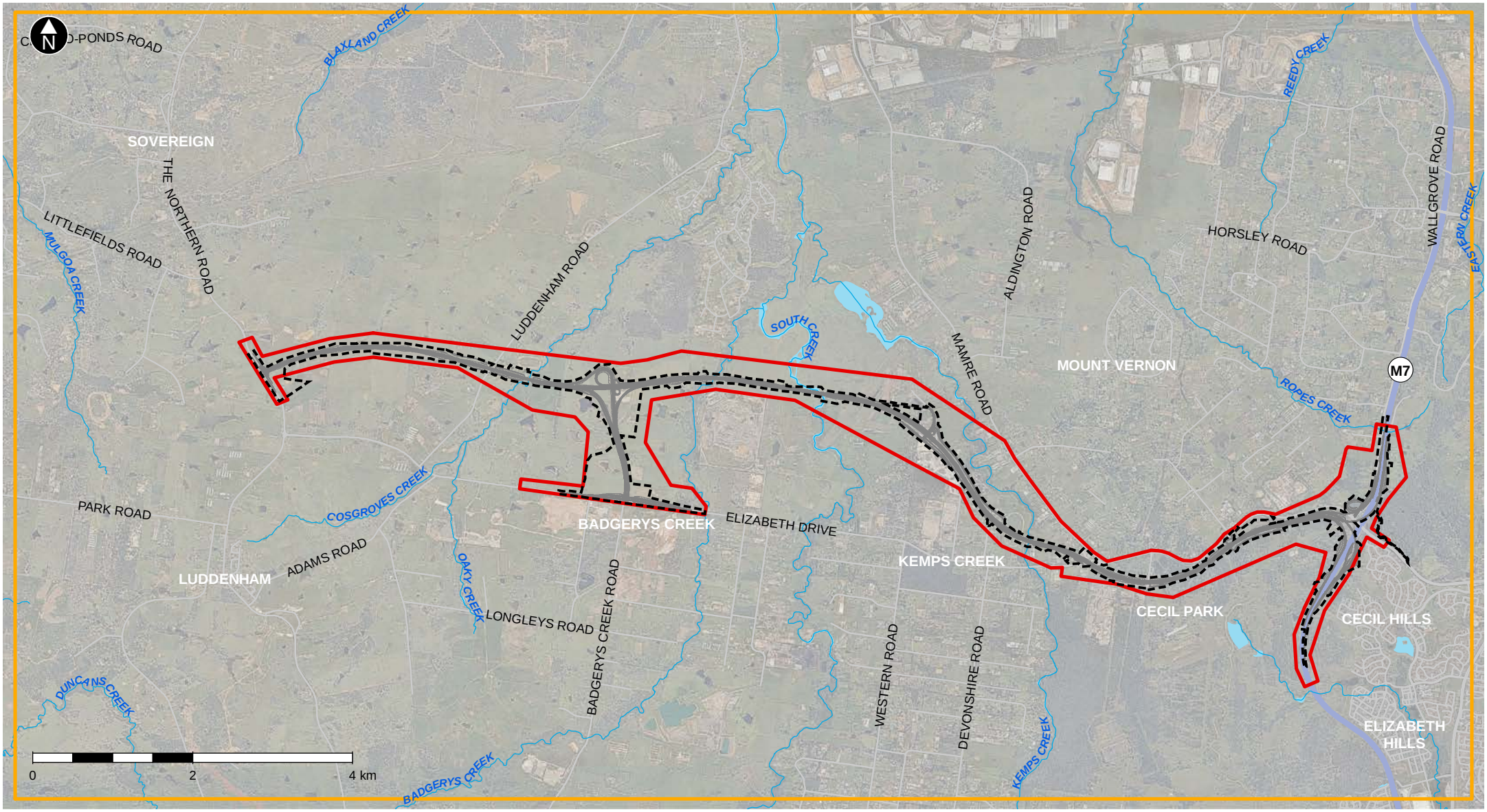
3.2 Previously recorded AHIMS sites

A search of registered sites in the detailed investigation area was obtained on 14 June 2017. The search area included a two kilometre buffer around the detailed investigation area. Due to the abundance of AHIMS records received from Department of Planning, Industry and Environment (DPIE) (Environment, Energy and Science) the original AHIMS data is not included in this report.

The AHIMS search identified 24 registered sites in the detailed investigation area. However, further interrogation of the site cards and mapping reduced this total to 15 registered sites comprising 14 stone artefact sites and one PAD, of which only eight are located in the construction footprint.

The reasons for the discrepancy include duplicate site records, incorrect mapping and the loss of sites from earlier developments. Specifically:

- The recorded coordinates for AHIMS 45-5-4049 are incorrect, it is located to the south of the detailed investigation area
- The recorded coordinates for AHIMS 45-5-2748 are incorrect and it is located to the east of the detailed investigation area
- AHIMS 45-5-2468, 45-5-2476, 45-5-2477 and 45-5-2722 have been destroyed and are no longer valid sites on AHIMS
- AHIMS 45-5-0496, 45-5-0528 and 45-5-4937 are duplicate records for 45-5-4749, 45-5-4750 and 45-5-4007 respectively.



Detailed investigation area

The project construction footprint

The project

Waterways

Broader study area

Figure 3-1 Site location showing broader study area for this assessment

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The 15 registered sites include 14 stone artefact sites (see glossary) and a potential archaeological deposit (PAD). This result is typical of AHIMS searches on the Cumberland Plain. However, further to the south of the detailed investigation area there are AHIMS records of modified trees and axe grinding grooves. Modified trees are very rare on the Cumberland Plain due to the past logging and agricultural practices.

Table 3-1 describes the sites inside the construction footprint and **Table 3-2** identifies sites outside the construction footprint but within the detailed investigation area. The location of the 15 registered sites (as per the AHIMS site cards) is demonstrated in **Figure 7-2**. It should be noted that some of the 8 registered Aboriginal sites within the construction footprint are mapped outside the project construction footprint due to incorrect mapping or the site boundary being greater that the point marker represented by AHIMS. These issues have been assessed and adjusted in **Figure 8-19**.

Table 3-1 Registered AHIMS sites inside the construction footprint

AHIMS number	Site description
45-5-2308	Eleven flaked stone artefacts were recorded along an eroded fire trail on a narrow ridge top within what is now the Western Sydney Parklands at Cecil Hills.
45-5-3804	A single silcrete flaked piece recorded on an interfluve between two first order drainage lines in a paddock near Luddenham. The artefact was exposed by an erosion scar at the base of a tree. The artefact could not be found during an inspection in 2017.
45-5-4747	Three stone artefacts recorded in a vehicle track exposure on an elevated ridge on the western side of Badgerys Creek. The artefacts were re-located in 2017.
45-5-4748	A single silcrete flake recorded on the Badgerys Creek eastern alluvial floodplain at the base of a tree. The artefact could not be found during an inspection in 2017.
45-5-4786	A single silcrete flake recorded on a ridge in a paddock near Luddenham. The artefact was exposed by a 25 m2 area of sheet erosion. The artefact could not be found during an inspection in 2017.
45-5-4007/ 45-5-4937	Three silcrete flaked stone artefacts recorded along a first order drainage depression next to Range Road at Kemps Creek as part of the present M12 assessment. On review of the AHIMS records it was discovered that the site had been previously recorded with incorrect coordinates.
45-5-0496/ 45-5-4749	A small number of stone artefacts recorded in 1985 by Professor Richard Wright from the University of Sydney near the concrete bridge over South Creek on the University of Sydney land. The site was inadvertently re-recorded by archaeologists surveying for M12 route options.
45-5-0528/ 45-5-4750	At the time of the assessment, more than 50 artefacts were recorded around a dam/soak waterbody serving as a farm water body with eroding gully walls. The waterbody appears to be located on a natural spring. The site was originally recorded in 1985 by Professor Richard Wright from the University of Sydney, and then inadvertently re-recorded by archaeologists surveying for M12 route options. This natural spring has now been in-filled by land practices.

Table 3-2 AHIMS sites outside the construction footprint but inside the detailed investigation area

AHIMS number	Site description
45-5-2307	Seven artefacts recorded along 100 m of unsealed track in the road reserve on the south side of Elizabeth Drive at Cecil Hills. The site may be continuous with 45-5-4374, however this would require testing of the intervening sub-surface deposits.
45-5-4374	Seventeen artefacts recorded along 45 m of unsealed track in the road reserve on the south side of Elizabeth Drive at Cecil Hills. The site may be continuous with 45-5-2307.
45-5-2310	Five flaked stone artefacts along 80 m of power line maintenance track within road reserve on the south side of Elizabeth Drive. The artefacts could not be found during an inspection in 2017.
45-5-2563	A single broken silcrete flake on a track near a drainage line at Cecil Park near the eastern end of the detailed investigation area, north of Elizabeth Drive. The artefact could not be found during an inspection in 2017.

AHIMS number	Site description
45-5-2721	Thirty-four artefacts recovered from 95 auger pits dug on the headwaters of Ropes Creek as part of the M7 Motorway investigation at the very eastern end of the detailed investigation area. A previous testing program undertaken established a low density sub-surface distribution of Aboriginal cultural material across the three landforms that were sampled: the banks of a creek, the associated floodplain and a nearby hillcrest.
45-5-2723	One hundred and forty artefacts recovered from 38 auger pits and one 2 m2 and twenty-seven were recovered from the open area excavation. A previous testing program undertaken established a low density sub-surface distribution of Aboriginal cultural material across the elevated terrace on the northern side of Hinchinbrook Creek.
45-5-4767	A single silcrete flake recorded in a cutting next to a greenhouse in a highly disturbed context on the eastern side of Kemp Creek. The artefact could not be found during an inspection in 2017.

3.3 Previous archaeological investigations

3.3.1 Archaeological investigations within the detailed investigation area

A number of previous archaeological investigations have been conducted around and within the detailed investigation area. A summary of the findings of these reports is provided in the sections below. **Figure 3-2** maps many of these studies, however they are mostly overlapped by the comprehensive 2015 M12 corridor selection study.

M12 Strategic Route Options Analysis (Map ID 1)

The *Strategic Route Options Analysis* (Aurecon 2016) was prepared to evaluate the potential environmental, heritage and social impacts of alternative routes for the M12 Motorway (Map ID 1). The analysis included a Heritage Working Paper (HWP) that considered the potential impact of each route option on Aboriginal cultural heritage values. The analysis informed the selection of the preferred route which is being assessed in this Archaeological Assessment Report.

The HWP considered existing information about regional site distributions and involved a 5-day field survey program. A total of 60 Aboriginal sites were identified within the original M12 corridor, of which five were located during the field survey. The project was unable to obtain access to all parts of the detailed investigation area and ground surface visibility was limited by heavy pasture.

The HWP demonstrated the presence of a low-density distribution of surface sites across the detailed investigation area. As a result, it was not possible to identify a route which wholly avoided areas of archaeological sensitivity. Instead, the recommended route options were designed to minimise the potential impact on areas of high cultural significance.

The predictive statements developed for the HWG are consistent with accepted characterisations of site distributions on the Cumberland Plain. They include:

- The density, size and complexity of surface and subsurface Aboriginal cultural heritage sites are positively correlated with proximity to, and the reliability of, freshwater sources
- The majority of sites will be located within 100 metres of a reliable freshwater source
- Locations near water sources are preferred, including creek banks, alluvial flats and basal (lower) hillslopes
- Other preferred locations include knolls and ridges, especially when these are close to food or stone resources
- Poorly drained landforms are generally avoided
- Silcrete will be the dominant raw material for stone artefacts
- In-situ cultural materials are likely to be concentrated below the plough zone (ie below 0.25 metres).

3.3.2 Previous archaeological investigations around the detailed investigation area

The following review of previous investigations of Aboriginal cultural heritage begins at Cecil Hills in the southeast and continues around the detailed investigation area in a clockwise direction. Where multiple projects have been conducted in the same sector they are organised chronologically, with the most recent presented first.

Cecil Park

Report/Date	Map ID	Key outcomes
Navin Officer Heritage Consultants 1997	2	Archaeological survey of the Cecil Hills shooting complex. Eight stone artefact sites were identified. Most of the 19 artefacts were silcrete with mudstone, quartz and volcanics also present.
Brayshaw, 1995	3	Archaeological survey of a proposed upgrade of Elizabeth Drive. The assessment covered two portions at the eastern end of the detailed investigation area. The survey identified six areas of PAD and one stone artefact site.
Dallas and Hanckel, 1985	4	Archaeological survey along a minor tributary of Ropes Creek. Two stone artefact sites identified. Raw materials were silcrete and mudstone. Artefacts types were described as flakes, flaked pieces and a core. The sites were located in a creek bed among ironstone gravels.

Western Sydney Airport

The site of the Western Sydney Airport is located immediately to the south of the detailed investigation area. The proposed Western Sydney Airport is approximately 1,700 hectares in area. It forms a continuous landscape with the detailed investigation area, capturing the headwaters of the South Creek catchment. That catchment dominates the central part of the detailed investigation area.

The cultural and environmental values of the Western Sydney Airport site have been investigated over a period of more than two decades. Previous studies include a systematic program of test pitting (Navin Officer 2015) across Stage 1 of the Western Sydney Airport, included several test pits on Badgerys Creek and Cosgroves Creek. Both creeks flow directly into the detailed investigation area and were subject to test pitting in the current project (see **Chapter 5**).

It is understood that further work will be conducted in the Western Sydney Airport through an archaeological salvage program.

Report/Date	Map ID	Key outcomes
Navin Officer, 2015	5	Comprehensive review of earlier Aboriginal heritage studies of Western Sydney Airport footprint. Due to size of Western Sydney Airport footprint it provides an opportunity to place the corridor in a strong regional context. Predictions emphasise the potential for hilltop locations with access to fresh water and that the distribution of surface sites is an unreliable indicator of subsurface artefact distributions. Eleven locations selected for test pitting, with 114 test pits excavated overall. A total of 91 artefacts identified, with silcrete being the dominant raw material. 12% of artefacts displayed retouch, with the majority being backed blades Little dorsal cortex on artefacts indicating heavy reduction. Most artefact occurrences single artefact sites with an average density of 1.6 artefacts per square metre, with the highest density 3.1 artefacts per square metre. Valley floors and alluvial flats had significantly higher artefact densities than other land forms. Subsurface density was positively correlated with the order of the closest drainage line, and with the order of the largest drainage line within 100 metres Overall distribution of artefacts variable across landforms.

Report/Date	Map ID	Key outcomes
Australian Museum Consulting, 2014	6	Survey undertaken for the Western Sydney Airport. Twenty-one Aboriginal cultural heritage sites identified. Many of the previously recorded sites in the area had been disturbed through erosional effects, dam construction and grazing.
Navin Officer Heritage Consultants, 1997	7	Survey of Western Sydney Airport footprint, covering 70 acres and identifying 111 Aboriginal sites. Sites comprised 102 artefacts, eight scarred trees and one PAD. Frequencies at most site were low, with silcrete the dominant raw material with small samples of quartz, chert and tuff. Stone tool types predominantly flakes with a small number of cores. Alluvial plains and valley floors identified as having best potential for scarred trees.

Badgerys Creek

Report/Date	Map ID	Key outcomes
Consulting Arboriculturists and Horticulturists, 2014	-	Two potential culturally modified trees examined. Both within riparian corridor of Badgerys Creek. Concluded that neither tree was culturally modified.
Nicholson, 1989	8	Archaeological survey of proposed clay/shale extraction site at Badgerys Creek. Location of survey could not be verified. No archaeological material identified, although visibility described as poor, with high disturbance from previous quarrying.

Luddenham

Report/date	Map ID	Key outcomes
Dean-Jones, 1991	9	Archaeological survey of proposed clay/shale extraction site. One artefact scatter of 22 artefacts identified at the edge of small pond near Oaky Creek. Artefacts comprised eight flakes, 12 flaked pieces and two cores. Raw materials included chert, sandstone and mudstone.
Dallas, 1988a	10	Aboriginal heritage survey. 12 artefact sites identified, dominated by silcrete and chert and comprising flakes, flaked pieces and cores.
Kelleher Nightingale Consulting 2017	11	Archaeological survey of The Northern Road between Narellan Road and Mersey Road. Total of 21 artefact sites identified, one scarred tree and one possible scarred tree. Artefacts described as flakes, broken flakes, flaked pieces, cores, scrapers and backed blades. Dominant raw material was silcrete, with smaller amounts of chert, tuff, quartz, mudstone and quartzite.

Report/date	Map ID	Key outcomes
ENSR AECOM, 2009	12	Large-scale test and salvage excavations at Oran Park, approx. 15 km south of detailed investigation area. Total excavated area 509 square metres. Dominant artefact type flaked material with small sample of cores, shatter and formal retouched tool types, including backed blades and scrapers. 74% of artefacts were silcrete. Concluded that 90% of artefacts were the by-product of tool manufacture and concentrated along watercourses and elevated areas overlooking the main creek valley. Presence of artefacts continued at the limits of excavation, 600 metres from nearest drainage line, well in excess of the predictive 100 metres from reliable fresh water.
Kelleher Nightingale Consulting 2017	13	Survey of The Northern Road between Mersey Road Bringelly and Glenmore Parkway, Glenmore Park. Survey of 16 kilometres of road corridor with 81 artefacts identified. Predominantly silcrete and silicified tuff with a small proportion of chert, mudstone and quartz. Artefact types described as flakes, flake fragments, cores, retouched and utilised flakes. Sites identified on upper slopes of north-south ridgeline, lower slopes and elevated locations adjacent to creeks. Authors suggest that sites not limited to waterways and ridgelines may have been preferred for shelter or tool manufacture.
Dallas and Steele, 2001	14	Survey of Glenmore Park residential development area. No Aboriginal artefacts identified during survey, however subsurface testing recovered 73 artefacts in 18 one square metre test pits. Artefacts predominant flakes and flaked pieces, with smaller numbers of scrapers, retouched fragments, cores, backed artefacts and a broken hatchet. Raw materials mostly silcrete with sporadic tuff and quartz. One area tested had an anomalous high density of artefacts and was interpreted as a knapping floor.
Dallas, 1981	15	Archaeological survey of M4 Motorway between Mulgoa Creek and The Northern Road, approximately 800 hectares. A total of 27 artefacts identified. Described as flakes, flaked pieces and a hatchet. Variety of raw materials, including mudstone, chert, silcrete, quartz and basalt.
Kelleher Nightingale Consulting, 2013	16	Aboriginal heritage assessment for an area off Luddenham Road north of current study area. Four stone artefacts identified.
McDonald, 2001	17	Archaeological assessment of a hard rock quarry off Elizabeth Drive. Survey identified a single quartz artefact. Adjacent soils were assessed as having potential to contain subsurface deposits and therefore the area was designated as a PAD.
Steele, 1999b	18	Archaeological survey between Luddenham and Mamre Roads. Survey identified six artefact sites and a scarred tree. A low spur above South Creek contained silcrete cobbles, some of which appeared to have been modified. Identified as a source for stone tool manufacture.

Report/date	Map ID	Key outcomes
Dallas, 1988b	19	Archaeological study of the Luddenham Equestrian Centre between Luddenham and Mamre Roads. Twelve artefact sites identified with silcrete and chert the raw materials Silcrete cobbles identified in drainage channels. Artefacts described as flakes, flaked pieces and cores.
Biosis, 2016	20	Archaeological testing in Mamre West precinct, three kilometres north of study area. 39 square metres excavated producing 43 artefacts. Overall density was 1.1 per square metre and 2.26 per cubic metre of excavated deposit. Notable was the predominance of chert and mudstone, with only 42% silcrete in the assemblage.
McDonald, 2008b	21	Archaeological excavations off Mamre Road, Erskine Park. Total of 298 square metres excavated. 8,867 flaked stone artefacts recovered, 13 from the surface. **Raw materials** dominated by silcrete, small proportions of quartz and silicified tuff. Artefacts included cores, debitage, backed blades, backed debitage, retouched artefacts, cores, bipolar artefacts and pebble fragments. Many had evidence of crenated fractures. Backed artefacts reduced in frequency with distance from water. Cores decreased with distance from silcrete sources. Bipolar artefacts more frequent around lower order streams. Platform debitage declined with distance from silcrete sources. Artefacts became smaller with distance from silcrete. Highest densities of artefacts occurred in the local yellow earth soil unit, possibly because of better drainage and therefore more suitable for occupation.
McDonald, 2000	22	Located 3.6 km north of the detailed investigation area. The raw materials were silcrete and mudstone. Eight stone artefact sites were found. Artefacts were described as flakes, broken flakes, debitage, cores and backed artefacts. All of the sites in the assessment area were located less than 300 metres from the closest water source, in, or near, first order tributaries or second order stream channels. The landforms on which site occurred were hillslope and floodplain-creek banks. Author suggests that increasing stream order is correlated with greater archaeological complexity.

Elizabeth Hills

Report/Date	Map ID	Key outcomes
McDonald, 2008 a	23	Archaeological survey three kilometres south east of the detailed investigation area. Survey identified six stone artefact sites and two PADs. Raw materials were silcrete, tuff and quartz.
Brayshaw and White, 1999	24	Archaeological survey for the M7 Motorway Survey identified six stone artefact sites and two PADs. Raw materials included silcrete, mudstone, quartz, quartzite and volcanics. Artefacts were described as cobble tools, flakes, backed pieces, flaked pieces and cores, some showing evidence of bi-polar production. Most of artefacts were located along creek flats.

3.4 Summary

A minimum of 25 archaeological investigations have been conducted within a few kilometres of the detailed investigation area. These investigations have taken place over more than 30 years, reflecting the long-term land use planning that has shaped this sector of metropolitan Sydney.

Almost all of the previous studies resulted in the discovery of Aboriginal cultural materials. Indeed, the only investigation which failed to find any such evidence was conducted in a heavily modified site subject to quarrying. There is abundant evidence that Aboriginal people occupied all the country in, and around, the detailed investigation area. The issue is not whether these areas were occupied, but instead what can be discerned from the patterning of sites which might offer further insight into how people lived on the Cumberland Plain. Trends that emerge from the previous studies include:

- There is a strong correlation between the density, size and complexity of sites and the presence of reliable freshwater
- A low density of artefactual material persists in areas beyond 100 and150 metres from watercourses
- Elevated rises above areas subject to periodic inundation are also important
- The presence or absence of artefacts on the exposed ground surface is a poor predictor of the density of subsurface artefactual material
- In contrast to the northern part of the Cumberland Plain, there is limited evidence that access to high quality stone is playing a major role in the distribution of sites. This may reflect the apparent paucity of extensive outcrops of silcrete in the southern half of the Cumberland Plain
- Opportunities for grinding grooves and scarred trees are limited by the rarity of sandstone outcrops and old growth trees on the Cumberland Plain.

An important consequence of the many studies that have taken place in the vicinity of the detailed investigation area is that there are opportunities to integrate the results of this assessment into the broader regional picture, and equally important, to identify cultural characteristics of the detailed investigation area which distinguish it from other parts of the Cumberland Plain. Of particular importance is the previous work in the Western Sydney Airport, which shares a similar sampling methodology and intensity to this project.

This review of previous archaeological assessments indicates that the construction footprint is likely to contain areas of high archaeological sensitivity and cultural significance to the Aboriginal community.

Table 3-3 provides an overview summary of the previous reports. **Figure 3-2** maps many of these studies, however they are mostly overlapped by the comprehensive 2015 M12 corridor selection study.

Further to the consulting reports summarised below, a recent PhD thesis (White 2018) reviews assemblages from stone artefact sites across the Cumberland Plain. The thesis critically evaluates the validity of chronologically defined stone artefact assemblages on the Cumberland Plain. The thesis finds that the nature of silcrete assemblages tend to differ depending on the temporal phases of artefact accumulation. The thesis provides a valuable research context for the evaluation of scientific significance, with particular reference to the sites on deep alluvial South Creek soils.

Table 3-3 Previous investigations in the study area

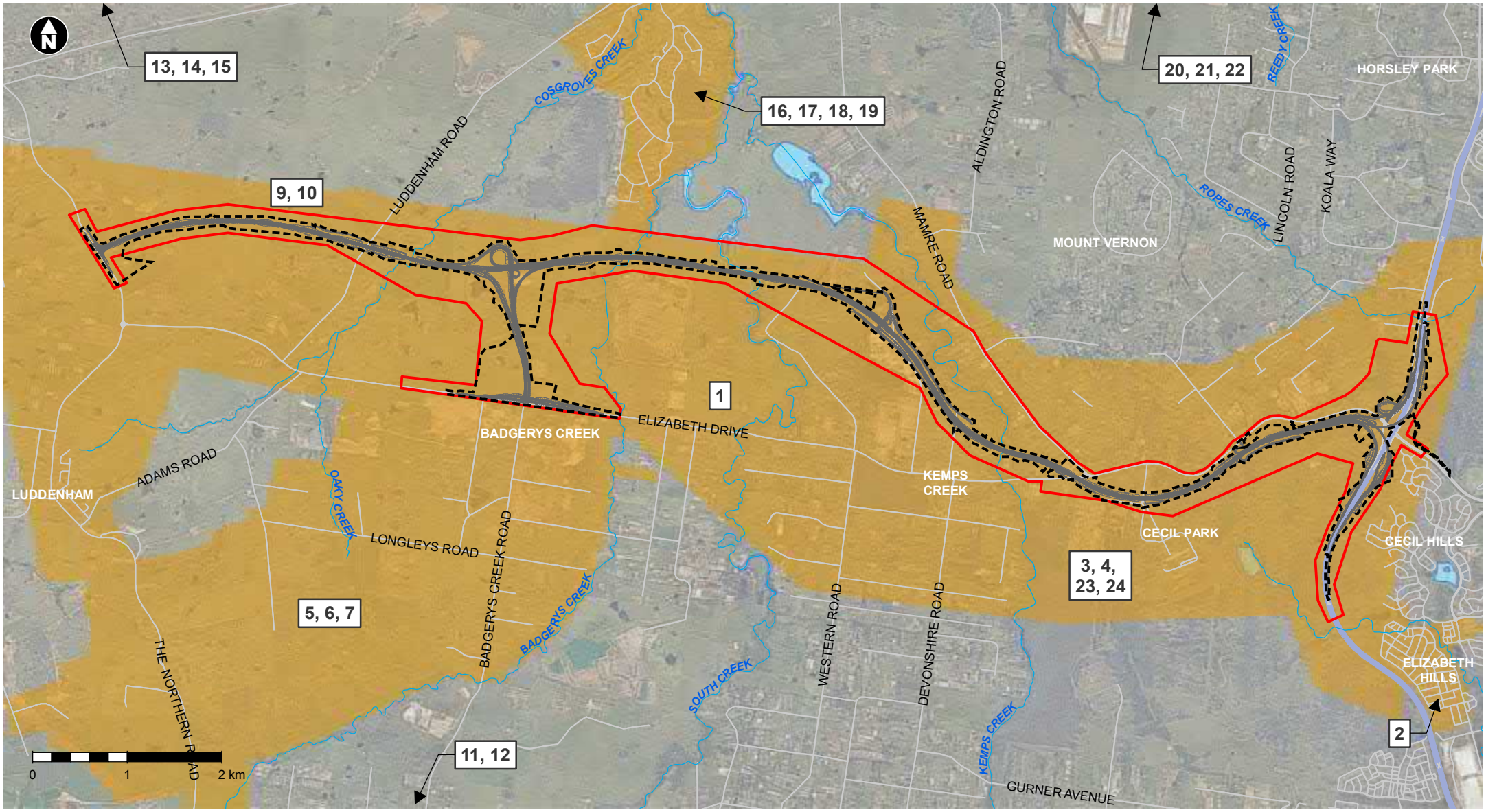
Author	Location	Map ID	No. Sites	Site types					Test pits	Area excavated (m2)	Artefact types	Materials	Dominated material
				Stone artefact site	Grinding Groove	Modified Tree	PAD	Artefact No.					
Roads and Maritime (Aurecon) 2016	Detailed investigation area	1	60	46	1	1	16		n/a	n/a	flake, flaked piece, core	silcrete, quartz, tuff	silcrete
Navin Officer Heritage Consultants 1997	Cecil Park	2	8	28				19	n/a	n/a	flake, core	silcrete, mudstone, quartz, volcanic	silcrete
Brayshaw 1995	Cecil Park	3	7	1			6	13	n/a	n/a	flake, flaked piece, core	Silcrete, chert, mudstone, quartzite, fine grained siliceous	silcrete
Dallas and Hanckel 1985	Cecil Park	4	2	2					n/a	n/a	flake, flaked piece, core	silcrete, mudstone	
Navin Officer Heritage Consultants 2015	Western Sydney Airport	5						114	60	91	flake, hammerstone backed artefact	silcrete, quartz, fine grained siliceous, igneous	silcrete

Author	Location	Map ID	No. Sites	Site types					Test pits	Area excavated (m2)	Artefact types	Materials	Dominated material
				Stone artefact site	Grinding Groove	Modified Tree	PAD	Artefact No.					
Australian Museum Consulting 2014	Western Sydney Airport	6	21	19		2		70	n/a	n/a	flake, flake fragment, flaked piece, core, bifacial blade	silcrete, chert, mudstone, quartzite	silcrete
Navin Officer Heritage Consultants 1997	Western Sydney Airport	7	111	102		8	1		n/a	n/a	flake, core	silcrete, quartz, chert, tuff	silcrete
Nicholson 1989	Badgerys Creek	8	0							0			
Dean-Jones 1991	Luddenham	9	1	1				22	n/a	n/a	flake, flaked piece, core	chert, sandstone, mudstone	chert
Dallas 1988a	Luddenham	10	12	12				716	n/a	n/a	flake, flaked piece, core, bi-polar core	silcrete, mudstone, quartz, chert, volcanic	silcrete
Kelleher Nightingale Consulting 2012	Bringelly	11	23	21		2			n/a	n/a	flake, broken flake, flaked piece, core, scraper, backed blade	silcrete, chert, tuff, quartz, mudstone, quartzite	silcrete

Author	Location	Map ID	No. Sites	Site types					Test pits	Area excavated (m2)	Artefact types	Materials	Dominated material
				Stone artefact site	Grinding Groove	Modified Tree	PAD	Artefact No.					
ENSR and AECOM 2009	Oran Park	12						4780	509	509	flake, flaked piece, core, retouched flake, backed artefact, scraper, thumbnail scraper, shatter	silcrete, mudstone, quartz, quartzite, chert, petrified wood, fine grained siliceous, igneous	silcrete
Kelleher Nightingale Consulting 2017	Glenmore Park	13	28	28				81	n/a	n/a	flake, flake fragment, core, retouched flake, utilised flake	silcrete, tuff, chert, mudstone, quartz	silcrete
Dallas and Steele 2001	Glenmore Park	14							18	73			
Dallas 1981	Glenmore Park	15	27	27					n/a	n/a	flake, flake piece, hatchet	silcrete, mudstone, chert, quartz, basalt	
Kelleher Nightingale Consulting 2013	Twin Creeks	16	4	4				4					
McDonald 2001	Twin Creeks	17	1				1			1		quartz	

Author	Location	Map ID	No. Sites	Site types					Test pits	Area excavated (m2)	Artefact types	Materials	Dominated material
				Stone artefact site	Grinding Groove	Modified Tree	PAD	Artefact No.					
Steele 1999	Twin Creeks	18	6	5		1		434	n/a	n/a	flake, flaked piece, core, backed blade, debitage, modified cobble, unmodified cobble	silcrete, mudstone, quartz, quartzite, chert	silcrete
Dallas 1988b	Twin Creeks	19	12	12					n/a	n/a	flake, flaked piece, core, cobble	silcrete, mudstone	silcrete
Biosis 2016	Erskine Park	20	1					1	39	43	flake, flake core, flake fragment, core, hammerstone	silcrete, chert, mudstone, basalt	chert
McDonald 2008b	Erskine Park	21	79					8867	298	298	flake, debitage, core, backed piece, backed debitage, retouched artefacts, bipolar artefacts, pebble	silcrete, quartz, tuff	silcrete

Author	Location	Map ID	No. Sites	Site types					Test pits	Area excavated (m2)	Artefact types	Materials	Dominated material
				Stone artefact site	Grinding Groove	Modified Tree	PAD	Artefact No.					
McDonald 2000	Erskine Park	22	8	8					n/a	n/a	flake, broken flake, debitage, core, backed piece	silcrete, mudstone	silcrete
McDonald 2008a	Elizabeth Hills	23	6	4			2	25	n/a	n/a		silcrete, tuff, quartz	
Brayshaw and White 1999	Elizabeth Hills	24	8	6			2		n/a	n/a	flake, backed piece, flaked piece, core, cobble tool	silcrete, mudstone, quartz, quartzite, volcanic	silcrete



Detailed investigation area

The project construction footprint

The project

Waterways

Motorway

Main roads

Previous archaeological investigation areas in and around the study area corridor

Note: Archaeological investigations areas are approximate only and not to scale

ID	Author	ID	Author	ID	Author
1	RMS (Aurecon) 2016	9	Dean-Jones 1991	17	McDonald 2001
2	Navin Officer Heritage Consultants 1997	10	Dallas 1988a	18	Steele 1999
3	Brayshaw 1995	11	Kelleher Nightingale Consulting 2012	19	Dallas 1988b
4	Dallas and Hanckel 1985	12	ENSR and AECOM 2009	20	Biosis 2016
5	Navin Officer Heritage Consultants 2015	13	Kelleher Nightingale Consulting 2017	21	McDonald 2008b
6	Australian Museum Consulting 2014	14	Dallas and Steele 2001	22	McDonald 2000
7	Navin Officer Heritage Consultants 1997	15	Dallas 1981	23	McDonald 2008a
8	Nicholson 1989 (Not show n)	16	Kelleher Nightingale Consulting 2013	24	Brayshaw and White 1999

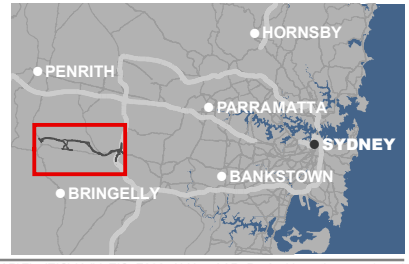


Figure 3-2 Previous archaeological investigations areas in relation to detailed investigation area

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4. Environmental Context

4.1 Cumberland Plain

The construction footprint is located on the Cumberland Plain, a relatively flat, low lying subregion of the Sydney Basin. The Sydney Basin is a major structural basin with its centre located at Fairfield, near Liverpool and extends from Batemans Bay through to Lithgow in the west and the Hunter Valley in the north. The Sydney Basin began to form roughly 300 million years ago as an effect of the river delta replacement of oceans (Clark and Jones 1991; OEH 2016). The Cumberland Plain is a depression characterised by the middle Triassic Wianamatta group of shales with interleaved Minchinbury sandstone. The weathering of the sedimentary geology gives rise to a primarily flat to rolling hill topography. The Cumberland Plain is demarcated to the west by the Hawkesbury-Nepean River which generally marks the transition from the Cumberland depression to the more elevated Hawkesbury Sandstone ridges and valleys of the Blue Mountains Plateau and Hornsby Plateau to the west and north. To the south east the Georges River likewise generally demarcates the Hawkesbury Sandstone geology of the Woronora Plateau.

4.2 Natural resources

The topography, soils and stream pattern of the study area supported a mosaic of Cumberland Plain woodland, riverine forest and wetland vegetation. Attenbrow (2010) has identified more than 250 species of edible plants in the Sydney basin, many of which occur on the Cumberland Plain. Significant plant foods include yams, banksia nectar, Burrawang fruit, grass seeds and the rhizomes of aquatic plants. The Alluvial Flats in the study area appear suitable habitat for the growth and cultivation of edible yams, a highly valued food on the Cumberland Plain.

Aboriginal people consumed a wide variety of fauna on the Cumberland Plain. Significant species include kangaroos, wallabies, possums, gliders, wombat, koala, echidna, platypus, emu, parrots, quail, goanna, snakes, skinks, frogs, bees and the larvae of wood boring beetles. A variety of aquatic fauna was abundant in the major creeks and included several species of waterfowl, turtles, eels, crayfish and freshwater mussel.

Potential fauna resources are summarised in **Table 4-1**. The data is derived from the Environment, Energy and Science Group (EESG) of the Department of Planning, Industry and Environment (DPIE) Bionet Atlas and does not include historical records or extrapolate to pre-contact periods. Notable omissions that are likely to also have been present prior to land clearing and stream modification include wombat, water rat, gliders and freshwater mullet. Nonetheless, the 283 recorded species is indicative of the high diversity of potential food species in the study area.

Table 4-1 Fauna recorded in the study area

Taxa	Species (n)	Recorded food species
Fish	4	Short-finned Eel and Long-finned Eel
Amphibians	18	Frogs
Reptiles	29	Eastern Snake-necked Turtle, Macquarie Turtle, Blue-tongued Skink, Lace Monitor and eight species of snake
Birds	194	Emu, five species of pigeon, fourteen parrots and nine ducks
Monotremes	2	Echidna and Platypus
Marsupials	10	Eastern Grey Kangaroo, Wallaroo, Red-necked Wallaby, Swamp Wallaby, Koala, Brushtail Possum and Ringtail Possum
Placentals	26	Grey-headed Flying Fox, Bushrat and Dingo
Total vertebrate fauna	**283**	

Source: EESG Bionet Atlas, search conducted 17 January 2019 *http://www.bionet.nsw.gov.au/*

The major waterways of the South Catchment ensured that the study area provided a diverse, abundant and reliable array of food resources were utilised by Aboriginal people, providing edible flora and fauna, wood and bark for the construction of tools and shelter, stone for the production of flaked and ground edge artefacts and ochres for ceremonial purposes. A particularly important characteristic of the detailed investigation area was the extensive freshwater habitats associated with the major waterways of the South Creek Catchment. In addition to enhancing the variety and abundance of edible flora and fauna these waterways provided a reliable source of fresh water.

The diversity and abundance of vegetation in the detailed investigation area has been diminished through agricultural land use practices. Wide scale clearing of native vegetation has been ongoing since the arrival of European settlers. Limited areas of native vegetation remain within the detailed investigation area. These are classified as Shale Hills Woodland, Shale Plains Woodlands and Alluvial Woodland, as presented in **Table 4-2**.

Table 4-2 Native vegetation types within the detailed investigation area and corresponding landform

Native vegetation type	Description
Shale Hills Woodland	The characteristic vegetation of this community includes: canopy species Grey Box (*Eucalyptus moluccana*), Narrow Leaved Ironbark (*Eucalyptus crebra*) and Forest Red Gum (*Eucalyptus tereticornis*); understory species Hickory Wattle (*Acacia implexa*), Blackthorn (*Bursaria spinosa*) and Giant Hop Bush (*Dodonaea viscosa*); and ground species Kangaroo Grass (*Themeda australis*), Kidney Weed (*Dichondra repens*), *Desmodium varians* and Weeping Meadow Grass (*Microlaena stipoides var stipoides*) (Blacktown City Council 2013).
Shale Plains Woodland	Characteristic vegetation of this community includes: canopy species such as Spotted Gum (*Corymbia maculata*), Thin leaved Stringybark (*Eucalyptus eugenioides*), Grey Box (*Eucalyptus moluccana*) and Forest Red Gum (*Eucalyptus tereticornis*); understory species including Blackthorn (*Bursaria spinose*); and ground cover species Kangaroo Grass (*Themeda australis*), Kidney Weed (*Dichondra repens*), *Desmodium varians and* Weeping Meadow Grass (*Microlaena stipoides var stipoides*) (Blacktown City Council 2013).
Alluvial Woodland	Characteristic vegetation of this community includes: canopy species such as Cabbage Gum (*Eucalyptus amplifolia*), Swamp Oak (*Casuarina glauca) and* Forest Red Gum (*Eucalyptus tereticornis*); understory species such as Grey Myrtle (*Backhousia myrtifolia*), White Sally (*Acacia floribunda*) and Coast Myall (*Acacia binervia*); and ground species including Weeping Meadow Grass (*Microlaena stipoides var stipoides*) and Kangaroo grass (*Themeda australis*) (Blacktown City Council 2013).

4.3 Geology

Outcropping sedimentary geological units were deposited during the middle of the Triassic period and are the oldest units with the Cumberland Plain area. Within this sub region, the Wianamatta group dominates the composition occurring throughout the Plain and across the Blue Mountain and Hornsby plateaus. This group includes textures of loam to heavy clay and soils such as fine to medium-grained sandstone, siltstone, claystone and laminate. Underlying this is the sporadic Mittagong Formation and Hawkesbury Sandstone. These generally outcrop on the margins of the Cumberland Plain, with more frequent occurrences along watercourses. Unconsolidated sediments overlay the Wianamatta group of this area. Silty-clay sands have been continuously deposited along the watercourse throughout the Quaternary. Tertiary sediments are located to the south of Richmond and the south of Liverpool and include clay, sand, gravel and volcanic breccia of alluvial and colluvial origins (Tozer 2003) (Walker 1960) (Chapman and Murphy 1989)(Bannerman and Hazelton 1990). Further detail on geomorhoolgy is provded in **Appendix D.**

The construction footprint includes two geological units as follows:

- Quaternary Alluvium, which is located along all four creek channels.
- Bringelly Shale bedrock.

The geological map (**Figure 4-1**) indicates that the alignment may be crossed at two locations by faulting or folding as follows;

- Narellan Lineament: The overall north/south linearity of South Creek suggests that it may be structurally controlled. In addition to this, there are also a number of north east trending tributaries into the South Creek channel, such as Cosgrove Creek, which it has been suggested may be an expression of regional faulting trends.
- Rossmore Syncline: This feature is described as a structural high within the Wianamatta Group. The 1:100,000 Scale Geological map for Penrith shows this feature ending at Elizabeth Drive, just to the east of the intersection with Luddenham Road. However, this feature may extend further north crossing the western end of the construction footprint. If this is the case, then dips in the bedrock in the vicinity of such a feature could be altered and potentially dipping to the west on the western side of this structure (refer JAJV Geotechnical Investigation Plan 2017).

4.3.1 Quaternary Alluvium

Quaternary Alluvium is located along all four major creek channels. These soils typically comprise fine grained sand, slit, and clay fluvial deposits. This alluvium is derived from erosion of Bringelly Shale and may be suited to the preservation of chronologically discrete archaeological deposits.

Sub-surface conditions where this unit is present typically comprise four metres to 10 metres of clayey and sandy soils over Bringelly Shale bedrock. These relatively recent sediments are typically unconsolidated to normally consolidated, and can be of low strength (Jacobs 2017).

4.3.2 Bringelly Shale

Bringelly Shale is the upper member of the Wianamatta Group and comprises interbedded shale, carbonaceous siltstone, siltstone, laminites, fine to medium grained sandstone and rare coal bands.

The Wianamatta Group was deposited during a single, mostly regressive period following subsidence of the Hawkesbury Sandstone alluvial plain. Deposition of sediment continuously during the period resulted in the shoreline progressing eastwards and a vertical accumulation of sediments, beginning with offshore low energy marine muds at the base of the group (Ashfield Shale), which became a shoreline sand deposit (Minchinbury Sandstone), and finally into alluvial plain deposits (Bringelly Shale) (Jacobs 2017).

The Bringelly Shale was deposited in an alluvial plain environment that included swampy organic rich sediments, overbank alluvial clays, channel sands and lake deposits and it comprises differing sedimentary rock types. It is expected that as a single unit, Bringelly Shale will be variable along the alignment with respect to both rock type and as a result, its engineering properties. Sandstone units in particular are often difficult to correlate between exposures and/or borehole information, as they are typically of limited lateral extent due to the sandstone being deposited in discrete alluvial/river channels.

The underlying Minchinbury Sandstone differs to Bringelly Shale in being a relatively thin stratigraphic unit that separates the overlying Bringelly Shale from the underlying Ashfield Shale. The unit comprises fine to medium-grained quartz lithic sandstone comprising more than 15% calcite and high quantities of quartzite, which differentiates it from the sandstones that occur in the Bringelly Shale.

Ashfield Shale which occurs below the Minchinbury Sandstone comprises dark grey to black claystone, siltstone, shale and fine grained sandstone-siltstone laminate (Jacobs 2017).

4.4 Drainage and geomorphology

The most striking geomorphological contrast lies between the flat Quaternary Alluvium valleys of the major creeks in the centre of the project, referred to here for simplicity as the South Creek Valley complex, and the shale slopes and hills. South Creek, and its major tributaries; Cosgroves Creek; Badgerys Creek; and Kemps Creek, are major fourth order watercourses (Strahler stream order system) flowing north. South Creek eventually meets the Hawkesbury River 30 kilometres to the north at Windsor. These interrelated creeks are characterised by relatively flat valleys of Quaternary Alluvium, which contrast with the weathered shale derived soils of the Bringelly Shale geology.

Isolated outcrops of Minchinbury Sandstone are known to occur either side of Elizabeth Drive just south of the construction footprint. The presence of these outcrops enables the axe grinding grooves that were recorded in studies related to the Western Sydney Airport (Haglund 1978 site card for AHIMS # 45-5-215; NOHC 2016:161 site B120 not registered in AHIMS).

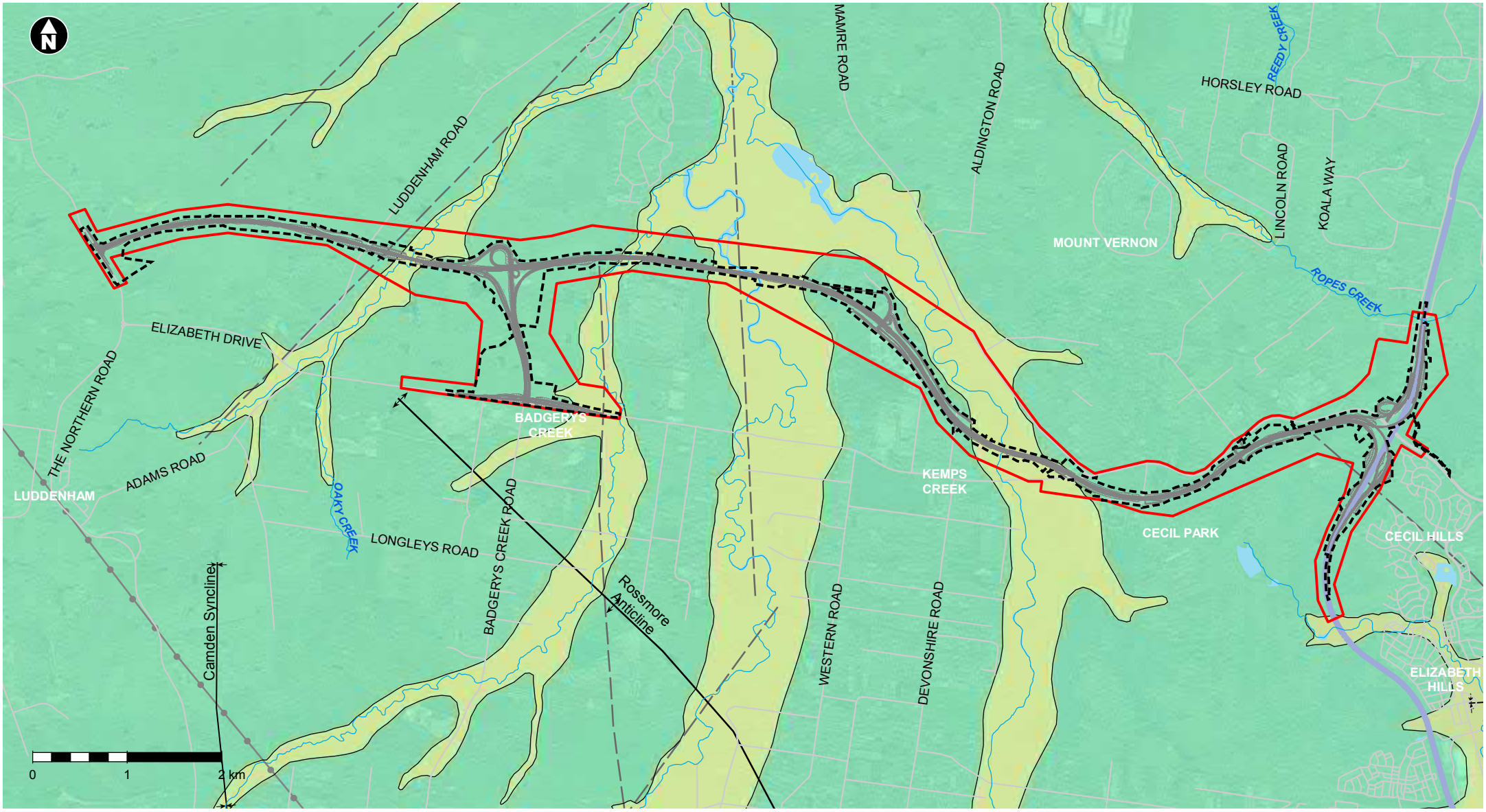
An exposure of the St Marys Formation fluvial soil and gravel was identified in the course of the project in South Creek on the University of Sydney land just south of the concrete bridge over South Creek. The exposure was identified in the eastern creek trench cutting and including large ironstone clasts and silcrete cobbles typical of St Marys Formation exposures typically found on ridge tops in the vicinity of Eastern Creek in the Northern Cumberland Plain at Riverstone and Dean Park. Reddish sandy sediments with silcrete gravel were also found on an archaeologically rich low rise at site South Creek West (SCW). This soil was interpreted as a remnant stump of St Marys Formation.

A separate geomorphological assessment was conducted for the project by Sam Player and is included at **Appendix D**. Player distinguishes the sites as either on residual or depositional soils. He raises the question of whether deep archaeological materials occur in or below depositional clayey sub-soils. His conclusion is reproduced below:

> *Many test pits sampled along the designated route of the M12 motorway were located on residual regolith. They include, the upslope test pits at BCW, the far eastern upslope pits at BCE, the north-south bearing test pit transect at SCW, and all pits at RRD, PCP8, and CHRP. The archaeological consequence for the listed test pits are that no stratification of Aboriginal objects is possible excepting under exceptional and irregular circumstances. All other test pits were situated on depositional landforms. They include test pits at BCW, the test pits on the western rise and open depression at BCE, the test pits bearing east-west at SCW, test pits at SCE, potentially all test pits at KNW (if those not observed are similar in character to the representative sample described here), and test pits at KCW. The archaeological consequence for the listed test pits are that Aboriginal objects may occur stratigraphically and therefore be of high scientific value. Within this group test pits of particular interest include DB300N at KNW and 340E260N at KCW. Both these test pits were composed of coarser materials which make them more reliable for OSL dating, and more likely to have been deposited in more rapid episodes and thereby more likely to preserve the sequence of Aboriginal objects.*
>
> *While the larger quantity of Aboriginal objects are predominantly found in the upper units, however, the South Creek alluvium poses the problem that buried units within the age-range of human habitation of Australia may occur buried at depth, within or below clay units that are usually used as a trigger to cease excavation. The spatial distribution, stratigraphy, and chronology of such buried units are poorly understood but may preserve Aboriginal objects. It is uncertain what the long-term solution to this problem is given that pursuit of deeper targets would increase the cost of archaeological assessment on the South Creek alluvium exponentially. In the short term, some investment in minor but deep geological test trenches or boreholes during archaeological salvage operations would at least increase our knowledge of the deeper substrate.*

The question of whether clay sub-soils are archaeologically sensitive has been raised in relation to archaeological work on Aboriginal sites in the Upper Hunter River valley, 300 kilometre to the north (ERM 2004). In the Upper Hunter, many open stone artefacts sites have been excavated on creek valley floors in mining leases. The soils are typically duplex soil comprising fine silty topsoil changing abruptly to a clay sub-soil derived from colluvial valley fills. Hughes emphasises the impact of the colder and drier climate during the last glacial maximum at around 18,000 years ago resulting in landscape instability and sediment stripping. He argues that topsoils would have been deposited separately after Holocene climate stabilisation to present day conditions. It is feasible that there are different stages of sediment deposition within the South Creek Quaternary Alluvium demarcated by the predominance of clay within the soil fabric at depth, reflecting the older, pre-human era landscape. Clay fabric (particles less than 0.002 millimetres) is derived from the weathering of larger particles and bedrock over a period of time greater than the period of human occupation. It follows that in-situ weathered clay layers are older than human occupation and that in-situ weathered clay sub-soils are not archaeologically sensitive. The process by which artefacts could be incorporated into clay sub-soils is through intrusion into clay cracks, or through bioturbation whereby artefacts move into soil spaces created by plants and animals.

The question of whether deep clayey sub-soils within the Quaternary Alluvium are archaeologically sensitive is not resolved and warrants further investigation, as recommended in this report during salvage excavations.



Detailed investigation area
The project construction footprint
The project

Waterways
Motorway
Main roads

CENOZOIC SEDIMENTARY PROVINCE

Quaternary Alluvium, Qal
Geological boundary, position accurate

PERMO-TRIASSIC BASINS

Anticline
Syncline
Dyke or Vein
Lineament
Bringelly Shale, Rwb

Penrith 1:100,000 Scale Geological Series Sheet 9030, New South Wales Department of Mines, Edition 1, 1991

Figure 4-1 Local geology

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4.5 Landform patterns employed for this investigation

For the purposes of this investigation, four major landform patterns have been identified reflecting variation in topography and soils derived from geomorphological differences (see **Figure 4-2**):

- Luddenham Rolling Hills
- Creek Flats
- Gentle Slopes
- Cecil Hills.

The Luddenham Rolling Hills landscape occurs west of Cosgroves Creek to The Northern Road which follows the watershed ridge between Mulgoa Creek to the west and Cosgroves Creek (South Creek complex) to the east. The Luddenham Rolling Hills is an area of higher relief rising from around 60 metres at Luddenham Road just west of Cosgroves Creek to 100 metres Australian Height Datum (AHD) and 90 metres at The Northern Road. The landscape comprises hills with occasional interspersed first order drainage lines and rare second order drainage lines. Very little ground exposure occurs throughout this area.

The Creek Flats is flat to gently undulating terrain in the central portion of the alignment comprising the Quaternary Alluvial flats of the major creeks which are grouped here as the South Creek complex, namely Cosgroves Creek, Badgerys Creek, South Creek and Kemps Creek. The topography is largely flat with deeply entrenched creek channels and comprises very gentle rises and undulations with broad rounded crests. Ground surface levels along the central portion of the alignment range from 35 metres to 70 metres AHD (Robyn Tuft and Associates, 1997).

The Gentle Slopes landform pattern generally borders the creek valleys and comprises bedrock derived soils on gentle slopes dividing the main creeks of the South Creek complex.

To the east the pronounced relief and steeper slopes of the Cecil Hills landscape comprises a distinctive landscape presently occupied by the Western Sydney Parklands and intersected by the M7 Motorway. This gives way at the far southeast end of the corridor along the M7 Motorway to the incipient Hinchinbrook Creek valley.

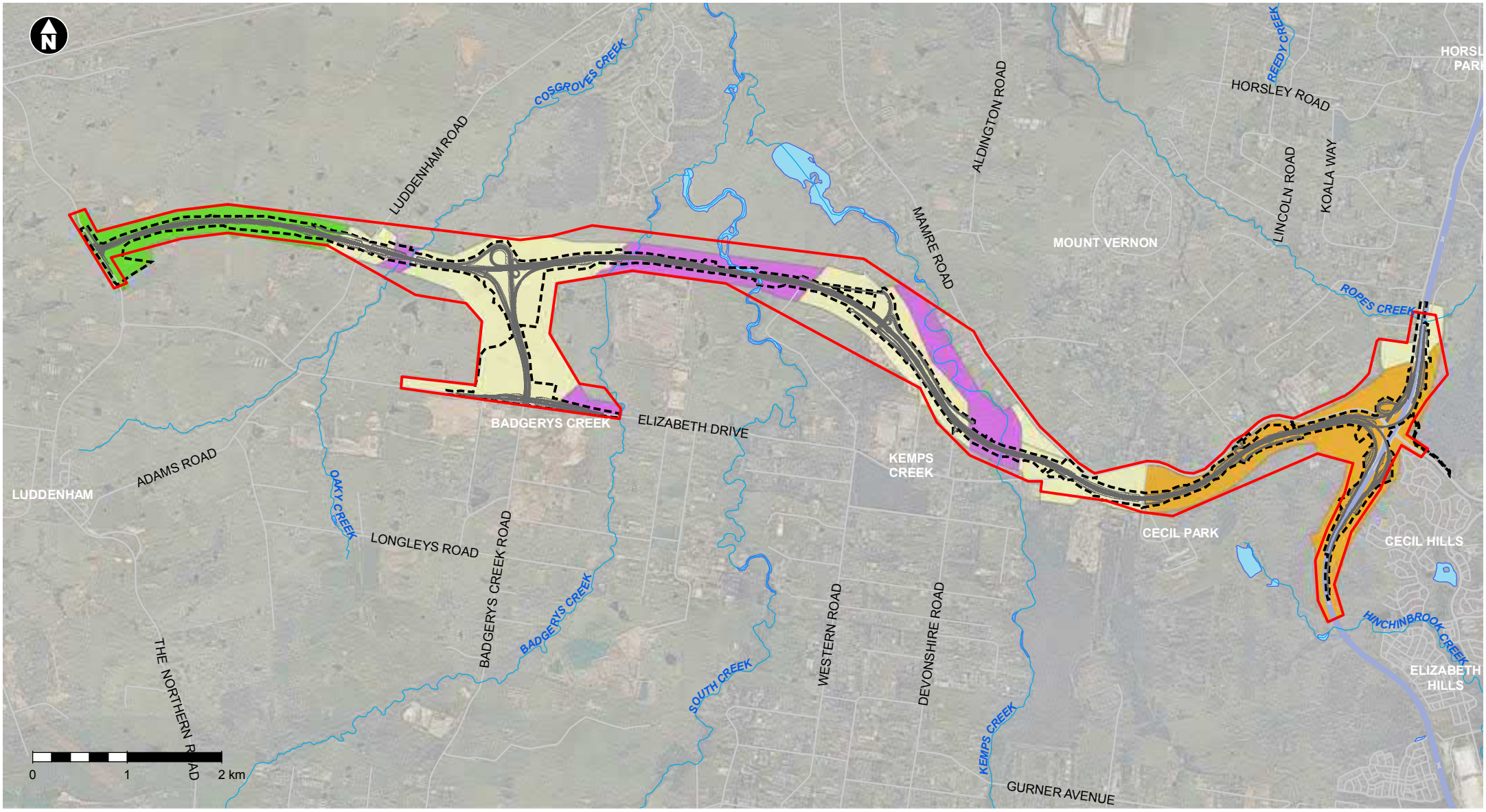
4.6 Soil Landscapes

The detailed investigation area is composed of three main soil landscapes: alluvial South Creek soils located near major creeks; residual Blacktown soils on the low rises and crests; and erosional Luddenham soils on the ridge and hill slopes. The location and extent of each soil landscape is closely related to surface landform and topography and are described in **Table 4-3**.

The Penrith 1:100,000 Soil Landscape Series Sheet 9030 shown in **Figure 4-3** indicates that the residual soils within the detailed investigation area include Luddenham, South Creek, Berkshire Park, Picton, Disturbed Terrain and Blacktown landscape groups (Soil Conservation Service of NSW 1966). The location of these soils landscapes is demonstrated in **Figure 4-3**.

4.7 Archaeological implications

Of key relevance to the archaeological Aboriginal site assessment is the potential for deep archaeological deposits in the Quaternary Alluvium, the inferred focus of past Aboriginal settlement along the South Creek valley complex (ie all creek alluvial valleys), and the possibility of Minchinbury sandstone outcrops, suitable for sharpening stone axes, occurring in the construction footprint.



Detailed investigation area
The project construction footprint
The project

Waterways
Motorway
Main roads

Landform pattern
Cecil Hills
Creek flats
Gentle slopes
Luddenham rolling hills

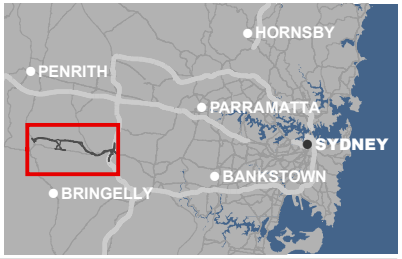


Figure 4-2 Landscape patterns within the detailed investigation area

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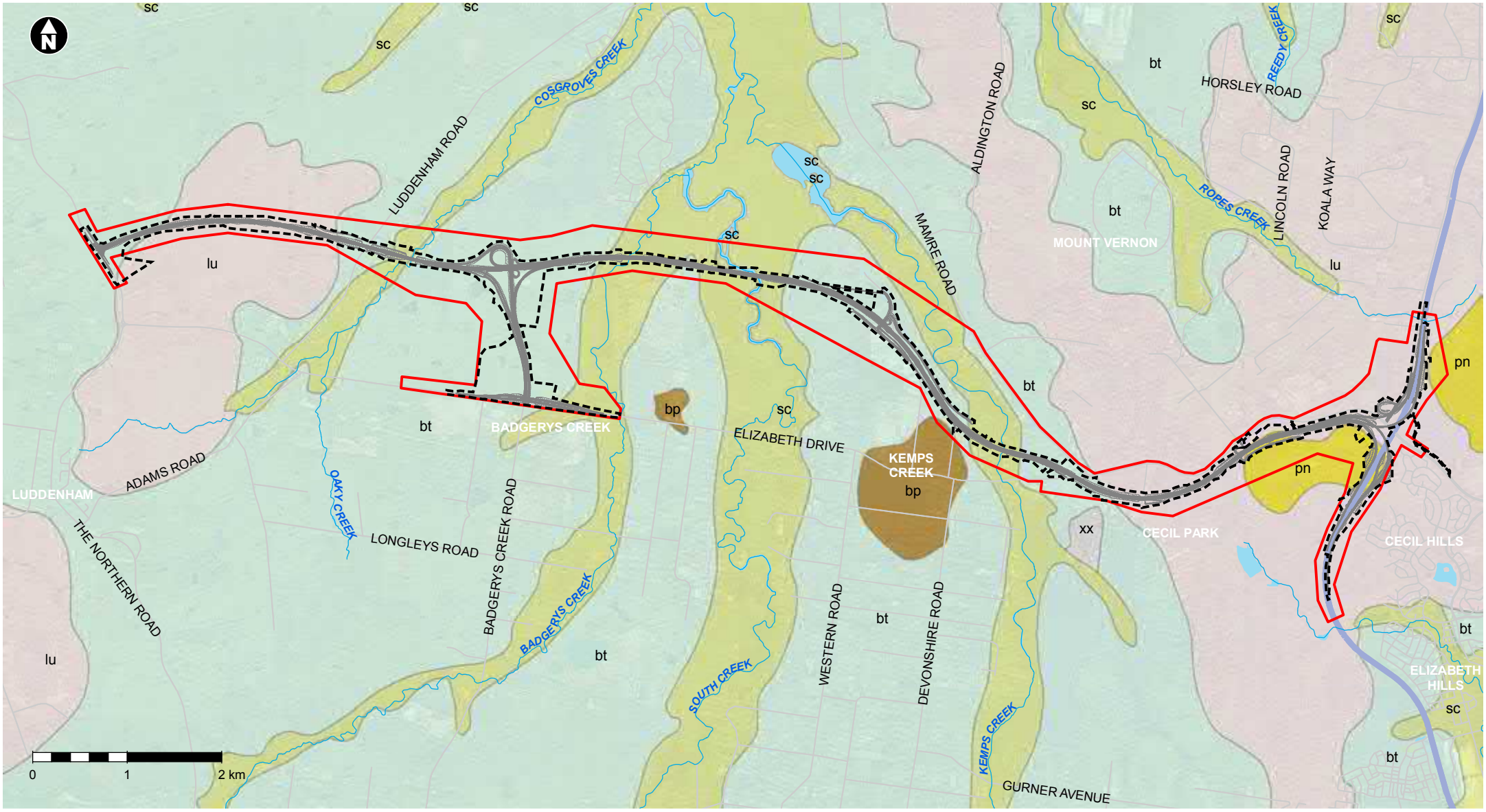
Table 4-3 Soil landscapes underlying the study area

Soil landscape	Landform pattern	Location in relation to project	Description	Specific Characteristics
Luddenham	Luddenham Rolling Hills	Traversing the Luddenham Rolling Hills of the detailed investigation area (approximately 0.68 km north, 2.58 km south either side of corridor). Also, occurring along eastern portion of corridor from northeast are of Mount Vernon to the end of the detailed investigation area at Cecil Park (extending approximately 5.14 km north, 5.68 km south and 4.11 km east).	Luddenham soils are located on the low rolling hills at both ends of the alignment. This soil landscape is derived from Bringelly Shales and is described as shallow to moderately deep, typically comprising clays, and (where Minchinbury Sandstone may be present) sandy clays. Moderately inclined slopes are the dominant landform and, as a result, development limitations included high erosion hazards, together with a high shrink-swell potential and low permeability and low fertility.	Landscape – undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury Sandstone. Local relief 50–80 m, slopes 5–20^0. Narrow ridges, hillcrests and valleys. Extensively cleared tall open forest (wet sclerophyll forest). Soils – shallow (<100 cm) dark podzolic soils (or massive earthy clays on crests; moderately deep (70–150 cm) red podzolic soils on upper slopes; moderately deep (<150 cm) yellow podzolic soils and prairie soils on lower slopes and drainage lines.
South Creek	Creek Flats	Four north-south passageways traversing the detailed investigation area between Luddenham and Kemps Creek with roughly 2 km in between each.	Generally indicated by flat landforms with incised channels, the alluvial South Creek soils are frequently exposed to erosion, aggradation and inundation. Primarily composed of loams and clays, these alluvial soils superimpose bedrock. Fluvial activity may compromise the integrity of archaeological deposits preserved in this landscape. The residual Blacktown soils are generally located on parabolic ridges and their respective slopes. Characterised by a reddish-brown colour these soils facilitate some preservation of archaeological artefacts but the soils acidic nature erodes organics and deflation causes temporal mixing of the stratigraphy and its associated artefacts. Lastly, occurring on moderately inclined slopes, drainage lines and steep hills, Luddenham erosional soil sandscape is characterised by dark podzolic soils. The specific coloration of this soil alternates with respect to location of features, where red soils characterise the upper slopes, yellow soils dominate the drainage lines and lower slopes.	Landscape – found on drainage depressions, valley flats, and floodplains of the channels on the Cumberland Plains. Mainly cleared, generally with occurring with incised channels. Soils – often very deep layered sediments over bedrock or relict soils. Where pedogenesis has occurred structured plastic clays or structured loams in and immediately adjacent to drainage lines; red and yellow podzolic soils are most common terraces with small areas of structured grey clays, leached clay and yellow solodic soils.

Soil landscape	Landform pattern	Location in relation to project	Description	Specific Characteristics
			South Creek soils are located within all four creek channels that cross the alignment. It is described as Quaternary alluvium derived from Wianamatta Group shales that comprise deep sandy, sandy clay and clay soils that were deposited as part of the current active South Creek drainage network. This is a dynamic soil landscape with many areas of erosion and deposition.	
Berkshire Park	Characterised by Gentle Slopes	Towards the centre of the detailed investigation area - two separate areas between Badgerys Creek and Kemps Creek and located south of the detailed investigation area.	Landscape – dissected, gently undulating low rises on the Tertiary terraces of the Hawkesbury/Nepean River system.	Soils – weakly pedal orange heavy clays and clayey sands often mottled. Ironstone nodules common. Large (up to 20 cm) silcrete boulders occur in sand/clay matrix. Solods, yellow podzolic soils, red podzolic soils, chocolate soils, structured plastic clays, structured clays.
Picton	Mapping of landform type was restricted only to include the detailed investigation area and this soil type extends beyond that corridor. Landform type, however, is presumably similar to the majority of the Cecil Hills area which is Cecil Hills.	Towards the eastern end of the detailed investigation area, within the Cecil Park portion of the detailed investigation area and also another area extending to the northeast of the of the detailed investigation area.	In addition to the discussed soil landscapes along the alignment, it is noted that there is an area of Picton soil landscape which is located in the rolling hills immediately to the north of the eastern end of the alignment. This soil landscape occurs on steep side slopes over Wianamatta Group shales usually with a southern aspect and where there are slope gradients $>20^0$. Picton soils are described as shallow to deep residual and colluvial clays. Of particular note for this soil landscape is that a key landscape feature is the potential for mass movement and slope instability, ie land sliding.	Landscape – steep side slopes, Wianamatta Group shale and shale colluvial materials usually with a southerly aspect. Local relief 90–300 m, slope gradients $>20^0$. Extensively cleared tall open-forest. Soils – shallow to deep (50–200 cm) red and brown podzolic soils on upper slopes. Brown and yellow podzolic soils on colluvial material. Yellow podzolic soils on lower slopes and in drainage lines.

Soil landscape	Landform pattern	Location in relation to project	Description	Specific Characteristics
Disturbed terrain	Mapping of landform type was restricted only to include the detailed investigation area and this soil type extends beyond that corridor. Landform type, however, is presumably Gentle slopes which characterised this area	Toward the eastern portion of the detailed investigation area between Kemps Creek and Cecil Park just south of the detailed investigation area.		Landscape – occurs within other landscapes and is mapped in **Figure 4-2**. The topography varies from level plains to undulating terrain, and has been disturbed by human activity to a depth of at least 100 cm. Most of these areas have been levelled to slopes of $<5^0$. The original vegetation has been completely cleared. Soils – the original soil has been removed, greatly disturbed or buried. Landfill includes soil, rock, building and waste material.
Blacktown	Luddenham Rolling Hills and Gentle Slopes.	Predominant soil unit form occurring across most of the detailed investigation area and only excluding those areas where other soil types exist.	Blacktown soils are located on the flat to gently undulating terrain between creek channels and are described as shallow to moderately deep clays and silty clays derived from the Bringelly Shales.	Landscape – gently undulating rises on Wianamatta Group shales. Local relief to 30 m, slopes usually >5%. Broad rounded crests and ridges with gently inclined slopes. Cleared Eucalypt woodland and tall open-forest (dry sclerophyll forest). Soils – shallow to moderately deep (>100 cm) hard-setting mottled texture contrast soils, red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines.



Detailed investigation area
The project construction footprint
The project

Waterways
Motorway
Main roads

PICTON
BLACKTOWN
LUDDENHAM
BERKSHIRE PARK
SOUTH CREEK
DISTURBED TERRAIN

1:100,000 Scale Soils Landscape Series Sheet 9030 , Penrith, Soil Conservation Service of NSW, 1989

Figure 4-3 Soil landscapes within the study area

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5. Cultural context

5.1 Historical

European exploration of the Cumberland Plain began in 1789 and rapidly led to the issue of land grants and settlement by the European colonists. Land grants were issued over areas with the most fertile soils and best forestry resources. Early land grants in the region included 840 acres to James Badgery, 1000 acres to Robert Lowe, 6710 acres to John Blaxland and 1200 acres to D'Arcy Wentworth. The grants and expansion of European settlement displaced Aboriginal people from their land and led to conflict, including the Appin Massacre in 1816 (Karskens 2015).

European settlement transformed the landscape, removing mature trees and introducing stock grazing, cropping, orcharding, and dairying. As populations increased on the Cumberland Plain, land was often subdivided into smaller holdings resulting in more intensive modification of the environment. Land use activities included logging, clearing native vegetation for agricultural purposes, quarrying for clay shale extraction, roads, and excavations for farm dams.

The alluvial flats and slopes along the major creeks, including Cosgroves, Badgerys, South and Kemps Creeks have been used for dairy farming, cropping, horse studs and horse training (Dean-Jones 1991). Large scale excavation and quarrying activities commenced in Badgerys Creek in 1956. There is widespread evidence of illegal historic land uses including the unapproved disposal of construction and industrial wastes.

The northern component of the Elizabeth Drive portion of the detailed investigation area is highly disturbed owing to recent land clearing that stripped the topsoil profile off much of the area. This area has also been used for clay shale extraction since 1969 and more recently, the dumping of building materials and waste.

Historic practices that have disturbed and modified landforms across the detailed investigation area include logging, clearing native vegetation for agricultural purposes, quarrying for clay shale extraction, roads, and excavations for farm dams.

5.2 Ethnohistory

Ethno-historic information about the lives of Aboriginal people on the Cumberland Plain prior to, and since, the first encounters with colonial forces in the late 18th century is far from complete. Information sources include the personal oral histories of Darug descendants and other long-term residents and the journals, diaries and official reports of the colonists.

A historical reference to Aboriginal people that specifically relates to the study area comes from George Caleys, who observed burning practices, the presence of huts, and walking trails. The remainder of the information below draws upon the broader Sydney region as described by anthropologists, historians and archaeologists such as Kohen (1986), Goodall and Cadzow (2009), Attenbrow (2010), and Irish (2017).

During the early years of British settlement many of the areas around Sydney Cove were surveyed for settlement, including Botany Bay, Rose Hill (Parramatta), Broken Bay, Prospect Hill, and the Hawkesbury, Nepean and Georges Rivers (Attenbrow 2010). Most accounts of the Cumberland Plain and wider Sydney area were produced by explorers, army officers and surveyors. Their accounts are not necessarily accurate or objective reflections of encounters with Aboriginal people (Barralier 1897; Hunter 1793; Tench 1788; Tench 1793).

During the initial phase of exploration there was minimal interaction between the colonists and Aboriginal groups, however as more settlers entered the regions beyond the established settlements of Sydney camps interactions became increasingly frequent and adversarial. Conflicts intensified between 1812 and 1816 as military expeditions were sent throughout the Sydney area (Attenbrow 2010; Australian Museum Consulting 2014; GML 2007).

There is less information in the early historic accounts about the lifestyle of Aboriginal people on the Cumberland Plain that for the more coastal parts of Sydney. The major reason for the paucity of historic accounts is the scale and rapidity of mortality as a result of the epidemics that swept through the Aboriginal population of the Cumberland Plain before they were in regular contact with the colonists. At least two waves of smallpox are recorded, the first in 1789 and another in the late 1820's. It is estimated that half of the Aboriginal population of the Sydney region was lost in the first epidemic (Turbet 1989).

The social disruption that must have accompanied this extraordinary loss of life was followed by the rapid dispossession of traditional lands across the Cumberland Plain. The first excursion of the British as far west as Parramatta took place in 1788. A party led by Watkin Tench had ventured as far west as the Nepean River by 1789.

The agricultural potential of the fertile soils on the Wianamatta shales was immediately apparent and the Cumberland Plain was quickly divided into a series of land grants. Early land holdings in the immediate vicinity of the study area included the 1806 grant of 640 acres to James Badgery on the southern side of Elizabeth Drive, and the 1813 grant to John Blaxland of 6,710 acres between Badgerys Creek and the Nepean River.

The scale of impacts on the Aboriginal occupants of the Cumberland Plain means that almost all recorded observations were of a society adjusting to rapid and severe change. Furthermore, the observers carried their own inherent biases and limited understanding of what they were observing. For these reasons the ethno-historic picture of Aboriginal life that can be extracted from the ethno-historic data is limited and cannot represent the complexity or richness of social, spiritual or economic activities that took place in the study area.

Matthews suggested that following the major epidemics in the late 18th and early 19th centuries that surviving Darug responded to the loss of life by consolidating into a South Creek group.

Darug descendants continued to live and practice cultural activities on several properties in the South Creek catchment. Three such properties, Exeter Farm on Badgerys Creek (AHIMS site card 45-5-215), Mamre Farm at Orchard Hills and the Macarthur farm at Mulgoa are located within fifteen kilometres of the study area.

5.2.1 Social organisation and language groups

The first level in the social hierarchy of Aboriginal groups of south-eastern Australia was the individual families who occupy and move throughout their traditional lands. Related families form bands who regularly come together for social, ceremonial and economic activities. Clans are likewise defined by descent and shared language, cultural practices and land. European interpretations of clan names were often adopted as place names in Sydney and more broadly across Australia. The languages spoken by clan members would generally share common elements with those of adjacent clans. Language groups or tribes form the highest level of related structure.

Attenbrow (2010) describes four language groups around the study area:

- Darug, coastal dialect/s – the Sydney Peninsula (north of Botany Bay; south of Port Jackson, west to Parramatta), as well as the country to the north of Port Jackson, possibly as far as Broken Bay
- Darug, hinterland dialect — on the Cumberland Plain from Appin in the south to the Hawkesbury River in the north; west of the Georges River, Parramatta, the Lane Cove River and Berowra Creek
- Dharawal — from south side of Botany Bay, extending south as far as the Shoalhaven River; from the coast to the Georges River and Appin, and possibly as far west as Camden
- Gundungurra — southern rim of the Cumberland Plain west of the Georges River, as well as the southern Blue Mountains. Attenbrow (Attenbrow 2010, p. 34)

Attenbrow's analysis suggests that the study area falls within the traditional lands of the Darug language group.

People from adjoining language groups could generally understand one another and shared common items of vocabulary. After observing exchanges between his Aboriginal companions from Port Jackson and a group of Darug they met near the Nepean River, Trench noted *'Although our natives and the strangers conversed on a par and understood each other perfectly, yet they spoke different dialects of the same language; many of the most common and necessary words used in life bearing no similitude, and others being slightly different'* (Tench 1788).

5.2.2 Subsistence

Most of the historical accounts of encounters with the Darug refer to differences between how Aboriginal people lived in coastal and inland Sydney. Attenbrow (2010, p. 63) notes that *'The local groups themselves also acknowledged differences between coast and hinterland in customs and subsistence practices. The coastal people called those of the hinterland 'climbers of trees, and men who live by hunting'. British colonists referred to people living in the hinterland as 'woods' people.'*

During his initial trip to Parramatta in 1788 Phillip '*reported sighting bark huts, fire-places and the results of plant collecting and hunting activities (fern roots, shells, animal bones and the fur of a 'flying squirrel' [possum], scarred and burning trees*' (Attenbrow 2010, p. 47).

The following year Tench travelled as far west as the Nepean River, probably in the vicinity of Windsor. His account refers to marks in the trees which he attributed to Aborigines climbing to catch 'squirrels'. Tench describes squirrel traps as '*a cavity of considerable depth, formed by art, in the body of a tree. When the Indians in their hunting parties set fire to the surrounding country (which is a very common custom) the squirrels, opossums and other animals that live in trees, flee for refuge in these holes, whence they are easily dislodged and taken*.' (Tench 1788).

The term squirrel has been interpreted as referring to Brushtail and/or Ringtail Possums, however, given the reference to opossums and the smaller size and faster movement of squirrels, it may also refer to one of several species of glider that occurred on the Cumberland Plain. In either case, it was clear that arboreal fauna formed part of the diet of the Darug.

The importance of arboreal fauna such as gliders, possums, birds and honey for the Darug is reinforced by the climbing skills demonstrated in a later encounter with Tench. While searching for the juncture of the Hawkesbury and Nepean River, Tench's party met a man named Gombeeree who gave a climbing demonstration. '*He asked for a hatchet and one of ours was offered to him, but he preferred one of their own making. With this tool he cut a small notch in the tree he intended to climb, about two feet and a half above the ground, in which he fixed the great toe of his left foot, and sprung upwards, at the same time embracing the tree with his left arm. In an instant he cut a second notch for his right toe on the other side of the tree, into which he sprung, and thus, alternatively cutting on each side, he mounted to the height of twenty feet in nearly as short a space as if he had ascended a ladder, although the bark of the tree was quite smooth and slippery and the trunk four feet in diameter and perfectly straight*.' (Tench 1793, p. 112).

Tench's observations on the Nepean included a description of a large trap for catching birds. 'These are formed of underwood and reeds, long and narrow, shaped like a mound raised over a grave, with a small aperture at one end for admission of the prey and a grate made of sticks at the other. The bird enters at the aperture, seeing before him the light of the grate, between the bars of which he vainly endeavours to thrust himself, until taken. Most of these decoys are full of feathers, chiefly those of quails, which showed their utility' (Tench 1793, p. 112). Other local birds which might enter such traps include Painted and Lathams Snipe.

Tench suggests that plant foods and hunting of woodland fauna were the main focus of subsistence on the Cumberland Plain '*What we were able to learn from them was that they depend but little on fish, as the river yields only mullets, and that their principal support is derived from small animals which they kill, and some roots, (a species of wild yam chiefly) which they dig out of the earth'* (Tench 1793, p. 193).

Later accounts recorded a wider range of foods, including yams, fern roots, the fruit of burrawang palms, nectar, honey, possum, kangaroo, wallaby, platypus, water rat, fruit bat, turtle, goanna, snakes, skink, many species of bird, freshwater eel, mullet and shellfish.

The importance of vegetable foods in traditional diets is often understated, however more than 250 edible plants have been recorded in the Sydney region (Attenbrow 2010, p. 40) and several authors commented upon the importance of the yam beds along the alluvial flats. There is strong evidence that yams were actively managed to maintain the viability and productivity of the beds. This involved retaining the upper sections of the rhizome and foliage and replanting them in the established beds. The high quality of the soils in the yam beds saw them targeted by the settlers for their own agricultural purposes (Kohen 1993, p. 63).

Notwithstanding the diversity of recorded and potential food species on the Cumberland Plain, several of the historical sources suggest that subsistence was more arduous in the 'woods' than in the coastal areas where there was an abundance of fish and shellfish. Attenbrow (2010, p. 62) cites Collins (1798) '*The natives who live in the woods and on the margins of the rivers are compelled to seek a different subsistence, and are driven to a harder exercise of their abilities to procure it'*.

While the historical accounts may overstate the difficulties of subsistence on the Cumberland Plain, they do imply that the Darug relied upon woodland resources that were thinly dispersed across the landscape. In this context, seasonally abundant foods, such as yams, burrawang fruit, eels and nesting waterfowl, may have been especially important for ceremonial and social activities. The dispersed distribution of food resources on the Cumberland Plain required high levels of mobility to find low density species and take advantage of seasonally abundant foods. This need for mobility made the Darug vulnerable as their traditional lands were occupied through the early 19th century and they lost access to key resources.

5.2.3 Tools, Weapons and Shelter

The overhangs and rock shelters that provided shelter during inclement weather in the sandstone country are almost entirely absent from the Cumberland Plain. Shelters were constructed from bark over a framework of timber. Trench described huts near the Nepean in 1789 as '*nothing more than a large piece of bark, bent in the middle and open at both ends, exactly resembling two cards set up to form an acute angle'* (Tench 1793, p. 112).

Canoes were critical for access, hunting and fishing along the coast and rivers. This included at least the major waterways of the Cumberland Plain. Tench observed canoes on at least two excursions, the first in 1789 '*We also met with two old damaged canoes hauled up in the beach, which differed in no wise from those found on the sea coast*' (Tench 1793, p. 112).

Ground stone axes were essential for the climbing techniques recorded on the Cumberland Plain as well as for a variety of other woodworking and hunting tasks. Potential sources for the igneous rock types favoured for ground edge axes include the deep gravel beds along the Nepean River as well as more distant basalt quarries near Tamworth and Oberon. Raw materials for flaked stone artefacts are widely distributed across the region. The most commonly used material for stone artefact production was the silcrete gravels associated with the St Marys Formation, which is available at multiple sites including the junction of Cosgrove and South Creeks to the north of the study area.

5.2.4 Land management

Fire provided a powerful tool in the Darug's management of the woodlands of the Cumberland Plain. Selective burning reduced undergrowth and improved access, generated fresh pick to encourage kangaroos and other macropods, synchronised the flowering and fruiting of plants foods such as burrawangs and was used to smoke arboreal fauna from their hollows (eg Tench 1879 as cited above).

6. Predictive model

A review of previous archaeological reports indicated that certain landscapes and landforms in the construction footprint are more likely to contain Aboriginal sites. Predictive modelling was used to determine the archaeological sensitivity of particular landforms, and ultimately the location, extent and sampling strategy for the test excavation methodology and program.

The predictive model is based on a 'land system' or 'archaeological landscape' model of site location (**Table 6-1**). This type of modelling enables the prediction of site location based on known patterns of site distribution in similar landscape regions or archaeological landscapes. Within the construction footprint differing degrees of ground disturbance and development has resulted in fluctuations of archaeological integrity, mainly as a product of alluvial, colluvial, agricultural, urban and industrial processes.

The archaeology of Aboriginal heritage in the Cumberland Plain is primarily found in stone artefact sites associated with watercourses. Three decades of archaeological investigations have established that stone artefacts are typically found within topsoil deposits on shale-based duplex soils. Scarred trees are rarer due to land clearing to increase the agricultural productivity of the land. Sandstone-based sites such as axe grinding grooves and rock shelters with deposits or art are typically found at the margins of the Cumberland Plain. The occurrence of sandstone outcrops with grinding grooves near the construction footprint is a rare exception.

Deep, stratified deposits of stone artefacts in open contexts are documented in sand-filled valleys at the north west margin of the Cumberland Plain at Pitt Town (AHMS 2013) and the shale-sandstone interface area at the Rouse Hill (McDonald 2001), but are less well documented in Quaternary Alluvium on the shale plain. One possible exception is the Caddies Creek site RH/CD12 located 25 kilometres to the north east (McDonald 2001). Comparable evidence closer to the construction footprint is lacking and therefore the potential for such deposits to occur in the construction footprint must be considered a priority for investigation.

Open stone artefact sites will be the primary form of evidence for past Aboriginal occupation. The stone artefact assemblages will reflect Holocene backed artefact technology, likely as a result of the proliferation of such technology about 3,800 years ago (Hiscock 2008). Evidence from excavations on South Creek at Oran Park (ENSR and AECOM 2009) and Rouse Hill (AMBS 2000) point to expansive distributions of artefacts over hundreds of metres with varying densities at different distance thresholds from water, reflecting variation in the mode of activity. Such locations close to reliable water encouraged repeated activity over time, resulting in an accumulation of material (archaeological) evidence through repeated discard. Those studies, particularly the Oran Park study, provided evidence for the lack of sub-surface deposits more than 400 metres from creeks, indicating that isolated artefacts on the slopes and hills away from creeks are not associated with sub-surface deposits, but are simply the results of random discard in the course of traversing the landscape.

Another major theme of Aboriginal archaeological investigations has been the distribution of raw material sources for stone working activities. Two major raw materials were utilised for stone artefact manufacture by Aboriginal people in the past: silcrete and indurated mudstone/tuff (IMT). While the source of IMT is confidently established as the gravels of the Nepean/Hawkesbury River and nearby associated Rickabys Creek gravels, the extent of silcrete sources is still being established. Doelman *et al.* (2015) has described sources across the north Cumberland Plain following the work of Tessa Corkill, but these studies have missed the Luddenham sources of silcrete at the confluence of Cosgroves and South creeks approximately one kilometre north of the construction footprint by Steele (1999b) and excavated by Steele in 2007 (Steele 1999a; Steele 2007). Silcrete typically occurs in the Cumberland Plain as a constituent of the St Marys Formation which includes fluvial sediments and clasts from ancient stranded river deposits. Silcrete thus occurs as cobbles and reference in many archaeological reports to "outcrops" of silcrete in the Cumberland Plain is erroneous. The close proximity of silcrete cobble observed in South Creek by (Steele 1999b, p.44) suggested that it may also occur in the construction footprint and that artefacts may reflect primary reduction from source material. The presence of silcrete within the detailed investigation area was confirmed in the course of this investigation.

At the south east end of the construction footprint the Cecil Hills forms the watershed between the Hawkesbury-Nepean River and the Georges River catchments. This was also the likely interaction zone. Anecdotal evidence points to the discovery of stone artefacts during construction in the cutting for the M7 Motorway through the hills just south of the intersection of the M7 and Elizabeth Drive (Nigel Robinson, Roads and Maritime pers comm July 2017), but no relevant archaeological report has been located, despite attempts to contact the original M7 investigating archaeologist. The hills form a prominent outlook and may have been used to look out over country.

Table 6-1 documents the archaeological predictions that were tested during the survey and excavation program. The detailed information supporting the comments in the outcome column of the table are provided in **Sections 8 and 9** of this report.

Table 6-1 Archaeological predictions

Archaeological prediction	Outcome
Stone artefact deposits will occur within the topsoil in Creek Flats areas within at least 300 m of the major creeks concentrated at the near margins and diminishing in density with increased distance from water	Confirmed by artefact distribution and abundance data
Stone artefact deposits will occur within the topsoil in prominently elevated landforms near, and with good outlook over, the major South Creek complex of creeks, diminishing rapidly in density with increased distance and obstructed outlook over the creek valleys	Confirmed by artefact distribution and abundance data
Stone artefacts are not anticipated to consistently occur in the Luddenham Rolling Hills other than as isolated random finds	Partial confirmation. This landscape unit contains a low but extensive distribution of low density sub-surface stone artefacts
Stone artefacts are not anticipated to occur in the Gentle Slopes rising from the creek valleys more than 300 m from the major creeks other than as isolated random finds	Partial confirmation. These landscapes contain a low but extensive distribution of low density sub-surface stone artefacts
Stone artefacts may occur in an unknown density and unknown extent on the highest of the Cecil Hills adjacent the M7 motorway, but this may be limited to areas of suitable outlook over adjacent country	Confirmed. The distribution of sub-surface artefacts appears strongly focused at the crest of the main southeast facing ridge at Cecil Hills
Stone artefacts are not anticipated to consistently occur through the Cecil Hills steeply sloping landscape other than on the eastern high outlook area	Confirmed. Testing in the Cecil Hills landform demonstrated a highly discontinuous distribution of stone artefacts.
The greatest proportion of flaked stone artefacts will be made of silcrete followed by IMT and then small proportions of quartz, quartzite, petrified wood, igneous stone and chert	Confirmed by artefact analysis
Concentrations of artefacts will reflect the manufacturing of backed artefacts, including the flakes (whole and broken), cores and flaked pieces. Small flakes and flaked pieces will occur in low density distributions	Potential confirmation. A high density concentration of flakes was tested on the eastern bank of South Creek and appears to be the primary reduction of cobbles. The recovered flakes are not necessarily associated with the production of backed blades.
Stone artefact in surface ground exposures will be of relatively low density compared to associated sub-surface deposits surface material may reflect low artefact densities	Confirmed by artefact distribution and abundance data
Grinding grooves may occur on suitable outcrops of Minchinbury Sandstone	Confirmed outside the construction footprint. No sandstone outcrops identified during the survey
Scarred trees may occur sporadically across the wider landscape, although these sites are rare in the Cumberland Plain and many naturally scarred trees are misidentified by some site recorders	Confirmed outside the construction footprint. No scarred trees identified during the survey

7. Archaeological survey

This chapter details the archaeological survey, strategy, methodology and results.

7.1 General aims and method

The aim of the archaeological survey was to identify and record Aboriginal objects, sites and PAD within the construction footprint. This helped to inform strategies for avoiding and/or mitigating potential harm to Aboriginal sites.

The survey involved the inspection of previously registered Aboriginal sites located within or adjacent to the construction footprint. On-site consultation with the nominated site officers from the Deerubbin LALC (for areas north of Elizabeth Drive) and Gandangara LALC (for areas south of Elizabeth Drive) and the Roads and Maritime Aboriginal Heritage Officer enabled the development of recommendations for further assessment (such as further investigation and test excavation) and management.

Survey of the construction footprint was conducted on foot and by vehicle, during which notes regarding the ground surface visibility, integrity (land condition) and archaeological sensitivity were taken. All data was recorded on a hand-held GPS and photographs taken. All Aboriginal sites/objects identified during the survey were recorded to a standard required by the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010b). The results of the archaeological survey are presented in **Table 7-3**.

It was acknowledged at the outset of the survey that surface survey was useful for construction footprint familiarisation and development of a test excavation plan. Surface survey is a notoriously inexact method for defining the archaeological record of stone artefact sites within any area of land.

7.2 Timing and personnel

Field surveys were carried out between July and September 2017 with the nominated site officers from Deerubbin LALC and Gandangara LALC. Fieldwork was conducted sporadically due to difficulties in securing access to multiple private land parcels. Details of fieldwork activities and the participation of the nominated site officer are provided in **Table 7-1.**

Table 7-1 Field survey timing and personnel

Date	Jacobs personnel	Sub-consultant	Roads and Maritime personnel	Aboriginal stakeholder involvement
11 July 2017	Andrew Costello (Senior Archaeologist, Jacobs)	Neville Baker (Director – Archaeologist, Baker Archaeology)	Mark Lester Aboriginal Heritage Officer	Steve Randall & Steve Knight (Site Officers, Deerubbin LALC)
12 July 2017	Andrew Costello (Senior Archaeologist, Jacobs)	Neville Baker (Director – Archaeologist, Baker Archaeology)	Mark Lester Aboriginal Heritage Officer	Steve Randall & Steve Knight (Site Officers, Deerubbin LALC)
13 July 2017	Andrew Costello (Senior Archaeologist, Jacobs)	Neville Baker (Director – Archaeologist, Baker Archaeology)	Nigel Robinson - Aboriginal Heritage Officer	Deon McDermott & Shannon Beale-Bogg (Site Officers, Gandangara LALC) Brad Maybury – (CE), Gandangara LALC)
21 July 2017	Andrew Costello (Senior Archaeologist, Jacobs)	Neville Baker (Director – Archaeologist, Baker Archaeology)	Mark Lester Aboriginal Heritage Officer	Steve Randall & Ray Adams (Site Officers, Deerubbin LALC)

Date	Jacobs personnel	Sub-consultant	Roads and Maritime personnel	Aboriginal stakeholder involvement
11 September 2017	Andrew Costello (Senior Archaeologist, Jacobs) and Chelsea Jones (Graduate Archaeologist, Jacobs)	Neville Baker (Director – Archaeologist, Baker Archaeology)	Mark Lester Aboriginal Heritage Officer	Ray Adams (Site Officers, Deerubbin LALC)

7.3 Survey sampling strategy and methodology

Prior to fieldwork, a search of the AHIMS database was conducted for an area encompassing and surrounding the construction footprint. A critical review was conducted to identify AHIMS data inaccuracies from incorrect recorder coordinates and duplicate records.

Relevant past Aboriginal heritage assessment reports were identified and reviewed. Reports most relevant to the present assessment were those where assessment areas overlapped for major road projects along The Northern Road (Kelleher Nightingale Consulting Pty Ltd 2017), the M12 corridor (Navin Officer 2016), or where land development projects occur in comparable landscape settings (Biosis 2016; Steele 2007), most notable of which is the Western Sydney Airport at Badgerys Creek (Haglund 1978; Navin Officer 1997; 2015; 2016).

A GIS mapping project was developed as part of the broader environmental and engineering project, including key environmental characteristics, design features and past archaeological results. These GIS data sets were downloaded to a field GIS collection app on iPad tablets for use in the field to guide survey, and to review and collect data.

Survey was conducted on those properties where access was granted. Survey was conducted in a manner allowing inspection of the ground to confirm either the presence of vegetation cover or to identify ground exposures. Systematic traverses of the entire landscape were considered ineffective due to the heavy vegetation cover in all properties. Identification of surface artefacts was therefore fortuitous rather than reliably representative of the different landscapes. Test excavation is the only reliable method of adequately identifying the extent and character of open stone artefact sites. The primary value of surface survey was to assist in planning for an appropriate test excavation strategy.

The survey method comprises all survey team members walking at a maximum of 20 metre separation allowing inspection of all ground within each property accessed. For certain areas, such as the Western Sydney Parklands in the east, heavy bushland hindered access to any area other than formed trails, bicycle tracks and vehicle tracks. In rare instances, land use resulted in extensive ground exposure providing a representative window into archaeological character as described in the following section.

In accordance with Requirement 5 of the Code (DECCW, 2010:12-14), the archaeological survey adopted a sampling strategy which targeted survey on each distinct landform within a given soil landscape. Where the predictive model identified archaeologically sensitive areas, these landforms were targeted for full survey coverage with an awareness of the likelihood of certain site types potentially occurring within particular landforms. Full coverage of the construction footprint within landforms was undertaken with the nominated site officer from Deerubbin and Gandangara LALC where feasible. The sampling strategy had the following directives:

- Areas of higher visibility and exposures of the ground surface were targeted for particular scrutiny for the presence of midden material or stone artefacts
- All mature trees in the construction footprint were inspected for cultural modification and scarring
- Any area potential rocky outcrops close to waterways were inspected for grinding grooves, waterholes and wells.
- The following details were recorded for each surveyed area:
  - Landform
  - Ground surface exposure and nature of exposure
  - Visibility as a result of vegetation
  - Degree of disturbance
  - Nature of current and historical land use.

AHIMS site recording forms will be completed for any newly Aboriginal site and PAD recorded and these will be submitted to AHIMS.

7.3.1 Effective coverage

Effective coverage is described in EESG guidelines (DECCW 2010b) and measures how much exposed ground was observed as a proportion of the construction footprint. The calculation of effective coverage suggests how “effective” the survey was in detecting archaeological evidence. Effective coverage is provided in **Table 7-2** for each survey unit. The approximate area inspected during the survey is depicted in **Figure 7-1** and **Figure 7-2**

In grassed paddocks there is typically near zero effective coverage. The total effective survey coverage for the construction footprint was 153 hectares, calculated to be 0.02 per cent which is considered to be very low. To address this ineffective surface survey method of assessing Aboriginal archaeological heritage, test excavation is proposed in areas of PAD defined according to the predictive model. The “landform pattern” refers to the four general landform patterns defined for the construction footprint in **Section 4.5** above.

Table 7-2 Effective coverage

Survey Unit	Landscape element	Landform pattern	Survey unit area (m²)	Visibility %	Exposure %	Effective coverage (m²) D = A x B x C	Effective coverage % E = D/(A x 100)
			A	B	C	D	E
1	Very gentle lower slope	Luddenham rolling hills	94,366.00	1.0	1.0	9	0.01
2	Flat	Creek flats	93,031.00	2.0	1.0	19	0.01
3	Slopes and rises	Luddenham rolling hills	1,572,316.00	0.5	1.0	79	0.01
4	Flat	Creek flats	40,246.00	1.0	1.0	4	0.01
5	Flat	Creek flats	439,941.00	5.0	2.0	440	0.10
6	Flat	Creek flats	155,742.00	5.0	5.0	389	0.25
7	Slopes and rises	Gentle slopes	117,559.00	8.0	8.0	752	0.06
8	Slope	Gentle slopes	30,623.00	0.0	0.0	-	0.00
9	Low rise	Gentle slopes	114,174.00	0.0	0.0	-	0.00
10	Flat	Creek flats	109,827.00	1.0	2.0	22	0.02
11	Flat to very gentle slope	Gentle slopes	250,170.00	1.0	1.0	25	0.01
12	Hills	Cecil Hills	1,034,874.00	2.0	0.5	103	0.01
Total			**4,052,869**	**1.8**	**1.9**	**153.5**	**0.02**

The survey units are listed west to east and do not include all land due to access constraints. Notwithstanding the lack of access, PADs could be defined in many areas not accessed based on the predictive model. Approximately five kilometres of detailed investigation area was constrained, including much of the land between The Northern Road and Cosgroves Creek and areas between the South Creek Airfield and Kemps Creek. The M7 Motorway corridor is excluded from this calculation because it is mostly disturbed by motorway construction. A landform summary relating to each landform pattern is included in **Table 7-3**.

Table 7-3 Landform pattern summary

Landform patterns	Landform Area	Area effectively surveyed	% of landform effectively surveyed	Number of sites	Comment
Luddenham rolling hills	1,034,874	103	0.01%	2	Identified in AHIMS/ site card review
Creek flats	838,787	874	0.10%	3	Identified in AHIMS, verified in field
Gentle slopes	512,526	75,263	14.68%	2	Newly discovered in field
Cecil Hills	1,666,682	88	0.01%	2	1 AHIMS record, no artefacts verified; 1 newly discovered in field
Total	**4,052,869**	**76,328**	**1.88**		

7.4 Constraints

The survey was hampered by access restrictions to some private properties. In these instances, survey was conducted through visual inspection from neighbouring properties. Access to all properties requiring archaeological survey was secured in the sub-surface testing phase. Additional survey was undertaken concurrently with sub-surface archaeological test excavations to ensure all areas of PAD and Aboriginal sites within the construction footprint were comprehensively surveyed.

There was thick vegetation in some areas, particularly throughout the Western Sydney Parklands and around the major creeks. The information provided through AHIMS site cards contains several examples of locational errors, sites being recorded twice, or a lack of detail. This pertains to several sites where the site record forms are too limited in detail to accurately relocate the sites.

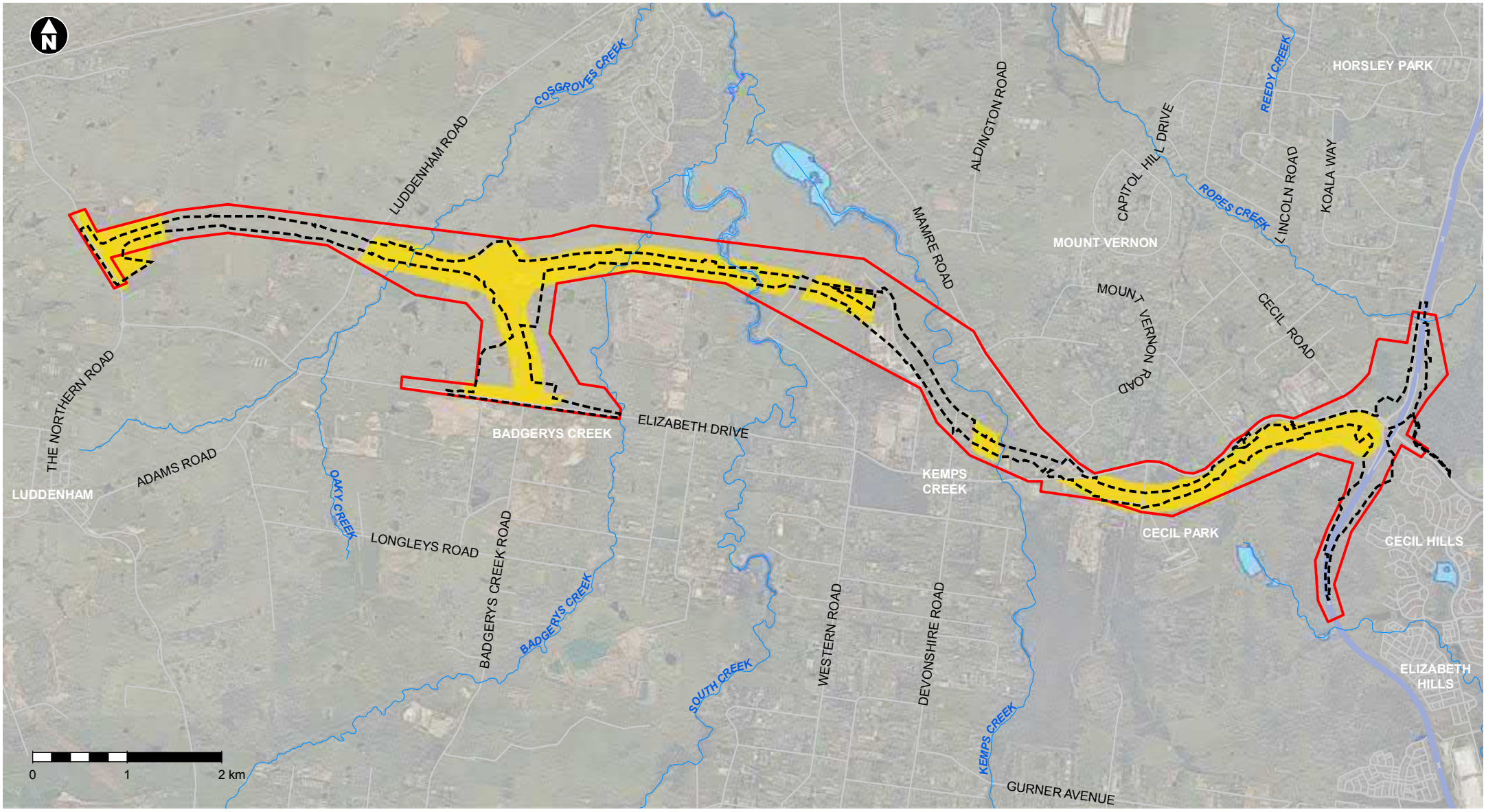
7.5 Results of archaeological survey

7.5.1 Additional stone artefact sites

Four additional Aboriginal archaeological sites were identified within the detailed investigation area during the archaeological survey, however after further investigation only one site, located within the construction footprint, was considered to have potential archaeological value; M12-AS-03 (AHIMS 45-5-4935; **Table 7-4**). This increased the number of registered stone artefact sites in the construction footprint from eight to nine.

Table 7-4 New stone artefact sites

AHIMS ID	Site Name	Assessment area	Site type
45-5-4935	M12-AS-03	Cecil Park	Stone artefact site



Detailed investigation area

The project construction footprint

Waterways

Motorway

Main roads

Survey coverage areas

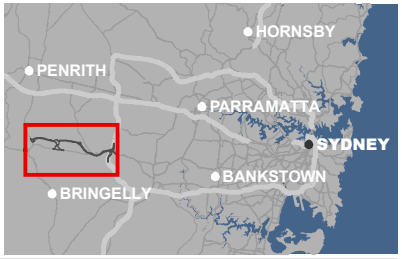


Figure 7-1 Survey coverage

Date: 3/07/2019 Path: J:\IE\Projects\04_Eastern\IA145100\08 Spatial\GIS\Directory\Templates\MXDs\Figures\EIS\SpecialistReports\AbHeritage\AAR\FinalEIS\JAJV_EIS_F005_AbHer_AAR_SurveyCovge_r5v1.mxd
Created by : AA | QA by : JC

7.5.2 Potential Archaeological Deposits

Based on the predictive model, 14 areas of PAD were identified initially to fall within the construction footprint (**Table 7-5**). In some instances, PADs were identified as a sub-surface component of an Aboriginal site where artefacts had been recorded on the surface. For the purpose of further investigation into the distribution and nature of cultural materials within the site the original sites were treated as a component of the PAD.

Most of the PADs are areas extending along watercourses. The PADs along Cosgroves, Badgerys, South and Kemps creeks are defined by the area 300 metres either side of the creek channels. In the case of first order watercourses the buffer only extended 100 metres either side of the drainage line. The PADs named PCP8 and CHRP are exceptions and were defined by their relationship to ridgelines rather than watercourses.

PAD areas have been mapped beyond the boundary of the construction footprint (**Figure 7-2**). However, even this expanded extent probably understates how far they continue along the creek channels and past the mapped boundaries. The continuity of such deposits along watercourses is well demonstrated in other parts of the Cumberland Plain (AMBS 2000, ENSR AECOM 2009).

Table 7-5 shows the 14 PADs that were selected for testing through the excavation program.

Table 7-5 Potential Archaeological Deposits

PAD name	(AHIMS ID)	Assessment area	Landform pattern	Soil landscape
The Northern Road (TNR)	TBC	Luddenham	Gentle Slopes	Blacktown
Cosgroves Creek West (CCW)	TBC	Luddenham	Gentle Slopes	South Creek
Cosgroves Creek East (CCE)*	TBC	Luddenham	Gentle Slopes	Blacktown
Badgerys West B (BWB)	TBC	Badgerys Creek	Creek Flats	Blacktown/South Creek
Badgerys Creek West (BCW)	TBC	Badgerys Creek	Luddenham Rolling Hills	Blacktown
Badgerys Creek East (BCE)	TBC	South Creek	Creek Flats	South Creek
South Creek West (SCW)	TBC	South Creek	Creek Flats	Blacktown/ South Creek
South Creek East (SCE)*	TBC	South Creek	Creek Flats	South Creek
Kemps North West (KNW)	TBC	Kemps Creek	Luddenham Rolling Hills	Blacktown
Kemps Creek West (KCW)	TBC	Kemps Creek	Creek flats	South Creek
Kemps Creek East (KCE)	TBC	Kemps Creek	Creek flats	South Creek/Blacktown
Range Road (RR)	TBC	Cecil Flats	Creek flats	Luddenham
PCP8 (PCP8)	TBC	Cecil Hills	Gentle Slopes	Luddenham
Cecil Hills Ridge PAD (CHRP)	TBC	Cecil Hills	Gentle Slopes	Picton/ Luddenham

** CCE and SCW were further sub-divided into three and two PADs respectively during the excavation program as small scale variations in landform and soil profile became apparent.*

The location of additional AHIMS sites and PADs identified during the survey component of this assessment are shown in **Figure 7-2.**

Figure 7-2 Location of AHIMS sites and PADs identified during survey

Figure 7-2 Location of AHIMS sites and PADs identified during survey

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Figure 7-2 Location of AHIMS sites and PADs identified during survey

8. Archaeological test excavations

8.1 Introduction and aims

The aims of the test excavation were to:

- Identify areas where Aboriginal stone artefacts are present within the soil, the extent of the presence of those artefacts and where they are not anticipated to occur in readily detectable densities
- Identify the variation in artefact density and assemblage content with varying proximity to key environmental features such as watercourse of varying order, prominent landforms associated with creeks
- Examine the potential for culturally stratified deposit in deep Quaternary Alluvium
- Explore artefact assemblages in different landscapes
- Provide archaeological data and interpretation to assess the scientific value of the archaeological sites, and subsequently inform the overall Aboriginal cultural significance assessment for the project, including social value to the local Aboriginal community.

Table 8-1 shows the test locations from west to east. The location of each transect is shown in **Figure 8-1.**

Table 8-1 Test excavation site descriptions

Site	AHIMS #	Landforms	Description
The Northern Road	45-5-3804	Luddenham Rolling Hills	Perpendicular to First Order Creek; contiguous with corrected 45-5-3804 location; vicinity of past ephemeral ponds
Cosgroves Creek West	TBC	Creek Flats	Vicinity of trotting tracks where artefacts have been observed; Localised significant disturbance by trotting tracks
Cosgroves Creek East	TBC	Creek Flats; Gentle Slopes	Transect 1 (T1) east-west Cosgroves Creek to dividing low ridge; Transect 2 (T2) east-west across second-order tributary; Transect 3 (T3) east-west across high ground distant from watercourses
Badgerys Creek West	TBC	Gentle Slopes	Contiguous with site 45-5-4747; along prominent hillocks and low ridge overlooking South Creek Badgerys Creek confluence valley continuous with BCE
Badgerys West B	TBC	Creek Flats; Gentle Slopes	Badgerys Creek floodplain and gentle slopes parallel to, and generally 25 metres north of, Elizabeth Drive
Badgerys Creek East	45-5-0528; 45-5-4750; 45-5-4748	Creek Flats	South Creek floodplain continuous with SCW T1
South Creek West	45-5-0496/45-5-4749; 45-5-0528/45-5-4750	Creek Flats; Gentle Slopes	Transect 1 (T1) east-west; Transect 2 (T2) along low rise north-south parallel to creek
South Creek East	TBC	Creek Flats	Perpendicular to creek
Kemps North West	TBC	Gentle Slopes	Generally parallel to meandering Kemps Creek at varying distances from 140 m to 300 m
Kemps Creek West	TBC	Creek Flats	Transect 1 (T1) parallel to creek at distances varying between 20 m and 55 m; Transect 2 perpendicular to creek
Kemps Creek East	TBC	Creek Flats; Gentle Slopes	T1 perpendicular to creek continuous with KCW T2
Range Road	45-5-4007/45-5-4937	Gentle Slopes	Two intersecting transects; 20 m spacing along drainage line, 40 m spacing perpendicular to drainage line
PCP8	45-5-2308	Cecil Hills	Site name given by original site recorder (Brayshaw); test pits along ridge top by fire trail
Cecil Hills Ridge PAD	45-5-4935	Cecil Hills	Two transects along ridge and down hillslope next to M7 cutting; Contiguous with Site 45-5-4937 M12-AS-03

Figure 8-1 Locations of archaeological test pits

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Figure 8-1 Locations of archaeological test pits

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 8-1 Locations of archaeological test pits

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8.2 Methodology

In accordance with the requirement of Stage 2 of PACHCI, following archaeological survey of the construction footprint, an archaeological methodology was developed. This methodology outlined how further investigations of PADS identified within the construction footprint would be conducted. This test excavation methodology accords with the Code of Practice (DECCW 2010b). As per Stage 3 of PACHCI and SEARs for the project, this methodology was provided along with the survey report to all RAPS and EESG to review and comment.

Archaeological test excavation was conducted to test the predictive model of PADs across the construction footprint. Test excavation was conducted across landscapes on a scale larger than typically undertaken. One transect of pits across the University of Sydney land was nearly two kilometres in length and a series of 200 metres spaced pits across Cosgroves, Badgerys and South creeks was 4.5 kilometre in length.

Due to the scale of the project and necessity to dig by hand under the Code (DECCW 2010b), transects of pits predominantly at 40 metres spacing were dug. The 40 metre interval was chosen as it falls within the distance (50 metres) whereby generally two artefacts may be considered as part of one “site”. This is a not a rule included in legislation or guidelines but is simply a common “rule of thumb” employed by field archaeologists. Artefacts in adjacent pits could therefore be deemed to be part of the same “site” following this rule of thumb. The 40 metre interval was also deemed the most efficient strategy to test large areas within a limited investigation timeframe.

Transects were oriented with the purpose of testing how far from each watercourse artefacts extended. For the most part, artefacts occurred in every part of the landscape tested, and continued to be found at the end of many excavated transects, even where those transects extended beyond standard models of archaeological distribution (200 metres as per the Code). Due to the scale of the project it was not possible to test every dimension of archaeological artefact distribution in relation to creeks. Based on past excavations in comparable contexts, it is safe to infer that artefacts continue along creeks within the same areas as defined by the test excavation transects. For this reason, perpendicular transects of test pits were not placed at every site. To have done so would have required years of archaeological excavation. A limited amount of supplementary excavation would further define artefact extents.

All archaeological test pits were one metre by one metre in dimension dug by hand in 500 millimetres by 50 millimetres quadrants and typically in 100 millimetre spits within soil levels.

A series of larger test pits were dug where later geotechnical testing would take place. These were referred to in the field as “geotech pits” and were typically three metres by one metre in size, with one geotech pit dug two metres by one metre. To abide by the Code, geotech pits were dug as a contiguous set of three one-metre squares (“sub-squares”), each sub-square subdivided into the four quadrants as required under the Code. Each geotech pit was labelled with a unique number provided by the JAJV geotechnical investigation team. In-field use of ESRI ArcMap Geographic Information System software on Apple iPad Pro tablet devices allowed accurate location of these planned geotech pits.

Excavation was conducted by hand employing trowel, hand pick, mattock and spade with wet sieving of all excavated soil through five millimetre aperture screen. Initial pits within each location were excavated in 50 millimetre spits in accordance with the Code (DECCW, 2010) to define variation in topsoil structure. Excavation ceased at the surface of the B Horizon clay-rich layer.

The remaining spits in each quadrant were excavated in 100-millimetre-deep layers. This generated a series of unique 500 millimetre x 500 millimetre x 100 millimetre excavation units. A small labelled plastic bag was prepared from each unit and travelled with the buckets of soil from that unit to the sieve. All finds from that unit were placed in the bag and all bags were retained with and without artefacts inside. All bags were recorded in the field by Neville Baker on an EXCEL spreadsheet, including line entries for empty bags and line entries for each and every artefact within bags.

Artefacts were labelled according to their site, transect and test pit name, quadrant within the pit and spit.

The number of pits at each site, placement of transects and rationale for test excavation are described for each site in **Section 8.6**.

8.3 Constraints

Refinement of the construction footprint resulted in modification of the location of the test pits, and the exclusion of excavation at AHIMS#45-5-4935 which fell outside the construction footprint. Excavation transects were adjusted on site in consultation with the archaeologists and RAPs, and additional archaeological test pits were excavated at several sites (CCE, BCW, SCE, KNW, KCW, KCE, PCP8) where access had not previously been granted, where in-field results warranted additional clarifying test pits or where archaeological material was evident on the ground surface.

The identification of asbestos soil contaminants within a test pit at KCE resulted in the test pit being abandoned and the area quarantined for further ground disturbing work.

8.4 Timing and personnel

Fieldwork for the subsurface archaeological test excavations was conducted between February and June 2018. Fieldwork was conducted sporadically due to the challenges of securing access to multiple private land parcels and inclement weather. Details of fieldwork activities are provided in **Appendix E**.

8.5 Additional surface surveys

While the archaeological survey was conducted across grassy paddocks, the subsequent test excavation was undertaken in a time of drought with reduced vegetation improving ground surface visibility. With improved surface visibility, four stone artefact scatters were discovered that were not visible during the survey, or during the preceding surveys for the strategic route selection study for the project undertaken in 2016.

At each of the four surface scatters (**Table 8-2**) all field personnel walked in evenly spaced lines over a selected area. Artefact locations were marked with flags, the location of which were recorded by GPS and then photographed. Each of the surface scatters fell within site boundaries defined as part of the test excavation.

Table 8-2 Additional archaeological survey results summary

Site	Lot/DP	Exposure dimensions	Number of artefacts	Comment
SCW	21/DP258414	200 m by 80 m	54	Eroding from red soil on low rise SCW T2
KNW	6/DP812284	150 m by 4 m	28	Eroding from trail next to creek
KCW	B/DP102214	10 m by 40 m 80 m by 40 m	16 & 58	Eroding from two salt scalds: 1) SW corner of trotting-track inner dam and 2) next to Kemps Creek
CHRP	3/DP1087825	240 m by 4 m	7	Eroding from fire trail

8.6 Results by site

This section presents data on the density of artefacts, their spatial and vertical distribution within the 13 test excavated sites, and relevant archaeological stratigraphy (or lack thereof) identified through test excavation (**Table 8-3**). These results are presented for each site and then for each of the four landform patterns defined above in **Section 4.5**. The description of artefact assemblages is presented in the following **Section 9**.

The locations of the test excavations for each site are shown in **Figure 8-1**. Section Drawings of the individual test sites are included in **Appendix B**. The refined site polygons for each of these sites are shown in **Figure 8-19**).

Table 8-3 provides details relating to test pit depths and artefact densitites per site.

Table 8-3 Summary of test pit depths and artefact densities by site

Site	Area dug (m²)	Minimum pit depth (mm)	Maximum Pit Depth (mm)	Average Pit Depth (mm)	Artefacts (N)	Maximum density (per m²)	Average density (per m²)	Median density (per m²)
TNR	6 m²	250	300	280	0	0	0	0
CCW	10 m²	280	700	440	69	16	7	8
CCE*	48 m²	50	350	230	141	11	3	3
BCW	13 m²	60	300	170	46	26	4	1
BWB	14 m²	180	700	320	72	24	5	2
BCE	27 m²	160	600	390	219	34	8	5
SCE	17 m²	230	600	350	333	154	20	12
SCW*	28 m²	160	500	360	379	90	14	7
KNW	33 m²	200	550	310	53	10	2	1
KCW	10 m²	200	730	490	53	16	5	3
KCE	12 m²	200	560	360	8	3	1	0
RR	8 m²	130	350	200	9	3	1	1
PCP8	6 m²	100	350	210	6	6	1	0
CHRP	10 m²	100	300	190	16	6	2	1

** Note that for SCW and KCW separate transects in different landform contexts yielded different average and median artefact densities as discussed in **Section 9** below.*

8.6.1 The Northern Road

Site TNR is located within the Luddenham Rolling Hills landscape. It was selected for test excavation because a single artefact, 45-5-3801, had been recorded on a low interfluve rise next to one of the rare unnamed second order watercourses occurring in this landscape.

A total of six archaeological test pits at 40 metre intervals in a single transect were excavated perpendicular to a second order watercourse (**Figure 8-2**). The transect was aligned with the location where a single artefact had been originally recorded as site 45-5-3801 in 1989. A total of six square metres were dug. No artefacts were recovered. This indicates that artefacts are effectively absent from the topsoil at this site.

Excavation was limited to the loam topsoil within a texture contrast soil typical of Luddenham Soil Landscape ending at a noticeably clayey soil boundary. Soils were consistent suggesting the entirely of the transect falls within Luddenham Soil Landscape despite mapping suggesting it crosses into Blacktown Soil Landscape.

The results confirm low archaeological sensitivity within the Luddenham Rolling Hills. Discovery of subsurface Aboriginal objects within this landscape is not expected.

Pit data are included in **Table 8-4**.

Table 8-4 TNR test pits

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
TNR100E	1	REDACTED		Slope	1000×1000mm	0
TNR140E	1			Slope	1000×1000mm	0
TNR180E	1			Slope	1000×1000mm	0
TNR260E	1			Slope	1000×1000mm	0
TNR300E	1			Crest	1000×1000mm	0
TNR340E	1			Slope	1000×1000mm	0

8.6.2 Cosgroves Creek West

A total of seven archaeological test pits at 40 metre intervals in one transect were excavated perpendicular to the west bank of Cosgroves Creek generally east west (**Figure 8-3**). One geotechnical test pit was also excavated at this site. A total of 10 square metres were dug. A total of 69 artefacts were recovered. The most in any one square metre pit was 16. The median number of artefacts per square metre was 8. This indicates that artefacts occur consistently at moderate numbers with occasional concentrations of up to 16 artefacts per square metre.

Excavation was limited to the alluvial silt topsoil and ending at a noticeably clayey soil boundary typical of South Creek Soil Landscape (Quaternary Alluvium). The transect was wholly within South Creek Soil Landscape

Artefacts were distributed throughout the soil profile and no cultural stratigraphy within the pit was identified. The extent of artefact occurrence in test pits demonstrates that artefacts occur consistently in the topsoil up to 250 metres away from the creek at which excavation could not continue due to rural yards and structures. The furthest extent of consistent artefact occurrence was not demonstrated.

Figure 8-2 TNR test pit results

Figure 8-3 CCW test pit results

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The results demonstrate the consistent occurrence of artefacts within Quaternary Alluvium on the western side of Cosgroves Creek which will extend to all unmodified areas within the construction footprint and beyond. Artefact deposit is likely to continue into areas more than 250 metres away from the creek at which point the soil changes to Blacktown Soil landscape within the Luddenham Rolling Hills. The extent of deposit on slopes of Luddenham Rolling Hills landscape should be defined as part of a salvage program.

Pit data are included in **Table 8-5**.

Table 8-5 CCW test pits

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
CCW0E	1	REDACTED		Very gentle slope	1000×1000mm	8
CCW 40E	1			Very gentle slope	1000×1000mm	9
CCW 80E	1			Very gentle slope	1000×1000mm	3
CCW 120E	1			Very gentle slope	1000×1000mm	0
CCW 160E	1			Very gentle slope	1000×1000mm	8
CCW 200E	1			Very gentle slope	1000×1000mm	16
CCW 240E	1			Very gentle slope	1000×1000mm	0
CCW GTTP201	1			Very gentle slope	3000mm×1000mm	25

8.6.3 Cosgroves Creek East

A total of 27 archaeological test pits mostly at 40 metre intervals, with the western extent in 200 metre intervals across high ground to Badgerys Creek, generally in an east-west orientation. The line of pits was divided into three transects (T1, T2, T3) covering different landforms (**Figure 8-4, Figure 8-5, Figure 8-6**). T1 extended for 400 metres from the east bank of Cosgroves Creek to the top of the low spur dividing Cosgroves Creek from a second order tributary. T2 extended for 200 metres either side of the second order tributary, a total of 400 metres. T3 was a 1.2-kilometre-long exploratory transect at 200 metre intervals to see if any artefacts occurred across the high ground dividing Cosgroves and Badgerys creeks. Single artefacts were found at three of the initial six widely spaced pits. Follow-up pits were dug 40 metres from the three artefact bearing pits. Each of the follow up pits yielded artefacts. Seven geotechnical test pits were also excavated at this site. A total of 48 square metres were dug. A total of 141 artefacts were recovered. The most in any one square metre pit was 11 The median number of artefacts per one square metre was three, although see the following analysis chapter for further analysis of each transect This indicates that artefacts occur consistently at low numbers with occasional concentrations of up to 11 artefacts per square metre.

Excavation was limited to the loam topsoil within a texture contrast soil typical of Blacktown Soil Landscape. The transects were wholly within Blacktown Soil Landscape.

Artefacts were distributed throughout the soil profile. The extent of artefact occurrence in test pits demonstrates that artefacts occur consistently in the topsoil over 400 metres away from Cosgroves Creek, consistently more than 200 metres from the second order tributary and sporadically across the dividing gentle slopes and high ground between Cosgroves and Badgerys creeks. The furthest extent of consistent artefact occurrence was adequately demonstrated, and no further exploration is warranted.

Pit data are included in **Table 8-6**.

Table 8-6 CCE test pits

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
CCE OE	1	REDACTED		Gentle slope	1000×1000mm	7
CCE 40E	1			Gentle slope	1000×1000mm	3
CCE 80E	1			Gentle slope	1000×1000mm	6
CCE TP202/ 120E	1			Gentle slope	3000mm×1000mm	6
CCE 160E	1			Gentle slope	1000×1000mm	3
CCE 200E	1			Gentle slope	1000×1000mm	5
CCE 240E	1			Gentle slope	1000×1000mm	3
CCE TP203/280E	1			Gentle slope	3000mm×1000mm	11
CCE 320E	1			Gentle slope	1000×1000mm	1
CCE 400E	1			Gentle slope	1000×1000mm	5
CCE -120E	2			Gentle slope	1000×1000mm	1
CCE - 100E20N	2			Gentle slope	1000×1000mm	3
CCE -80E	2			Gentle slope	1000×1000mm	1
CCE -40E	2			Gentle slope	1000×1000mm	3
CCE 0E	2			Gentle slope	1000×1000mm	5
CCE 40E	2			Gentle slope	1000×1000mm	7
CCE 80E	2			Gentle slope	1000×1000mm	11
CCE 120E	2			Gentle slope	1000×1000mm	1

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
CCE 160E	2	REDACTED		Gentle slope	1000×1000mm	0
CCE 200E	2			Gentle slope	1000×1000mm	1
CCE TP404/ 240E	2			Gentle slope	3000mm×1000mm	4
CCE 400E	3			Very gentle slope	1000×1000mm	1
CCE 600E	3			Very gentle slope	1000×1000mm	0
CCE 800E	3			Ridge top flat	1000×1000mm	3
CCE 840E	3			Ridge top flat	1000×1000mm	1
CCE 1000E	3			Ridge top flat	1000×1000mm	0
CCE 1200E	3			Ridge top flat	1000×1000mm	0
CCE 1400E	3			Ridge top flat	1000×1000mm	3
CCE 1440E	3			Ridge top flat	1000×1000mm	1
CCE 1600E	3			Very gentle slope	1000×1000mm	0
CCE TP204	3			Gentle slope	3000mm×1000mm	13
CCE TP205	3			Gentle slope	3000mm×1000mm	9
CCE TP206	3			Gentle slope	3000mm×1000mm	18
CCE TP401	3			Gentle slope	3000mm×1000mm	7

Figure 8-4 CCE T1 test pit results

Figure 8-5 CCE T2 test pit results

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Figure 8-6 CCE T3 test pit results

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8.6.4 Badgerys West B

A total of 14 archaeological test pits in one 520 metres long transect were excavated at 40 metre intervals generally east-west from a slope down to alluvial floodplain across an entrenched third-order tributary of Badgerys Creek (**Figure 8-7**). The transect was located approximately 20 metres north of, and parallel to, the boundary fence with Elizabeth Drive. A total of 14 square metres were dug. A total of 72 artefacts were recovered. The most in any one square metre pit was 24. The median number of artefacts per one square metre was two. This indicates that artefacts occur consistently at low numbers with occasional concentrations of up to 24 artefacts per square metre.

The transect crossed soil type boundaries at a break in slope from Blacktown Soil Landscape generally around 320E to South Creek Quaternary Alluvium identified in pit 340E. Excavation was limited to the loam topsoil within a texture contrast soil typical of Blacktown Soil Landscape or limited to the alluvial silt topsoil and ending at a noticeably clayey soil boundary typical of South Creek Soil Landscape (Quaternary Alluvium).

Artefacts were distributed throughout the soil profile. The extent of artefact occurrence in test pits demonstrates that artefacts occur consistently in the topsoil up to 360 metres away from the creek. The furthest extent of consistent artefact occurrence was not demonstrated and therefore is anticipated to continue west up the slope for an undetermined distance. Further exploratory excavation is warranted to define the western limits of artefact distribution.

Pit data are included in **Table 8-7**.

Table 8-7 BWB test pits

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
BWB100E	1	REDACTED		Very gentle slope	1000×1000mm	2
BWB140E	1			Very gentle slope	1000×1000mm	10
BWB180E	1			Very gentle slope	1000×1000mm	7
BWB220E	1			Very gentle slope	1000×1000mm	1
BWB260E	1			Very gentle slope	1000×1000mm	2
BWB300E	1			Very gentle slope	1000×1000mm	0
BWB340E	1			Creek flat	1000×1000mm	8
BWB380E	1			Creek flat	1000×1000mm	6
BWB420E	1			Creek flat	1000×1000mm	24
BWB460E	1			Creek flat	1000×1000mm	1
BWB500E	1			Creek flat	1000×1000mm	1
BWB540E	1			Creek flat	1000×1000mm	1
BWB580E	1			Creek flat	1000×1000mm	7
BWB620E	1			Creek flat	1000×1000mm	2

Figure 8-7 BWB test pit results

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

8.6.5 Badgerys Creek West

A total of 10 archaeological test pits in two perpendicular transects were excavated at 40 metre intervals along and down a ridge with minor hillocks overlooking the Badgerys-South creeks interfluvial floodplain to the east (**Figure 8-8**). One geotechnical test pit was also excavated at this site. A total of 13 square metres were dug. A total of 46 artefacts were recovered. The most in any one square metre pit was 26. The median number of artefacts per one square metre was one, reflecting the many test pits with no artefacts. This indicates that artefacts occur sporadically at low numbers with a concentration on a single prominent hillock peak with a distinctly different red sandy topsoil reminiscent of St Marys Formation sediments.

Excavation was limited to the loam topsoil within a texture contrast soil typical of Blacktown Soil Landscape with the exception of the single test pit with red sandy soil described by the project geomorphologist as having fine fluvial gravel components. Given the location on a prominent point of the hillcrest, the material is certainly older than the colonisation of Australia and therefore archaeologically residual. The transect were wholly within Blacktown Soil Landscape.

Artefacts were distributed throughout the soil profile. The extent of artefact occurrence in test pits demonstrates that artefacts occur sporadically in the topsoil in some prominent landforms, but not all, within 160 metres of the creek. The eastern-most site CCE T3 pit was dug just 150 metres west of BCW with no artefacts discovered.

Pit data are included in **Table 8-8**.

Table 8-8 BCW test pits

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
BCW TP111/ -40E	1	REDACTED		Ridge top	3000×1000mm	8
BCW 0E	1			Hillock top	1000×1000mm	26
BCW 40E	1			Ridge top	1000×1000mm	2
BCW 80E	1			Ridge top	1000×1000mm	1
BCW 120E	1			Ridge top	1000×1000mm	1
BCW 280E	1			Ridge top	1000×1000mm	1
BCW 320E	1			Ridge top slope	1000×1000mm	0
BCW 360E	1			Ridge top slope	1000×1000mm	0
BCW 120E 80N	2			Upper slope	1000×1000mm	1
BCW 120E 40N	2			Mid slope	1000×1000mm	0
BCW 120E 0N	2			Flat	1000×1000mm	1

Figure 8-8 BCW test pit results

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8.6.6 Badgerys Creek East

A total of 15 archaeological test pits at 40 metre intervals in one transect were excavated generally east west from the stable floodplain (**Figure 8-9**). Four geotechnical test pits were also excavated at this site. A total of 27 square metres were dug. A total of 219 artefacts were recovered. The most in any one square metre pit was 34. The median number of artefacts per one square metre was five. This indicates that artefacts occur consistently at low numbers with occasional concentrations of up to 34 artefacts per square metre.

Excavation was limited to the alluvial silt topsoil and ending at a noticeably clayey soil boundary typical of South Creek Soil Landscape (Quaternary Alluvium), and in the eastern end on the low rise, limited to the loamy topsoil which typical of Blacktown Soil Landscape. The transect were most within South Creek Soil Landscape with the eastern end defined by a low rise of duplex soil typical of Blacktown Soil Landscape, but with some characteristic of residual St Marys Formation, such as the sporadic occurrence of non-artefactual silcrete gravel and patches of reddish sandy topsoil (see **Appendix D**). The transect crossed soil type boundaries between pits 460E and 500E at a drainage line that included a superficial layer of clay fill derived from runoff from the Waste Depot immediately to the south.

Artefacts were distributed throughout the soil profile. The extent of artefact occurrence in test pits demonstrates that artefacts occur consistently in the topsoil up to 700 metres away from the creek and across the entire Badgerys-South creeks interfluve. There was a broken distribution indicated by the lack of artefact on the western slope of the low rise. This may be explained by the abundance of artefacts on the low rise closer to South Creek, indicating a preference for repeated occupation on the top and eastern part of the low rise facing South Creek. The furthest extent of consistent artefact occurrence was adequately demonstrated and no further exploratory excavation to determine the extent of distribution away from Badgerys Creek is warranted.

The end of the BCE transect was defined as the top of the low rise bordering South Creek at a prominent old eucalyptus tree. The transect was continuous with site SCW Transect 1.

Pit data are included in **Table 8-9** generally in west to east order.

Table 8-9 BCE test pits

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
BCE100E	1	REDACTED		Creek flat	1000×1000mm	18
BCE140E	1			Creek flat	1000×1000mm	4
BCE GTP221	1			Creek flat	3000×1000mm	46
BCE180E	1			Creek flat	1000×1000mm	5
BCE220E	1			Creek flat	1000×1000mm	9
BCE300E	1			Creek flat	1000×1000mm	0
BCE GTP222	1			Creek flat	3000×1000mm	62
BCE340E	1			Creek flat	1000×1000mm	1
BCE380E	1			Creek flat	1000×1000mm	1
BCE420E	1			Creek flat	1000×1000mm	0
BCE460E	1			Creek flat	1000×1000mm	0
BCE GTP223	1			Drainage line	3000×1000mm	11

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
BCE500E	1	REDACTED		Very gentle slope	1000×1000mm	0
BCE540E	1			Very gentle slope	1000×1000mm	2
BCE GTP224	1			Creek flat	3000×1000mm	54
BCE580E	1			Very gentle slope	1000×1000mm	9
BCE620E	1			Ridge top flat	1000×1000mm	2
BCE660E	1			Ridge top flat	1000×1000mm	2
BCE700E	1			Ridge top flat	1000×1000mm	2

8.6.7 South Creek West

A total of 25 archaeological test pits in two transects were excavated predominantly at 40 metre intervals (**Figure 8-10** and **Figure 8-11**). Transect 1 was continuous with the BCE transect oriented generally east-west. Transect 2 was oriented generally north-south along the top of the low rise where surface artefacts were discovered during test excavations due to a reduction in grass cover since initial survey over six months earlier. A single line of pits extended north from SCW T1 100E, with a limited second line of three pits offset by 20 metres to explore the east facing upper slope of the low rise. One geotechnical test pit was also excavated along T1 at this site. A total of 28 square metres were dug, 17 in T1 and 11 in T2. A total of 379 artefacts were recovered. The most in any one square metre pit was 90 on a T2 pit on the low rise where consistently high numbers were found. The median number of artefacts per one square metre was seven, however there are noticeable difference between T1 with a lower median or two and T2 with higher median of 15. This indicates that artefacts occur consistently at high numbers on the low rise but sporadically along T1 near the south bank of South Creek where several deep alluvial test pits yielded no artefacts but next to occasional concentrations of up to 57 artefacts per square metre.

Excavation was limited to the loam topsoil within a texture contrast soil typical of Blacktown Soil Landscape and the alluvial silt topsoil and ending at a noticeably clayey soil boundary typical of South Creek Soil Landscape (Quaternary Alluvium). The transects crossed soil type boundaries from Blacktown duplex soil to Quaternary Alluvium at the eastern base of the low rise between pits 260E and 300E. Along the low rise, a distinct different from reddish sandy topsoil to brown loam topsoil occurred between pits 100E120N and 100E160N. This was the general location where greater numbers of surface artefacts were observed, suggesting erosion from the reddish sandy soil. Natural small angular silcrete gravel fragments were observed in association with the reddish sand, suggesting that it is a stump of St Marys Formation fluvial sediment. This interpretation is consistent with the observation of unmistakable St Marys Formation Gravels and silcrete cobbles 600 metres to the east in the creek trench wall of South Creek.

Test Pit 580E is typical of the South Creek soil landscape and is confirmed as depositional. Aboriginal objects preserved within the landform have a high probability of stratification. However, being the active flood plain of South Creek, Aboriginal sites recovered here would likely be aged only up to a few thousand years. Test Pit 660E diverges from typical characteristics of the South Creek soil landscape because of its position at the immediate left-bank of the channel. Very recent sediments had accumulated there, and the wet environment has assisted preservation of the organics, causing its dark colour (**Appendix D)**.

Figure 8-9 BCE test pit results

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 8-10 SCW T2 test pit results

Figure 8-11 SCW T1 test pit results

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Artefacts were distributed throughout the soil profile. The extent of artefact occurrence in test pits demonstrates that artefacts occur consistently in the topsoil over the low rise and sporadically along the south bank of South Creek. The furthest extent of consistent artefact occurrence was adequately demonstrated.

Pit data are included in **Table 8-10.**

Table 8-10 SCW test pits

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
SCW 100E	1	REDACTED		Creek Flats	1000×1000mm	18
SCWGTP225	1			Creek Flats	3000×1000mm	4
SCW 140E	1			Creek Flats	1000×1000mm	3
SCW 180E	1			Creek Flats	1000×1000mm	27
SCW 220E	1			Creek Flats	1000×1000mm	1
SCW 260E	1			Creek Flats	1000×1000mm	7
SCW 300E	1			Creek Flats	1000×1000mm	7
SCW 340E	1			Creek Flats	1000×1000mm	2
SCW 380E	1			Creek Flats	1000×1000mm	2
SCW 420E	1			Creek Flats	1000×1000mm	0
SCW 460E	1			Creek Flats	1000×1000mm	0
SCW 500E	1			Creek Flats	1000×1000mm	57
SCW 540E	1			Creek Flats	1000×1000mm	0
SCW 580E	1			Creek Flats	1000×1000mm	4
SCW 660E	1			Creek Flats	1000×1000mm	0
SCW 100E 40N	2			Creek Flats	1000×1000mm	15
SCW 120E 40N	2			Creek Flats	1000×1000mm	13
SCW 100E 80N	2			Creek Flats	1000×1000mm	90
SCW 120E 80N	2			Creek Flats	1000×1000mm	15
SCW 100E 120N	2			Creek Flats	1000×1000mm	13
SCW 120E 120N	2			Creek Flats	1000×1000mm	12

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
SCW 100E 160N	2	REDACTED		Creek Flats	1000×1000mm	25
SCW 100E 200N	2			Creek Flats	1000×1000mm	26
SCW 100E 240N	2			Creek Flats	1000×1000mm	22
SCW 100E 280N	2			Creek Flats	1000×1000mm	10
SCW 100E 320N	2			Creek Flats	1000×1000mm	6

8.6.8 South Creek East

A total of 11 archaeological test pits in one transect were excavated generally east west at 40 metre intervals with one pit at 20 metre interval to explore a major concentration near the creek bank edge (**Figure 8-12**). Two geotechnical test pits were also excavated at this site. A total of 17 square metres were dug. A total of 333 artefacts were recovered. The most in any one square metre pit was 154, the highest density encountered during the test excavation. The median number of artefacts per one square metre was 12 This indicates that artefacts occur consistently at moderate numbers with occasional concentrations of up to 154 artefacts per square metre, indicative of knapping floors and quarrying of a nearby silcrete cobble exposure within the South Creek channel 100 m south of the transect. Higher densities are anticipated closer to the silcrete exposure close to the creek bank edge.

Excavation was limited to the alluvial silt topsoil and ending at a noticeably clayey soil boundary typical of South Creek Soil Landscape (Quaternary Alluvium). The transect was wholly South Creek Soil Landscape.

Artefacts were distributed throughout the soil profile. The extent of artefact occurrence in test pits demonstrates that artefacts occur consistently in the topsoil for over 340 metres away from the creek. The furthest extent of consistent artefact occurrence was not demonstrated as the transect could not be extended into a fenced small airfield constructed at the very eastern edge of the alluvial floodplain.

The SCE transect formed the eastern section of a continuous line of test pits extending 4.5 kilometre from the western side of Cosgroves Creek to almost the eastern edge of the Quaternary Alluvium on the eastern side of South Creek.

Pit data are included in **Table 8-11**. The pits are in west to east order.

Table 8-11 SCE test pits

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
SCE 100E	1	REDACTED		Creek flat	1000×1000mm	154
SCE 120E	1			Creek flat	1000×1000mm	39
SCE 140E	1			Creek flat	1000×1000mm	18
SCE 180E	1			Creek flat	1000×1000mm	15
SCETP226	1			Creek flat	3000×1000mm	23
SCE 220E	1			Creek flat	1000×1000mm	15
SCE 260E	1			Creek flat	1000×1000mm	8

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
SCE 300E	1	REDACTED		Creek flat	1000×1000mm	1
SCE 340E	1			Creek flat	1000×1000mm	10
SCE 380E	1			Creek flat	1000×1000mm	4
SCETP227	1			Creek flat	3000×1000mm	38
SCE420E	1			Creek flat	1000×1000mm	2
SCE460E	1			Creek flat	1000×1000mm	7

8.6.9 Kemps Creek North West

A total of 17 archaeological test pits at 40 metre intervals in a single transect were excavated generally northwest-southeast but referred to in the field as south to north (**Figure 8-13**). A total of six geotechnical test pits were also excavated at this site. Thirty-four square metres were excavated producing 53 artefacts. The most in any one square metre pit was 10. The median number of artefacts per one square metre was one. This indicates that artefacts occur consistently in low numbers with occasional concentrations of up to 10 artefacts per square metre.

Excavation was conducted at this location to test the outer limits of what is typically anticipated to be the extent of an artefact distribution associated with a major creek. Meanders of Kemps Creek are located between 150 metres and 300 metres from the transect. Despite this great distance and the gently sloped landform, artefacts were consistently discovered in low densities. The transect of archaeological test pits was 560 metres in length. Three 1 x 3 metres geotech pits were also dug in alignment with the transect, but 280 metres further south east. The results from the geotech pits have been included on the basis of shared landscape context.

Excavation was limited to the loam topsoil within a texture contrast soil typical of Blacktown Soil Landscape. The transect was wholly within Blacktown Soil Landscape.

Artefacts were distributed throughout the soil profile. The extent of artefact occurrence in test pits demonstrates that artefacts occur consistently in the topsoil at distances over 300 metres away from the creek a gently sloping landform.

Figure 8-12 SCE test pit results

Figure 8-13 KNW test pit results

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Pit data are included in **Table 8-12** in order from south east to north west.

Table 8-12 KNW test pits

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
KNW TP237	1	REDACTED		Gentle slope	3000×1000mm	8
KNW TP236	1			Gentle slope	3000×1000mm	5
KNW TP235	1			Gentle slope	3000×1000mm	4
KNW 100N	1			Gentle slope	1000×1000mm	2
KNW 140N	1			Gentle slope	1000×1000mm	4
KNW BH129	1			Gentle slope	1000×1000mm	1
KNW 180N	1			Gentle slope	1000×1000mm	1
KNW 220N	1			Gentle slope	1000×1000mm	1
KNW TP309	1			Gentle slope	1000×1000mm	1
KNW 260N	1			Gentle slope	1000×1000mm	10
KNW 300N	1			Gentle slope	1000×1000mm	4
KNW 340N	1			Gentle slope	1000×1000mm	0
KNW 380N	1			Gentle slope	1000×1000mm	0
KNW TP233	1			Gentle slope	3000×1000mm	5
KNW 420N	1			Gentle slope	1000×1000mm	2
KNW 460N	1			Gentle slope	1000×1000mm	0
KNW TP308	1			Gentle slope	2000×1000mm	0
KNW 500N	1			Gentle slope	1000×1000mm	1
KNW 100E 100N	1			Gentle slope	1000×1000mm	0
KNW TP232	1			Gentle slope	3000×1000mm	3
KNW 100E 140N	1			Gentle slope	1000×1000mm	1
KNW 100E 180N	1			Gentle slope	1000×1000mm	0
KNW 100E 220N	1			Gentle slope	1000×1000mm	1

8.6.10 Kemps Creek West

A total of 10 archaeological test pits at 40 metre intervals in two transect were excavated in and around a trotting track on the western side of Kemps Creek (**Figure 8-14**). A total of 10 square metres were dug. A total of 53 artefacts were recovered. The most in any one square metre pit was 16. The median number of artefacts per one square metre was three. This indicates that artefacts occur consistently at low numbers with occasional concentrations of up to 16 artefacts per square metre close to the creek bank. Very low artefact numbers were found more than 80 metres from the creek.

Excavation was limited to the alluvial silt topsoil and ending at a noticeably clayey soil boundary typical of South Creek Soil Landscape (Quaternary Alluvium). The transects were wholly within South Creek Soil Landscape. The correspondence of the physical regolith properties observed at site KNW to the South Creek soil landscape shows that the profile was depositional rather than residual in contrast to the mapped interpretation. The potential for Aboriginal objects to occur stratigraphically is considered high (**Appendix D**).

Artefacts were distributed throughout the soil profile. The extent of artefact occurrence in test pits demonstrates that artefacts occur consistently in the topsoil up to 260 metres away from the creek. The furthest extent of consistent artefact occurrence was not demonstrated.

Pit data are included in **Table 8-13**.

Table 8-13 KCW test pits

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
KCW 340E 300N	1	REDACTED		Creek flat	1000×1000mm	3
KCW 340E 260N	1			Creek flat	1000×1000mm	13
KCW 340E 220N	1			Creek flat	1000×1000mm	7
KCW 340E 180N	1			Creek flat	1000×1000mm	10
KCW 320E 140N	1			Creek flat	1000×1000mm	16
KCW 320E 100N	1			Creek flat	1000×1000mm	1
KCW 100E 280N	2			Creek flat	1000×1000mm	1
KCW 140E 280N	2			Creek flat	1000×1000mm	2
KCW 220E 275N	2			Creek flat	1000×1000mm	0
KCW 260E 260N	2			Creek flat	1000×1000mm	0

Figure 8-14 KCW test pit results

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

8.6.11 Kemps Creek East

A total of five archaeological test pits excavated at 40 metres intervals in one east-west transect and one cluster on another accessible property (**Figure 8-15**). Three geotechnical test pits were also excavated at this site. A total of 12 square metres were dug. A total of eight artefacts were recovered. The most in any one square metre pit was three. The median number of artefacts per one square metre was zero. This indicates that artefacts occur inconsistently in very low numbers.

Excavation was limited to the alluvial silt topsoil and ending at a noticeably clayey soil boundary typical of South Creek Soil Landscape (Quaternary Alluvium).

Artefacts were too rare to make conclusions about their location within the soil profile. The extent of artefact occurrence in test pits demonstrates that artefacts occur rarely in the topsoil up to 200 metres away from the creek.

Pit data are included in **Table 8-14** order from west to east.

Table 8-14 KCE test pits

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
KCE -25E	1	REDACTED		Creek Flats	1000×1000	0
KCE 20E	1			Creek Flats	1000×1000	3
KCE 60E	1			Creek Flats	1000×1000	2
KCE 100E	1			Creek Flats	1000×1000	1
KCE 140E	1			Creek Flats	1000×1000	2
KCE BH225	2			Creek Flats	1000×1000	0
KCE TP143	2			Creek Flats	1000×1000	0
KCE TP241	2			Creek Flats	1000×1000	0

8.6.12 Range Road

The Range Road site incorporates a previously recorded surface scatter, 45-5-4937. A total of eight archaeological test pits variously at 20 metres and 40 metres intervals in two perpendicular transect were excavated at northwest-southeast and northeast southwest orientations (**Figure 8-16**). Not all planned pits were dug due to low numbers and thus mapped pits may differ. A total of eight square metres were dug. A total of nine artefacts were recovered. The most in any one square metre pit was three and the median number of artefacts per one square metre was one. This indicates that artefacts occur consistently in low numbers with no high-density concentrations.

Excavation was limited to the loam topsoil within a texture contrast soil typical of Luddenham Soil Landscape. Artefacts were too rare to make conclusions about their location within the soil profile. The extent of artefact occurrence in test pits demonstrates that artefacts occur rarely in the topsoil up to 100 metres away from the first order drainage line.

Figure 8-15 KCE test pit results

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 8-16 RR test pit results

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Pit data are included in **Table 8-15**.

Table 8-15 RR test pits

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
RR 40E 140N	1	REDACTED		Very gentle slope	1000×1000	0
RR 80E 140N	1			Very gentle slope	1000×1000	0
RR100E 140N	1			Very gentle slope	1000×1000	1
RR 120E 140N	1			Very gentle slope	1000×1000	3
RR 140E 140N	1			Very gentle slope	1000×1000	2
RR 100E 100N	2			Very gentle slope	1000×1000	2
RR 100E 180N	2			Very gentle slope	1000×1000	1
RR 100E 220N	2			Very gentle slope	1000×1000	0

8.6.13 PCP8

PCP8 is based on a previously recorded site, 45-5-2308. Three test pits were excavated at 40 metres intervals in a single transect in a north south orientation next to an unsurfaced fire trail on a narrow ridge top (**Figure 8-17**). One geotechnical test pit was also excavated at this site. A total of six square metres were dug. A total of six artefacts were recovered. The most in any one square metre pit was five. The median number of artefacts per one square metre was zero. This indicates that artefacts occur sporadically in very low numbers. None of the 11 original artefacts recorded by Brayshaw in 1995 were observed in 2017 or 2018.

Excavation was limited to the loam topsoil within a texture contrast soil typical of Luddenham Soil Landscape. Artefacts were too rare to make conclusions about their location within the soil profile.

Pit data are included in **Table 8-16** ordered from south to north.

Table 8-16 Summary of test excavations at PCP8

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
PCP8 ETP 117	1	REDACTED		Ridgetop flat	1000×3000	0
PCP8 160N	1			Ridgetop flat	1000×1000	5
PCP8 200N	1			Ridgetop flat	1000×1000	0
PCP8 240N	1			Ridgetop flat	1000×1000	1

Figure 8-17 PCP8 test pit results

8.6.14 Cecil Hills Ridge PAD

A total of seven archaeological test pits were excavated at 20 metres intervals in two transects oriented along the ridgetop and down the slope immediately next to the M7 Motorway cutting (**Figure 8-18**). One geotechnical test pit was also excavated 220 metres north of this site but no artefacts found. A total of 10 square metres were dug. A total of 16 artefacts were recovered. The most in any one square metre pit was six. The median number of artefacts per one square metre was one. This indicates that artefacts occur consistently at low numbers.

Excavation was limited to the loam topsoil within a texture contrast soil typical of Picton Soil Landscape. Artefacts were too rare to make conclusions about their location within the soil profile.

The extent of artefact occurrence in test pits demonstrates that artefacts occur consistently in the topsoil along the ridgetop and parts of the slope. The furthest extent of consistent artefact occurrence along the ridgetop was not demonstrated due to ecological constraints. Recorded sites along other parts of the same ridgetop 700 metres to the west (outside of the construction footprint) show a comparable consistent surface exposure of artefacts.

Pit data are included in **Table 8-17**.

Table 8-17 CHRP test pits

Pit name	Transect	MGA Easting	MGA Northing	Landform element	Excavation units (mm)	Artefacts
CHRP TP170	N/A	REDACTED		Lower slope	1000 x 3000	0
CHRP 100E 200N	1			Slope	1000×1000	1
CHRP 100E 180N	1			Slope	1000×1000	0
CHRP 100E 160N	1			Slope	1000×1000	6
CHRP 100E 140N	1			Slope	1000×1000	0
CHRP 100E 120N	1			Slope	1000×1000	4
CHRP 100E 100N	1			Ridgetop flat	1000×1000	3
CHRP 80E 100N	2			Ridgetop flat	1000×1000	1

Figure 8-18 CHRP test pit results

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

8.7 Landform pattern comparison

The research design for this investigation identified four landscapes where differences in soil, topography and drainage may influence archaeological site variability. At the broadest level the landscape model contrasts the depositional Quaternary Alluvium soil in the Creek Flats landscape with residual soils in the Luddenham Rolling Hills, Gentle Slopes and Cecil Hills landscapes. The archaeological distributional results from each of these landscapes compiled in **Table 8-18** demonstrate the higher density and greater archaeological richness of the Quaternary Alluvium Creek Flats landscape.

The paucity of data for the Luddenham Rolling Hills and Cecil Hills landscape reflects that lack of near-creek locations conventionally regarded as archaeologically sensitive warranting test excavation. This lack of data could be addressed by further exploratory excavation to fill this data gap, although in the Luddenham Rolling Hills such work is likely to confirm the absence of archaeological evidence.

The data demonstrates that the Creek Flats were consistently artefact bearing regardless of the distance from the creek. Creek Flats sites which had relatively few test pits without artefacts (roughly one in seven square metres), whereas one in every four test pits in Gentle Slopes sites was without artefacts. The Cecil Hills sites were confined to high ground and, of the two Cecil Hills sites, the CHRP site warrants further investigation as hilltop/ridgetop Aboriginal site occurrence is rare in the Cumberland Plain.

Table 8-18 Landscape comparative density statistics

Landscape	Area dug (m^2)	Median density (per m^2)	Average density (per m^2)	Maximum density (per m^2)	Squares without artefacts	% Squares without artefacts	Artefacts (N)
Creek Flats	118	5	9.8	154	17	14%	1157
Gentle Slopes	102	2	2.2	11	26	25%	225
Cecil Hills	16	0	1.4	5	9	56%	22
Luddenham Rolling Hills	6	0	0	0	6	100%	0

8.8 The sites

The M12 Motorway test excavation program was designed to confirm the presence, distribution and character of sub-surface cultural deposits in PADs. Based on the predictive model, 14 PADs were initially identified within the detailed investigation area however based on differences in landform, soils and archaeological characteristics noted during test excavations, two of the 14 PADs (Cosgroves Creek East and South Creek West) were later sub-divided into three and two separate PADs respectively. Therefore, a total of 17 PAD have been considered within the detailed investigation area and investigation as part of the test excavations.

Extensive sub-surface distributions of Aboriginal flaked stone artefacts were demonstrated in all but one of the tested PAD (TNR PAD). The absence of subsurface artefacts at that location, the TNR PAD near The Northern Road, is interpreted as reflecting a low level of Aboriginal activity in the Luddenham Hills and should no longer be regarded as a PAD.

The process of defining all of the Aboriginal sites that occur within the construction footprint is complicated by:

- Landform scale dimensions of the sites investigated in the test excavation program
- Overlap between certain previously registered sites and the larger boundary of the subsurface distributions defined as sites by this project.

Where previously recorded sites fall within one of the ‘new’ sites they are assessed as part of that larger site. This ensures that all of the cultural materials at the location are assessed in the context of the new information provided by the sub-surface testing program.

Following test excavations, the term ‘Potential Archaeological Deposit’ is no longer used given that the ‘potential’ for archaeological deposit at each test excavation location has now been confirmed or discarded. Therefore, herein only the term ‘Aboriginal site’ or ‘Aboriginal object’ (as part of the impact assessment) is used.

A final number of 19 Aboriginal sites are located within the construction footprint, including:

- CCW
- CCE T1
- CCE T2
- CCE T3
- BWB
- BCW
- BCE
- SCW 1
- SCW 2
- SCE
- KNW
- KCW
- KCE
- RR
- PCP8
- CHRP
- 45-5- 4747 (M12A1)
- 45-5- 3804 (Isolated artefact 4)
- 45-5- 4786 (TNR AFT-14).

An additional seven Aboriginal sites are located outside of the construction area but within the detailed investigation area, including:

- CP AS1
- P-CP9
- PAD-OS-7
- PAD-OS-5
- DLC 2
- M12A5
- KC/ED2.

A detailed description of how recorded Aboriginal sites and PADs have changed, been corrected or been absorbed following results of the field surveys and test excavations into the 'final sites' is shown in **Table 8-20** and **Table 8-19.**

Table 8-19 Aboriginal sites within the construction footprint

AHIMS sites pre-test excavations	PAD as defined by desktop assessment	PAD as refined during excavations	Final sites (shaded)	Comments
Sites within construction footprint				
45-5- 2308			Part of PCP8	Site is located within PCP8 and has been incorporated into that site.
45-5- 3804			45-5- 3804 **(Isolated artefact 4)**	
45-5- 4747			45-5- 4747 **(M12A1)**	
45-5- 4748			Part of BCE	Site is located within BCE and has been incorporated into that larger site.
45-5- 4786			45-5- 4786 **(TNR-AFT-14)**	Single stone artefact, not be relocated during project fieldwork. Site is located within TNR PAD. No other artefacts were discovered in the PAD, therefore site remains as a single stone artefact
45-5- 4007/4937			Part of CHRP	Site was recorded twice with duplicate entry in AHIMS. Site is located within CHRP and has been incorporated into that larger site.
45-5- 0496/4749			Part of SCE	Site was recorded twice with duplicate entry in AHIMS. Site is located within SCE and has been incorporated into that larger site.
45-5- 0528/4750			Part of BCE	Site was recorded twice with duplicate entry in AHIMS. Site is located within BCE and has been incorporated into that larger site.
45-5-4935 (M12-AS-03)			Part of CHRP	Identified during project surveys June-Sept 2017. Site is located within CHRP and has been incorporated into that site.
	TNR PAD	TNR PAD	Not a site	No artefacts were discovered in test excavations in the PAD. As a result the PAD is not considered a site.
	CCW PAD	CCW PAD	**CCW**	
	CCE PAD	CCE T1 PAD	**CCE T1**	The original CCE PAD was divided into 3 separate PADs based on field observations of soils and landforms
		CCE T2 PAD	**CCE T2**	
		CCE T3 PAD	**CCE T3**	
	BWB PAD	BWB PAD	**BWB**	
	BCW PAD	BCW PAD	**BCW**	
	BCE PAD	BCE PAD	**BCE**	Incorporates 45-5- 0528/4750 and 45-5-4748

AHIMS sites pre-test excavations	PAD as defined by desktop assessment	PAD as refined during excavations	Final sites (shaded)	Comments
	SCW PAD	SCW T1 PAD	**SCW 1**	The original SCW PAD was divided into 2 separate PAD based on field observations of soils and landforms
		SCW T2 PAD	**SCW 2**	
	SCE PAD	SCE PAD	**SCE**	Incorporates 45-5- 0496/4749
	KNW PAD	KNW PAD	**KNW**	
	KCW PAD	KCW PAD	**KCW**	
	KCE PAD	KCE PAD	**KCE**	
	RR PAD	RR PAD	**RR**	
	PCP8 PAD	PCP8 PAD	**PCP8**	Incorporates 45-5-2308
	CHRP PAD	CHRP PAD	**CHRP**	Incorporates 45-5- 4007/4937
TOTAL				
9 Registered Sites	**14 PADS**	**17 PADS**	**19 Final Sites** **(within construction footprint)**	

Table 8-20 Aboriginal sites within detailed investigation area (outside the construction footprint)

AHIMS sites pre- test excavations	PAD as defined by desktop assessment	PAD as refined during excavations	Final sites (shaded)	Comments
Aboriginal sites inside detailed investigation area (outside the construction footprint)				
45-5-4374			**CP AS1**	Stone artefact site
45-5-2307			**P-CP9**	Stone artefact site
45-5-2721			**PAD-OS-7**	Stone artefact site: initially a PAD with artefacts discovered in test excavation
45-5-2723			**PAD-OS-5**	Stone artefact site: initially a PAD with artefacts discovered in test excavation
45-5-2563			**DLC 2**	Stone artefact site
45-5-4767			**M12A5**	Stone artefact site
45-5-2310			**KC/ED2**	Stone artefact site
TOTAL				
7 Registered Sites			**7 Final Sites** **(within detailed investigation area)**	

Figure 8-19 Revised site boundaries after test excavation

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 8-19 Revised site boundaries after test excavation

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 8-19 Revised site boundaries after test excavation

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

8.9 Summary

The M12 test excavation program demonstrated that archaeological evidence of Aboriginal occupation is widely distributed across the creek valleys crossed by the construction footprint. The term “Aboriginal site” in conventional use does not adequately convey the size of the areas over which archaeological evidence was revealed by the excavation program.

Test excavation found evidence of Aboriginal settlement in the South Creek valley, camping along Cosgroves, Badgerys and Kemps Creek, activities along minor watercourses and occupation at the eastern margin of the construction footprint on an atypical hilltop location overlooking Darug-Tharawal boundary country. Archaeological evidence is near-absent in the Luddenham hills at the western end of the detailed investigation area, save only for rare single-artefact surface sites.

The sites in the South Creek valley show evidence of stone extraction, primary flaking, stone tool production, artefact use and repeated camping activity in strategic locations such as close to the creek channel, along a central low spur within the Badgerys-South creeks confluence and adjacent hills at the valley floor edge. Further afield from vantage points, a consistent low-density artefact signature reflects resource extraction activity. Present evidence does not suggest cultural stratification of archaeological deposit in deep Quaternary Alluvium valley fill. There is no bimodal distribution of artefacts within alluvium suggesting lower Pleistocene and upper Holocene phases (see **Section 9.7** below) as suggested in deep sand deposits at Pitt Town. The age of the deeper alluvial topsoil is unknown. Dating those deep alluvial topsoils would be a priority for further research in the study area.

Cosgroves Creek is associated with a broad, low density distribution that extends for more than 400 metres from its banks, including low density deposit along minor tributaries and occasional artefacts along the high ground between Cosgroves and Badgerys creeks. Kemps Creek is associated with varying densities along the creek within the Quaternary Alluvium on the western side. Very low numbers of artefacts were found on the residual soils on the eastern side of Kemps Creek.

Test excavation demonstrated the presence of stone artefacts in all but one of the areas where subsurface deposit was predicted. Furthermore, the real extent of artefacts within the topsoil from major creeks exceeded the standard model of Aboriginal site location (200 metres from creeks) by hundreds of metres. The presence of a sparse distribution identified between Cosgroves and Badgerys Creeks may also be present on the Luddenham Hills, however given the lack of permanent water sources it is unlikely to be any sites of significance within the Luddenham Hills landform.

Many of the sites that were recorded from the construction footprint prior to the current investigations have been incorporated into the new sites that have been defined through subsurface archaeological testing. This has been done where the test excavations confirm that an AHIMS registered isolated artefact or artefact scatter is in fact part of a more extensive subsurface distribution of Aboriginal cultural materials. In such cases it is essential that all of the cultural materials at the location are assessed in the context of the new information provided by the sub-surface testing program.

To summarise, following the test excavation program, there are:

- Nineteen Aboriginal sites within the construction footprint
- Seven Aboriginal sites within the detailed investigation area, outside the construction footprint.

These sites have been considered in the following sections.

9. Artefact analysis

9.1 Scope

This section describes the artefacts recovered from each site and comments on technological features. Artefacts were identified and recorded by Neville Baker. Distributional analysis is provided in the previous **Section 8**. A comprehensive technological attribute analysis is not attempted. Such detailed analysis requires larger samples from large open area excavations conducted at the salvage stage of the project.

9.2 Key terms

Site, test pit, unit and technical terms used in artefact analysis are defined in the glossary.

9.3 Database

In the course of test excavation in early 2018 a database was created of all artefacts and relevant stone objects together with provenance information described above. The database was consolidated in Microsoft ACCESS to include Aboriginal flaked stone artefacts as well as a selection of associated shattered stone and gravel relevant to investigating archaeological site formation processes. The dataset included some modern gravel fragments introduced to the site as examples of modern contamination. These are filtered out of the artefact analysis below. At South Creek a selection of natural silcrete gravel fragments was recorded for the purpose of representing the natural silcrete-rich lithology of certain squares.

9.4 Properties of flaked stone artefacts

Aboriginal flaked stone artefacts are identified by reference to morphology and context. These two characteristics are equally important in the accurate identification of a flaked stone object as an Aboriginal stone artefact. It should be acknowledged that stone can bear the evidence of flake removal through natural processes, such as river rolling, or through modern processes, such as machinery impact, hoofed animal impact or through modern people breaking stone intentionally. The original location of the flaked stone provides indicators of the likely cause of flaking. At a high level of description, flaked artefacts can be generally divided into objective pieces (eg cores and retouched flakes) and detached pieces (eg flakes and flaked pieces –(Andrefsky 2005)).

The morphological features of an Aboriginal flaked stone artefact reveal signs of controlled breakage usually, in Australia, through hard hammer percussion. This means that stone of appropriate characteristics, being highly siliceous, homogeneous, isotropic, hard and inert, rigid, elastic (Hiscock 1988:10), is impacted by another hard stone to cause breakage which can be controlled.

Controlled breakage of stone by Aboriginal people in the past occurred predominantly as conchoidal fracture (**Figure 9-1**). Conchoidal fracture is the breakage of stone by cracking from a small ring (a Hertzian initiation) on an outer surface. This leaves a distinctive fracture surface bearing some similarity to a bivalve shell, hence the term “conchoidal” after the Greek word for shell *konche*. In the application of controlled force to a stone to make a flaked stone artefact the detached piece is known as a “flake”. The objective piece bears the negative scar of that flake removal. Important elements in understanding the formation of flakes and their resulting morphology include crack initiation, propagation and termination (Cotterell and Kamminga 1987).

In discussing initiations, reference is made to the “platform” of the flake, being the surface on which the rock is struck to remove a flake. A ringcrack or point of force application (PFA) indicates the area struck by the hammerstone and the commencement of the crack which passes through the stone to detach the flake. A cone of force results from the spread of the crack through the stone much like a stone dropped in still water results in expanding ripples. Sometime the force removes a thin secondary flake called an erraillure flake which appears scale-like on its own.

When the flaking action is well controlled, the crack exits the objective piece, or core, without deviation to produce a sharp crack termination, termed a feather termination. When the flaking action is angled incorrectly, or insufficient force is applied, the termination can form a hinge termination or the partially formed flake can snap off the core at a step termination. Because step terminations are essentially a snapping of the flake through an imbalance of outward force over downward force, they may not be reliably distinguished from laterally snapped flakes. However, a small lip may serve as a basis to distinguish a step termination from a snap.

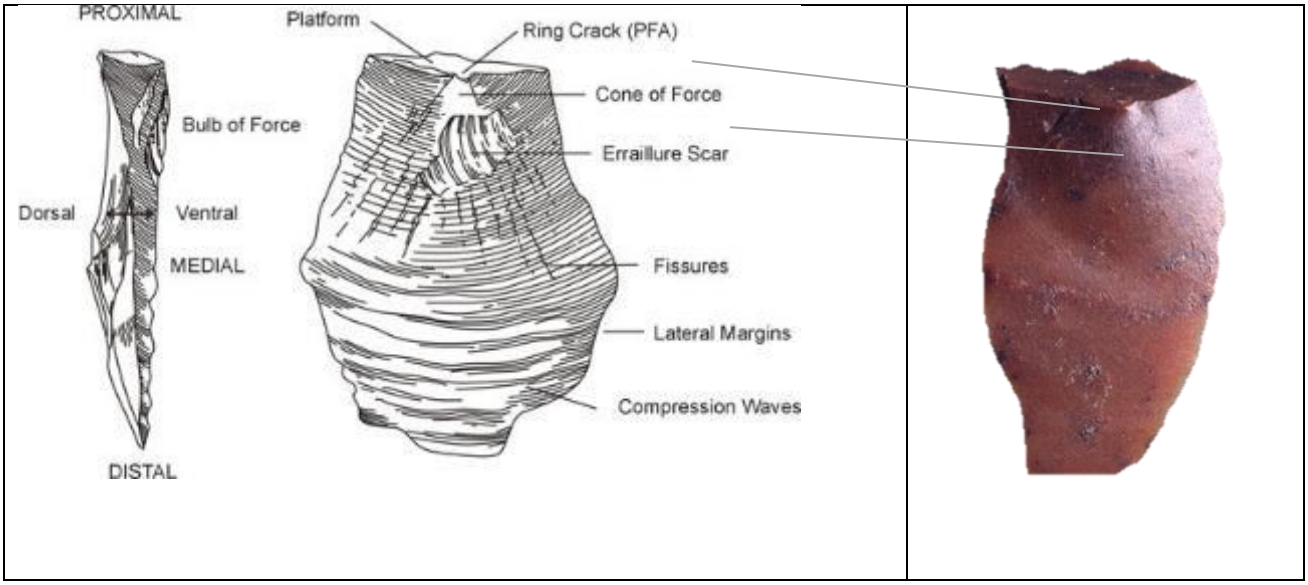

Figure 9-1 Key features of flakes

Source: Clarkson 2007 Fig 3.2 and Holdaway and Stern 2004 Fig 3.1.2 rotated

The above description provides an idealised technological distinction. In practice, flaked stone artefacts can be difficult to discern when found amidst naturally occurring broken stone of the same material. Quartz artefacts are notoriously difficult to distinguish due to the toughness of some quartz, its resistance to forming clear morphological evidence of human flaking and the typical abundance of natural quartz gravel co-occurring with quartz artefacts. A small proportion of artefacts in an assemblage typically comprised “flaked pieces” where fracture surfaces can be partially identified but there is an absence of clear initiations and terminations due to breakage or irregular fracture due to flaws in the rock or internal cracks. Whereas on the majority of flaked artefacts a sequence of flake removals leading up to the last fracture surface can be discerned, such irregularities render it difficult to reconstruct the fracture sequence in some problematic artefacts. These “flaked pieces” are identified on the basis of partial fracture surfaces where the “last ventral surface” cannot be discerned.

Complications in Aboriginal stone artefact identification occur where silcrete occurs naturally and breaks down through weathering to angular fragments. The problems of differentiating natural silcrete gravel fragments from Aboriginal flaked stone artefacts has been discussed at length for Aboriginal sites located at silcrete cobble sources in the Cumberland Plain (Baker 1997). Baker identified the heightened importance of considering context as well as morphological features and recommended a conservative approach to differentiating artefacts from gravel fragments. Naturally occurring silcrete within land subject to modern machinery impacts is known to result in flaked fragments of silcrete, typically with fresh heavy impact scars without evidence for precision in force application.

9.5 General description of all artefacts

A total of 1,509 artefacts (excluding gravel) including culturally informative manuports and shattered fragments of artefact-quality stone were recorded from all sites.

A total of 1,404 flaked and abraded stone artefacts were recorded from all sites. Two abraded artefacts included a hammerstone/anvil and a probable ochre pencil.

For the purpose of ensuing artefact assemblage description, only the 1,404 flaked and abraded artefacts will be discussed, unless otherwise stated. Several implement types are defined within the category “retouched flake”. These implement types include whole, partial fragments and some incompletely backed items of the relevant type.

Table 9-1 All recorded objects including artefacts

Type	Implement	Count
Flake		573
Cone-split flake		12
Proximal flake		73
Medial flake		98
Distal flake		226
Retouched flake		4
	Backed artefact	28
	Elouera	1
	Graver	1
	Scraper	15
	Thumbnail scraper	4
Core		63
Core tool		1
Flaked piece		303
Hammerstone/Anvil		1
Ochre pencil		1
Sub-total -Artefacts		**1404**
Manuport		5
Shatter		100
Gravel		23
Grand Total		**1532**

Artefacts were primarily made of silcrete (64% by weight) comprising silcrete typical of that which occurs as cobbles derived from the St Marys Formation soil. This material has a relatively coarse fabric compared to silcretes from other regional sources. Cobbles are more highly weathered with checks and flaws typical. A source of silcrete occurs within the construction footprint eroding from the South Creek channel trench on the University of Sydney land 100 metres upstream of the concrete bridge over South Creek. A number of large silcrete cobbles were observed at this location in 2018.

A very small proportion of silcrete was a distinctive very light grey relatively flawless material. This is attributed to the Marulan area where silcrete has been observed by Neville Baker on Aboriginal sites in Boral's quarrying operations immediately west of the Bungonia Gorge over 100 kilometre to the south. Source outcrops of comparable material have also been observed by Baker at Tallong on the margin of Bungonia Gorge. Very small proportion of the same silver-grey silcrete was observed by Baker from assemblages he excavated at Oran Park in 2007-2008 (Baker 2009).

Indurated Mudstone/Tuff (IMT) was present in all sites as a consistent secondary material (19% of weight). The same techniques of blade manufacturing technology employing prepared platforms was utilised on both silcrete and IMT materials.

Quartz and petrified wood were present in most sites (3% and 1% by weight respectively). This is typical of all other Cumberland Plain assemblages recorded by Baker over 25 years, although petrified wood is often missed by other analysts and hence rarely features in reports.

Very small numbers of chert and igneous stone fragments occur.

One small fragment of soft orange ochre was recovered from the ridgetop PCP8 site within the hilly Western Sydney Parklands area. This has been interpreted as an ochre pencil.

Table 9-2 Artefact raw materials

Raw Materials	Count	Weight (grams)	% Weight
Silcrete	1038	1991.8	64%
IMT	244	604.9	19%
Quartz	93	108.0	3%
Petrified wood	14	38.2	1%
Quartzite	8	56.0	2%
Chert	2	1.6	0%
Igneous	4	325.4	10%
Ochre	1	1.1	0%
Total	**1404**	**3127.0**	**100%**

9.6 Artefact distribution

Aboriginal stone artefacts were demonstrated to be present at all but one site (“The Northern Road site”: TNR). The TNR PAD does not appear to contain an extensive sub-surface distribution of flaked stone artefacts or other Aboriginal objects. This indicates that it should no longer be considered a PAD. However, AHMIS site 45-5-4786, which was located within the area tested as TNR, remains a valid site comprising a single flaked stone artefact.

Survey and limited test excavation in hilly and ridge areas found rare artefacts and many test pits were dug with no artefacts present. With some exceptions, test pits in the Quaternary Alluvium yielded artefacts, but artefact numbers varied markedly.

Overall, the results demonstrated consistent presence of artefacts in Quaternary Alluvium with minor exceptions. At a landscape level, it is safe to estimate that artefacts are present in all parts of the Quaternary Alluvium within the construction footprint, although the distribution may be patchy, evident in the sporadic occurrence of test pits devoid of artefacts close to South Creek. The standard EESG model of archaeological site distribution stating that areas within 200 metres of creeks are archaeologically sensitive underestimates the extent of artefact distribution associated with the major creek valleys investigated for this assessment, and for other areas of the South Creek valley investigated at a similar scale such as at Oran Park, 16 kilometres to the south (ENSR AECOM 2009). The results of this investigation demonstrate that areas up to 400 metres from major creeks should be considered archaeologically sensitive, with testing of the limits of actual artefact distribution extent beyond 400 metres.

The presence of artefacts on prominent landform elements with good outlook over water and the surrounding country is irregular and cannot be reliably predicted. While there is a marked consistent concentration on a low rise within the South and Badgerys creeks interfluvial valley, prominent elevated slopes and low hills with excellent market garden exposures at the eastern margin of the South Creek valley were surveyed with only a single artefact located. Low hills presenting prominent outlook over the valley from the western side of Badgerys Creek were test excavated with many empty pits and inconsistent densities in those pits with artefacts – including one significant concentration on a hilltop capped with distinctive red sandy fluvial sediment cap.

Artefacts were observed on the tops of ridges within the Cecil Hills area of the Western Sydney Parklands. Artefacts were seen in exposures within recorded sites both within and outside of the construction footprint. An ochre pencil was excavated from the PCP8 site along a ridgetop fire trail. Artefacts, including blade cores indicating knapping activity were excavated from the CHRP hilltop site next to the M7 motorway. The presence of artefacts in these locations cannot be simply explained by the common resource-access motivation behind the standard site location model.

For the CHRP site, the evidence may be explained by a social imperative for security and interaction utilizing the sites' outlook to monitor for the presence of other people while engaged in activities resulting in stone artefact discard.

9.7 Artefacts in stratigraphic context

Aboriginal artefacts were recovered from A horizon topsoil contexts (see stratigraphy in **Appendix B**). No pedological difference was discerned within topsoils, and therefore all excavation proceeded in arbitrary spits through consistent topsoil fabric until the pedological boundary with the B horizon clayey soil was encountered. Where the surface of the underlying clay layer was excavated, no artefacts were found. With some exceptions, artefacts were not visible on the ground surface where they were excavated. Where they were visible, artefact density was significantly less that the densities demonstrated through excavation. Only in areas of market gardening where near 100% surface visibility of deep furrowed exposures were observed could surface observations of artefact absence be considered a reliable indicator of lack of archaeological evidence.

Artefacts occurred throughout the topsoil in residual soils. Of greater interest was the distribution of artefacts in depositional contexts. South Creek Quaternary Alluvium fills the valley floors across the major creeks – Cosgroves, Badgerys, South and Kemps creeks. In some instances the alluvium was nearly one metre deep, and care was taken to retain stratigraphic hygiene in excavation. Select squares from key sites with deep alluvium are displayed in **Table 9-3, Table 9-4, Table 9-5**, **Table 9-6, Table 9-7** and **Table 9-8.**

Many of the deep alluvial pits had very low artefact numbers. Present evidence does not indicate older Pleistocene material overlain by younger Holocene material. For example, the lower artefacts in KCW 340E180N includes a backed artefact, typical of Holocene assemblages. Pit SCW 500E shows a deep concentration at 200 – 300 mm depth with artefacts trailing off to the base of the pit where clay was encountered at 500 mm. The question of cultural stratification deserves further investigation and the South Creek sites have excellent research potential.

Table 9-3 Artefacts in deep alluvium – KCW 340E180N (50 mm spits)

Site	Square	Spit	A	B	C	D	Total
KCW	340E180N	1	0	0	0	0	0
		2	0	0	1	0	1
		3	0	0	2	1	3
		4	0	0	1	1	2
		5	0	0	0	0	0
		6	0	0	0	0	0
		7	0	0	0	1	1
		8	0	0	0	3	3
		9	0	0	0	0	0
Total			**0**	**0**	**4**	**6**	**10**

Table 9-4 Artefacts in deep alluvium – SCW 100E (Quad A only 50 mm spits)

Site	Square	Spit	A (50 mm)	B (100 mm)	C (100 mm)	D (100 mm)	Total
SCW	100E	1	9	1	1	6	17
		2	0				
		3	0	0	1	0	1
		4	0				
		5	0	0	0	0	0
		6	0				
Total			**9**	**1**	**2**	**6**	**18**

Table 9-5 Artefacts in deep alluvium – SCE 180E (Quad A only 50 mm spits)

Site	Square	Spit	A (50 mm)	B (100 mm)	C (100 mm)	D (100 mm)	Total
SCE	180E	1	2	0	0	0	9
		2	0				
		3	1	6	1	0	3
		4	2				
		5	0	0	0	0	0
Total			**5**	**6**	**1**	**0**	**12**

Table 9-6 Artefacts in deep alluvium – CCW 0E (Quad A only 50 mm spits)

Site	Square	Spit	A (50 mm)	B (100 mm)	C (100 mm)	D (100 mm)	Total
CCW	0E	1	0	0	1	0	2
		2	1				
		3	0	1	0	1	2
		4	0				
		5	0	2	0	0	2
		6	0				
		7	0	0	0	0	0
Total			**1**	**3**	**1**	**1**	**6**

Table 9-7 Artefacts in deep alluvium – KCE 140E (Quad A only 50 mm spits)

Site	Square	Spit	A (50 mm)	B (100 mm)	C (100 mm)	D (100 mm)	Total
KCE	140e	1	0	0	0	0	0
		2	0				
		3	0	0	1	0	1
		4	0				
		5	0	0	0	0	0
		6	0				
		7	0	0	0	0	0
		8	0				
		9	0	0	0	0	1
		10	1				
		11	0	0	0	0	0
Total			**1**	**0**	**1**	**0**	**2**

Table 9-8 Artefacts in deep alluvium – SCW 500E (100 mm spits)

Site	Square	Spit	A (100 mm)	B (100 mm)	C (100 mm)	D (100 mm)	Total
SCW	500E						
		1	0	0	0	0	
		2	3	1		0	4
		3	15	8	1	11	35
		4	4	3	8	1	16
		5	0	0	0	2	2
Total			**22**	**12**	**9**	**14**	**57**

9.8 Artefact densities across the landscape

Artefact data from all pits including geotech pits and archaeological pits were aggregated into one square metre totals in order to compare the variation in artefact density between sites where different numbers of test pits had been dug. This analysis allowed comparison of the concentration of past Aboriginal activity in a place, as represented the test pits. **Table 9-9** shows the number of square metres dug at each site, the total number of artefacts and the minimum, maximum, average and median density value per square metre.

Table 9-9 shows the breakdown of sites CCE and SCW into discrete landform samples. Cosgroves Creek East is divided into Transect 1 (CCE T1) which comprised test pits extending 360 metres from the east creek bank to the top of the dividing low ridge from Transect 2 (CCE T2). CCE T2 continued east over the dividing ridge from CCE T1, comprising test pits across a second order tributary watercourse. CCE T3 continued east at 200 metre intervals from CCE T2 across what was considered likely culturally sterile high ground between Cosgroves Creek and Badgerys Creek. When artefacts were found in two pits, pits were dug 40 metres away, also yielding one or more artefacts.

South Creek West lies between South Creek and the low dividing spur (the “low rise”) which extends north into the Badgerys Creek/ South Creek interfluvial plain. SCW T1 comprises the east-west transect between creek and low rise. SCW T2 was a collection of pits extending north from the T1 transect along the top of the low rise, with an additional two offset pits. Surface artefacts and silcrete gravel were noticed eroding from a reddish sandy soil which changed abruptly to a brown topsoil. The low rise exhibited the largest consistent concentration of artefacts.

Table 9-9 demonstrates that the most intensive discard, indicating intensive reduction activity and likely repeated occupation, occurred in the close vicinity of South Creek, particularly near the eastern bank close to the silcrete source, and on the low rise on the western side of the creek. The majority of sites had a low but consistent density of artefacts with rare instances of knapping concentrations usually close to the creek. In contrast the test pit sample near The Northern Road was devoid of artefacts, which indicates that surface sites recorded at the western end of the construction footprint do not warrant further investigation by test excavation.

Table 9-9 Artefact density values for each site/transect

Sites	Area dug (m²)	Total Artefacts	Minimum / 1 m²	Maximum / 1 m²	Average / 1 m²	Median / 1 m²
CCW	10 m²	69	0	16	7	8
CCE T1	14 m²	50	1	7	4	3
CCE T2	27 m²	82	0	11	3	2
CCE T3	7 m²	9	0	3	1	1
BWB	14 m²	72	0	24	5	2
BCW	13 m²	46	0	26	4	1
BCE	27 m²	219	0	34	8	5
CHRP	10 m²	16	0	6	2	1
KCE	12 m²	8	0	3	1	0
KCW	10 m²	53	0	16	5	3
KNW	33 m²	53	0	10	2	1
PCP8	6 m²	6	0	5	1	0
RRD	8 m²	9	0	3	1	1
SCE	17 m²	333	1	154	20	12
SCW T1	17 m²	132	0	57	8	2
SCW T2	11 m²	247	6	90	22	15
TNR	6 m²	0	0	0	0	0
Total	**242 m²**	**1404**	**0**	**154**	**6**	**2**

9.9 Key features at each site

Artefact type proportions were compared to explore differences in assemblage composition between each site. The purpose of this analysis is to identify research potential and not make definitive statements about behavioural differences between sites. Because the sample size varies between sites (see **Table 9-9**), only general subjective inferences were made for the purpose of assessing scientific value. Attention is paid mostly to the relative proportion of cores, representing reduction activity, and retouched artefacts, representing tools.

Several Aboriginal sites occur in close proximity and appear to be associated with a specific landform feature, either creek or a ridgeline. These sites have been considered as part of a ‘site complex’ on the basis of distinctive landform, soils and archaeological characteristics. The grouping of individual sites into site complexes enables all of the cultural materials at a location be assessed in the context of all available information. This is discussed further in **Chapter 10**.

Based on test excavations, five 'site complexes' associated with particular creek systems have been identified within the detailed investigation area, including:

- Cosgroves Creek complex
- Badgerys Creek Upstream complex
- South Creek complex
- Kemps Creek complex
- Cecil Hills complex.

The locations of the complexes are demonstrated in **Figure 9-2**.

The three isolated Aboriginal sites (M12A1, Isolated artefact 4, TNR-AFT-14) are not discussed in the following section because they are isolated artefacts found in disturbed contexts with no associated areas of potential archaeological deposit and are not likely to divulge any additional archaeological or cultural information through analysis or further investigation.

9.9.1 The Cosgroves Creek complex (CCW, CCET1, CCET2, CCET3)

The Cosgrove Creek sites include:

- CCW on alluvium on the western side of Cosgroves Creek
- CCE Transect 1 on residual soils on the eastern side directly opposite CCW
- CCE Transect 2 on residual soils aligned with Transect 1 but east of a low rise and across a second order tributary creek
- CCE Transect 3 on residual soils continuing east over the dividing rise between Cosgroves and Badgerys creeks.

The most striking outcome of the Cosgroves Creek sites results is the discovery of backed artefacts in a context of use-discard in an otherwise very sparse and patchy artefact distribution on high landforms between Cosgroves Creek and Badgerys Creek (**Table 9-10**). Three backed artefacts were found in two pits 400 metres apart. Two conjoining fragments of a single backed artefact were found in different spits of one pit (CCE T3 800E). This is evidence of retouched tools discarded in a context of use within the dispersed activity zone of a landscape. This is evidence which contrasts with the residential zone of use represented by the South Creek valley sites SCW T2 and SCE. The high landforms between Cosgroves and Badgerys Creeks holds research potential for further exploring this pattern of evidence through further test pitting at comparable 40 metre intervals as areas near the creeks.

Table 9-10 Cosgroves Creek assemblages

Type	CCW		CCE T1		CCE T2		CCE T3	
	N	%	N	%	N	%	N	%
Flake	38	55%	14	31%	32	39%	1	7%
Proximal flake	0	0%	1	2%	3	4%	3	21%
Medial flake	4	6%	6	13%	8	10%	2	14%
Distal flake	13	19%	5	11%	10	12%	1	7%
Cone-split flake	0	0%	2	4%	0	0%	0	0%
Core	2	3%	4	9%	1	1%	0	0%
Backed artefact	0	0%	2	4%	4	5%	4	29%
Elouera	1	1%	0	0%	0	0%	0	0%
Scraper	0	0%	0	0%	1	1%	0	0%
Flaked piece	11	16%	11	24%	23	28%	3	21%
Total	**69**	**100%**	**45**	**100%**	**82**	**100%**	**14**	**100%**

N = number of artefacts

Figure 9-2 Aboriginal site complexes

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 9-2 Aboriginal site complexes

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

Figure 9-2 Aboriginal site complexes

FIGURE REDACTED FOR PUBLIC EXHIBITION DUE TO SENSITIVITY OF IMAGE

9.9.2 Badgerys Creek upstream (BWB)

Site BWB comprised a transect mostly on alluvium on the western side of Badgerys Creek and across a minor tributary located 1.6 kilometres upstream (south) from the BCW site. The results (see Table 9-11) demonstrated continuous archaeological material across all the area excavated- more than 300 metres from the creek channel, and likely to continue upslope beyond the area tested. The assemblage is typical of the area representing a Holocene backed-artefact related technology with one Bondi point and evidence of prepared platforms on flakes for blade flaking. Most squares had a low density of artefacts. Only one pit had a relatively higher concentration of 24 artefacts.

Table 9-11 BWB assemblage

Type	N	%
Flake	31	43%
Proximal flake	2	3%
Medial flake	5	7%
Distal flake	12	17%
Cone-split flake	1	1%
Core	2	3%
Backed artefact	1	1%
Core tool	1	1%
Flaked piece	17	24%
Total	**72**	**100%**

N = number of artefacts

9.9.3 The South Creek Valley complex (BCW, BCE, SCWT1, SCWT2, SCE)

The South Creek Valley sites include those test excavated sites within and on the immediate margin of the interfluvial valley incorporating Badgerys and South creeks from west to east:

- BCW comprising pits on residual soils on prominent ridge, hills and creek flat immediately west of Badgerys Creek with outlook over the valley;
- BCE mostly on alluvium and some residual soil on the eastern side of Badgerys Creek;
- SCW Transect 2 on residual soils on the low rise;
- SCW Transect 1 mostly on alluvium on the western side of South Creek; and
- SCE on alluvium on the eastern side of South Creek.

Cores and retouched artefacts are in relatively higher proportions on the SCW T2 low rise. This site has a higher density of stone artefacts indicative of it being a more regularly revisited location. South Creek West includes a diverse assemblage within the topsoil and eroding from a stump of St Marys Formation red sandy soil. Higher artefact numbers could also represent more stone-tool making producing more manufacturing discard, although the relative proportions of debitage are not notably greater. Site SCW has high research potential for investigation of late stage silcrete reduction and general base camp site structure on the low rise within an iconic alluvial plain setting. SCW Transect 1 includes artefacts within deep alluvium and has good research potential for better understanding artefacts in stratigraphic context within the South Creek alluvium. As mentioned above, there is no cultural stratigraphy present within excavated pits.

Table 9-12 lists a sub-set of retouched flakes that are classified with specific implement forms. Backed artefacts are present within the interfluvial plain, but are absent from the BWB site, likely due to the small assemblage size (<100 artefacts). A graver, being a tool with an obtuse retouched edge likely used for carving, is present on the low rise as are backed artefacts and blade cores. SCE includes a concentration of knapping debris include very large silcrete flakes, large silcrete shattered fragments and knapping debitage indicative of primary reduction of silcrete cobble eroding nearby in the creek channel. The large amount of heat shattered silcrete is suggestive of using heat to break open the round cobbles. The near-bank area of site SCE has excellent research potential for investigating quarrying and associated reduction sequences relating to St Marys Formation silcrete.

Table 9-12 South Creek Valley assemblages (counts)

Type	BCW		BCE		SCW T1		SCW T2		SCE	
	N	%	N	%	N	%	N	%	N	%
Flake	15	34%	75	34%	62	46%	95	39%	140	42%
Proximal flake	6	14%	14	6%	6	4%	16	7%	17	5%
Medial flake	8	18%	10	5%	10	7%	16	7%	23	7%
Distal flake	10	20%	48	22%	25	18%	34	14%	54	16%
Cone-split flake	0	0%	0	0%	0	0%	0	0%	2	1%
Core	2	5%	2	1%	6	4%	20	8%	14	4%
Retouched flake	0	0%	0	3%	0	1%	3	5%	1	2%
Backed artefact	0	0%	3	1%	1	1%	5	2%	4	1%
Gravel	0	0%	0	0%	0	0%	1	0%	0	0%
Scraper	0	0%	3	1%	0	0%	4	2%	3	1%
Thumbnail scraper	0	0%	1	0%	1	1%	0	0%	0	0%
Hammerstone/Anvil	0	0%	0	0%	0	0%	0	0%	1	0%
Flaked piece	5	9%	63	29%	25	18%	49	20%	74	22%
Total	**46**	**100%**	**219**	**100%**	**136**	**100%**	**243**	**100%**	**333**	**100%**

N = number of artefacts

Also present at SCE near the creek is an example of an IMT bondi point backed artefact in the midst of silcrete knapping debitage. This is indicative of tool maintenance and replacement activity whereby the exhausted stone point component of a composite tool is removed and replaced with a newly manufactured point.

The BCW site revealed highly patchy artefact distribution, with most pits on high vantage point, slope and floodplain locations devoid of artefacts. One concentration of 26 artefacts was identified in square 0E on a hill within a red sandy fluvial soil – possibly a stump of St Marys Formation camping the hill. The BCW hill was evidently a favoured activity location with valley outlook and has good research potential for further revealing evidence of this activity.

9.9.4 The Kemps Creek complex (KCW, KCE, KNW)

The Kemps Creek sites include:

- KCW on alluvium on the western side of Kemps Creek
- KCE on alluvium and residual soils directly across Kemps Creek from KCW
- KNW on alluvium and residual soils on the western side of Kemps Creek located one kilometre downstream (north) from KCW.

A striking difference is evident between the relatively flat alluvial floodplain KCW and the very gently sloping KCE where artefacts were absent from most pits dug. KNW included very deep Quaternary Alluvium nearly one metre depth close to the creek and shallow alluvium in pits through the middle of an oval trotting track. A relatively high proportion of retouched implements in the context of manufacture was found in pits close to the creek at KCW. KCW therefore holds good research potential for investigating artefact manufacture in later stages of knapping as well as better understanding of horizontal artefact distributions in deep Quaternary Alluvium.

Site KNW comprised a very low density distribution of artefacts (see **Table 9-13**) at a substantial distance from the creek. Retouched implements were found in one of the deeper alluvial pits: DB260N.

Table 9-13 Kemps Creek assemblages

Type	KCE		KCW		KNW	
	N	%	N	%	N	%
Flake	4	50%	29	55%	25	47%
Proximal flake	0	0%	1	2%	4	8%
Medial flake	1	13%	1	2%	2	4%
Distal flake	1	13%	4	8%	4	8%
Cone-split flake	1	13%	0	0%	5	9%
Core	0	0%	4	8%	2	4%
Backed artefact	0	0%	3	6%	1	2%
Scraper	0	0%	3	6%	1	2%
Thumbnail scraper	0	0%	1	2%	1	2%
Flaked piece	1	13%	7	13%	8	15%
Total	**8**	**100%**	**53**	**100%**	**53**	**100%**

N = number of artefacts

9.9.5 The Cecil Hills complex (PCP8, CHRP)

The Cecil Hills sites include two sites within the Western Sydney Parklands on elevated landforms:

- PCP8 on residual soil being the location of artefacts previously recorded along a ridge-top fire trail
- CHRP on residual soil being the slope and ridgetop edge immediately west of the M7 Motorway cutting.

Despite the very patchy distribution and low numbers of artefacts encountered at PCP8 and CHRP (see **Table 9-14**), the recovery of an ochre "pencil", being an ochre fragment 17 millimetre x 9 millimetre x 9 millimetre, from PCP8 was a rare find. Little can be made of the site function based on this rare find and the low numbers of artefacts recovered.

Site CHRP comprised a patchy distribution of artefact up a slope and a low density of artefact on a ridgetop. Artefacts were also observed eroding from the surface. Three blade cores were recovered from a single pit midway up the slope from the modern walking path. While little can be inferred about the nature of activity on the ridge from the small numbers of artefacts recovered, site CHRP has good research potential for exploring activity in an unusual elevated ridgetop "outlook" context.

Table 9-14 Cecil Hills assemblages

Type	CHRP		PCP8	
	N	%	N	%
Flake	7	44%	1	17%
Medial flake	0	0%	1	17%
Distal flake	1	6%	3	50%
Core	3	19%	0	0%
Ochre pencil	0	0%	1	17%
Flaked piece	5	31%	0	0%
Total	**16**	**100%**	**6**	**100%**

N = number of artefacts

9.9.6 Minor sites (TNR, RR)

Two minor sites include:

- TNR on residual soil across a second order creek with no artefacts
- RR on a residual soil along a first order drainage line.

Site TNR revealed no artefacts from the six test pits dug in a line across the creek. This was a significant absence of evidence in light of the presence of artefacts in the more sparsely watered RR site (see **Table 9-15**). No inferences could be drawn about past site function and no research potential was identified for these sites.

Table 9-15 RR site assemblage

Type	N	%
Flake	4	44%
Medial flake	1	11%
Distal flake	1	11%
Cone-split flake	1	11%
Core	1	11%
Flaked piece	1	11%
Total	**9**	**100%**

N = number of artefacts

9.10 Technology

9.10.1 Knapping (production) versus retouching (maintenance) activity across the landscape

No discernible difference in technological traits between sites is apparent when comparing all artefacts. Technological traits typical of late Holocene blade-based technology are generally present in all sites with sizeable assemblages including prepared flake platforms and backed artefacts. Assemblages with greater than 100 artefacts all include backed artefacts. The absence of backed artefacts from some site assemblages with less than 100 artefacts may be explained by inadequate sample size.

When all flakes are compared between sites, the higher density sites SCW T2 (the low rise) and SCE have more larger flakes, reflecting the greater amount of stone tool production as opposed to tool retouch/maintenance in other low density sites. The number of whole flakes for all sites is shown in **Figure 9-3**.

9.11 Implications for future studies

Aboriginal flaked stone artefacts are distributed more widely across major creek valleys than previously described. While standard models of archaeological sensitivity suggest areas within 200 metres have archaeological potential, this assessment demonstrates that artefacts can extend over approximately 400 metres from creeks. Higher artefact density may be present on locally prominent landforms close to major creeks, including immediately adjacent hills fringing major creek valleys.

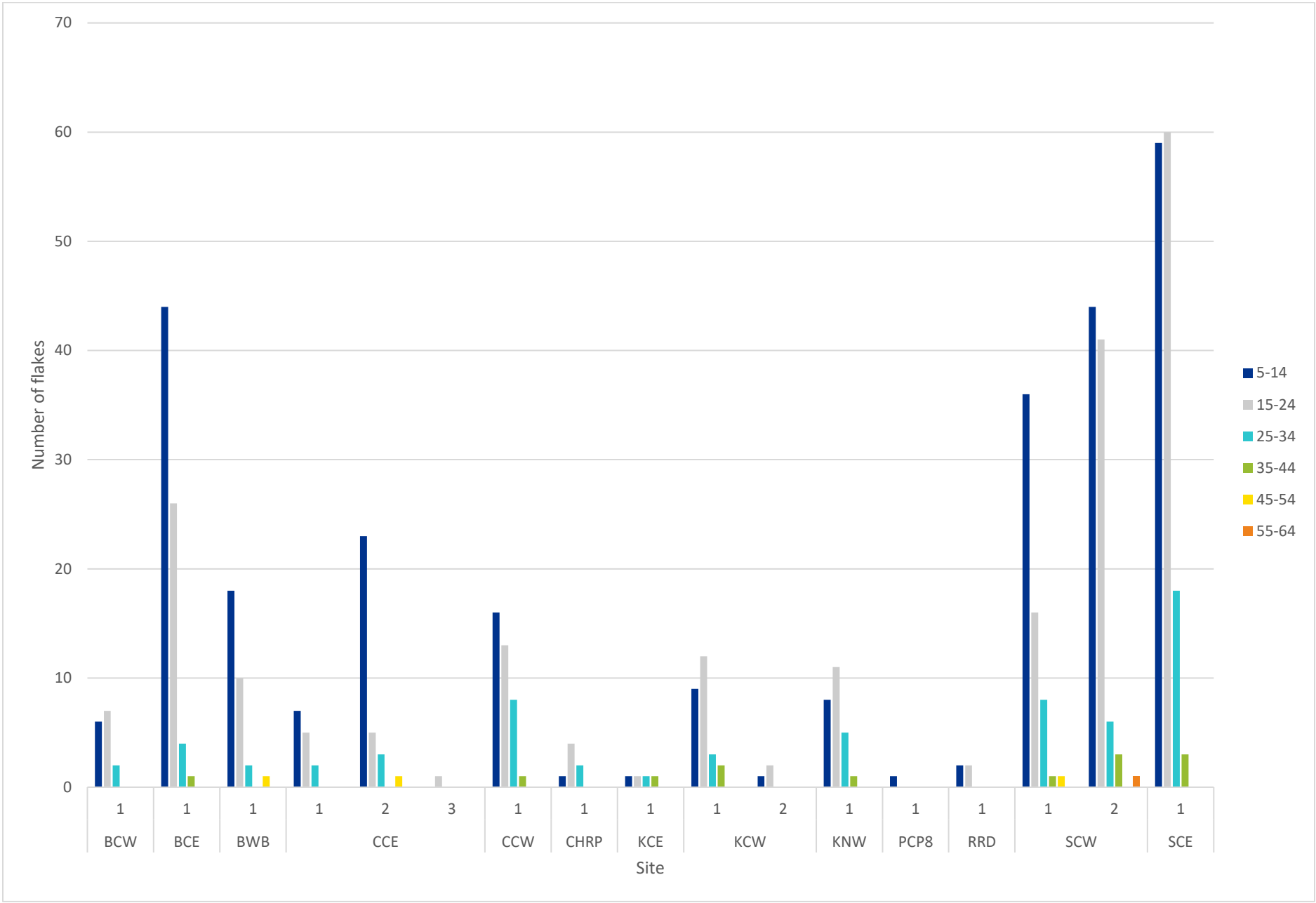

Figure 9-3 Whole flake maximum length modes for all sites

10. Archaeological significance assessment

10.1 Methodology

10.1.1 Basis for assessment

Significance assessments generally use a series of standard criteria to define why a site is important. The criteria used in this significance assessment are described in the Australia International Council On Monuments and Sites (ICOMOS) Burra Charter (Australia ICOMOS 2000). They are:

- Social value
- Historical value
- Scientific value
- Aesthetic value
- Spiritual value.

With the exception of spiritual value, the individual criteria are applied to each of the Aboriginal sites that have been identified in the construction footprint. An overall significance rating site is assigned to a site based on an average across the criteria. While this may oversimplify the significance of particular sites or their attributes to particular stakeholders, it does provide a consistent basis for comparing the relative significance of sites.

10.1.2 Social significance

The views of Aboriginal people, as the traditional custodians of all material and immaterial aspects of their culture, are the primary determinant of the social significance of Aboriginal cultural heritage. Aboriginal people's views on the significance of Aboriginal sites are usually related to traditional, cultural and educational values, although some Aboriginal people also value any scientific information a site may be able to provide.

Aboriginal cultural significance was assessed through consultation with the nominated site officers from the RAPs before, during and after the field work phase of the project. It should be noted that the information gained through this process may not reflect the views of all members of the local Aboriginal communities.

10.1.3 Historic significance

The historic value of a site is determined through its association with historically important people, events or activities.

10.1.4 Scientific significance

Attributes which contribute to scientific and research significance include:

- **Site integrity** – The integrity of a site refers to its state of preservation, or condition. A site can be disturbed through a number of factors including natural erosion processes, destructive land use practices or repeated use of a site in the past by both humans and animals
- **Site structure** – Structure refers to a site's physical dimensions, that is, size and stratigraphy. A large site or a site with stratified deposits has more research potential than small sites and/or surface scatters. Sometimes however, specific research questions may be aimed at smaller sites in which case they would be rated at a higher significance than normal. Site structure cannot be assessed for scarred trees or isolated artefacts
- **Site contents** – This category refers to the range and type of occupation debris found in a site. Generally, complex art sites, extensive quarries with associated debris and surface sites that contain a large and varied amount of organic and non-organic materials are considered to have greater research potential than those sites with small, uniform artefacts, single motif art sites and small quarries with little or no debris. For scarred trees, contents may refer to the size and type of scar and/or how many scars there are on the one tree
- **Representativeness and rarity** – Representativeness refers to how much variability exists between the subject site and others inside or outside the subject area. It also considers the types of sites already conserved in the area and how much connectivity between sites exists. Rarity considers how often a particular site type occurs in an area. Assessment of representativeness and rarity requires some knowledge of the background archaeology of the area or region in which a study is being undertaken. Rarity also relates to whether the subject site or area is important in demonstrating a distinctive way of life, custom, process, land use, function or design which is no longer practiced (OEH 2011).

The scientific significance of each of the Aboriginal sites has been assessed as high, moderate or low.

A rating of 'high scientific significance' is reserved for those sites, the loss of which would represent an unrecoverable opportunity for future generations which cannot be mitigated by reference to other local and securely protected sites. All sites of high significance warrant management priority. This might entail extra protection measures if direct impacts can be avoided, or further investigation through archaeological salvage if impacts are unavoidable.

Sites of moderate scientific significance are considered to have important contributions to make to knowledge, but not in a unique manner. A sample of sites of moderate significance should be salvaged if impacted.

A rating of low scientific significance does not diminish the inherent significance of a site as a representation of Aboriginal life which is important to Aboriginal people. Sites of low significance may comprise a small number of artefacts that do not offer new insights when considered in the context of the regional archaeological resource.

10.1.5 Aesthetic significance

Aesthetic significance refers to the sensory value of a place, and can include aspects such as form, texture, and colour, and can also include the smell and sound elements associated with use or experience of a site. Aesthetic significance is often closely linked to the social value of a site.

10.2 Site significance assessments

The column 'site complex' indicates a group of sites that occur in close proximity and as part of a continuous area of landscape. As discussed in **Section 9.9**, some individual sites have been defined within one of five 'site complexes' on the basis of distinctive landform, soils and archaeological characteristics. The location of the complexes are demonstrated in **Figure 9-2**.

The significance assessment focuses on the sites within, or with a portion of the site boundary within the construction footprint or where the potential for inadvertent impacts warrants management measures for to be developed to minimise impacts to these sites (listed in **Table 10-1**). The significance assessment does not include sites which have been recorded outside the construction footprint but within the detailed investigation area (**Table 3-2**) as these sites are not expected to be impacted by the project. However, environmental management measures have been considered for these sites (**Chapter 13**) given their proximity to the construction footprint.

Table 10-1 Sites in the construction footprint

Site Complex	Site Name	AHIMS sites incorporated	Location	Site type
Cosgroves Creek	CCW		Cosgroves Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
Cosgroves Creek	CCE T1		Cosgroves Creek	Continuous area with Aboriginal objects in sub-surface deposits
Cosgroves Creek	CCE T2		Cosgroves Creek	Continuous area with Aboriginal objects in sub-surface deposits
Cosgroves Creek	CCE T3		Cosgroves Creek	Continuous area with Aboriginal objects in sub-surface deposits
Badgerys Creek Upstream	BWB		Badgerys Creek Upstream	Continuous area with Aboriginal objects in sub-surface deposits
South Creek	BCW		South Creek	Continuous area with Aboriginal objects in sub-surface deposits
South Creek	BCE	45-5-0528 (Fleurs 2)/45-5-4750 (M12 A3); 45-5-4748 (M12 A2)	South Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
South Creek	SCW T1	45-5-0496/45-5-4749; 45-5-0528/45-5-4750	South Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits

Site Complex	Site Name	AHIMS sites incorporated	Location	Site type
South Creek	SCW T2		South Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
South Creek	SCE	45-5-0496 (Fleurs 1)/45-5-4749 (M12 A4)	South Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
Kemps Creek	KNW		Kemps Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
Kemps Creek	KCW		Kemps Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
Kemps Creek	KCE		Kemps Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
Cecil Hills	PCP8	45-5-2308	Cecil Hills	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
Cecil Hills	CHRP	45-5-4935	Cecil Hills	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
Range Road	RR	45-5-4937/ 45-5-4007	Cecil Park	Continuous area with Aboriginal objects on the surface and in sub-surface deposits
NA	M12A1	45-5-4747	Badgerys Creek	Surface stone artefact site
NA	Isolated artefact 4	45-5-3804	Luddenham	Stone artefact site (single artefact)
NA	TNR-AFT-14	45-5-4786	Luddenham	Stone artefact site (single artefact)

Table 10-2 Sites within the detailed investigation area (outside the construction footprint)

Site Complex	Site Name	AHIMS sites incorporated	Location	Site type
N/A	CP AS1	45-5-4374	Cecil Park	Stone artefact site
NA	P-CP9	45-5-2307	Cecil Park	Stone artefact site
NA	PAD-OS-7	45-5-2721	Cecil Park	Stone artefact site: initially a PAD with artefacts discovered in test excavation
NA	PAD-OS-5	45-5-2723	Cecil Park	Stone artefact site: initially a PAD with artefacts discovered in test excavation
NA	DLC 2	45-5-2563	Cecil Park	Stone artefact site
NA	M12A5	45-5-4767	Kemps Creek	Stone artefact site
N/A	KC/ED2	45-5-2310	Kemps Creek	Stone artefact site

10.2.1 Cosgroves Creek complex

Four separate sites have been identified at Cosgroves Creek, these are:

- CCW
- CCE T1
- CCE T2
- CCE T3.

The landform and archaeological characteristics that have been used to define each of the sites are described in **Section 8.7.**

CCW: Cosgroves Creek West

Description: A continuous area of alluvial deposits on the western side of Cosgroves Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits aligned roughly east-west and perpendicular to the creek. The full area of the site was not established; however, it extends for at least 240 metres on an east-west axis (ie the full length of the line of test pits). A total of 69 flaked stone artefacts were recovered from the site.

Table 10-3 CCW significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of high social significance. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, historical significance is considered low to moderate.
Scientific significance	The deep alluvial soils at CCW offer the opportunity to investigate the distribution of artefacts in a deep soil profile, particularly the area close to the creek where there is less evidence of extensive ground disturbance. The integrity of the site overall is low-moderate as a result of historic and ongoing disturbance by agricultural activities. The site had moderate representativeness/rarity as a sub-surface distribution of stone artefacts, a common type of site on the Cumberland Plain, particularly in close proximity to major water sources. Cosgroves Creek West is assessed as being of moderate scientific significance.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform and its connection to the riparian corridor along Cosgroves Creek. The site is considered of moderate aesthetic significance.
Summary statement of significance	Overall, Cosgroves Creek West is of moderate significance at a local level as it provides evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate as the site is likely to have been subject to disturbance as a result of being located within an agricultural environment. However, the site has moderate representativeness/rarity due to its location within the agricultural environment. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

CCW T1: Cosgrove Creek East Transect 1

Description: A continuous area of alluvial deposits and residual soils on the eastern side of Cosgroves Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits aligned roughly east-west and perpendicular to the creek. The full area of the site was not established however it extends for at least 400 metres on an east-west axis (ie the full length of the line of test pits). A total of 45 flaked stone artefacts were recovered from the site.

Table 10-4 CCE T1 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The residual soils that occur across the undulating slopes of CCE T1 contain a variable, low density distribution of sub-surface artefacts. The site has potential for research into dispersed patterns of artefact discard associated with hunting areas. However, the presence of a low density of artefacts beyond the high-activity areas typically associated with reliable water is more illustrative of a general archaeological pattern than offering a rare research opportunity. The integrity of the site overall is low-moderate as a result of historic and ongoing disturbance by agricultural activities. The site has moderate representativeness/rarity value as an extensive sub-surface distribution of stone artefacts, a common type of site on the Cumberland Plain. Cosgroves Creek East T1 is assessed as being of **moderate scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform. The site is considered of **low aesthetic significance**.
Summary statement of significance	Overall, Cosgroves Creek East T1 is of **moderate significance** at a local level as it provides evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate as the site is likely to have been subject to disturbance as a result of being located within an agricultural environment. However, the site has moderate representativeness/rarity due to its location within the agricultural environment. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

CCE T2: Cosgrove Creek East Transect 2

Description: A continuous area of residual soils between Cosgroves Creek and Badgerys Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits aligned roughly east-west and perpendicular to the two creeks. The full area of the site was not established however it extends for 200 metres on an east-west axis (ie the full length of the line of test pits). A total of 82 flaked stone artefacts were recovered from the site.

Table 10-5 CCE T2 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The residual soils that occur across the undulating slopes of CCE T2 contain a variable, low density distribution of sub-surface artefacts. The site has potential for research into dispersed patterns of artefact discard associated with hunting areas. However, the presence of a low density of artefacts beyond the high-activity areas typically associated with reliable water is more illustrative of a general archaeological pattern than offering a rare research opportunity. The integrity of the site overall is low-moderate as a result of historic and ongoing disturbance by agricultural activities. The site has moderate representativeness/rarity value as an extensive sub-surface distribution of stone artefacts, a common type of site on the Cumberland Plain. Cosgroves Creek East T1 is assessed as being of **moderate scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform. The site is considered of **low aesthetic significance**.
Summary statement of significance	Overall, Cosgroves Creek East T3 is of **moderate significance** at a local level as it provides evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate as the site is likely to have been subject to disturbance as a result of being located within an agricultural environment. However, the site has moderate representativeness/rarity due to its location within the agricultural environment. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

CCE T3: Cosgrove Creek East Transect 3

Description: A continuous area of residual soils between Cosgroves Creek and Badgerys Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits aligned roughly east-west and perpendicular to the two creeks. The full area of the site was not established however it extends for at least 1200 metres on an east-west axis (ie the full length of the line of test pits). A total of 14 flaked stone artefacts were recovered from the site.

Table 10-6 CCE T3 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.

Criterion	Assessment
Scientific significance	The residual soils that occur across the undulating slopes of CCE T3 contain a variable, low density distribution of sub-surface artefacts. The site has potential for research into dispersed patterns of artefact discard associated with hunting areas. However, the presence of a low density of artefacts beyond the high-activity areas typically associated with reliable water is more illustrative of a general archaeological pattern than offering a rare research opportunity. The integrity of the site overall is low-moderate as a result of historic and ongoing disturbance by agricultural activities. The site has moderate representativeness/rarity value as an extensive sub-surface distribution of stone artefacts, a common type of site on the Cumberland Plain. Cosgroves Creek East T1 is assessed as being of **moderate scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform. The site is considered of **low aesthetic significance**.
Summary statement of significance	Overall, Cosgroves Creek East T3 is of **moderate significance** at a local level as it provides evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate as the site is likely to have been subject to disturbance as a result of being located within an agricultural environment. However, the site has moderate representativeness/rarity due to its location within the agricultural environment. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

10.2.2 Badgerys Creek upstream

One site has been identified in the upstream section of Badgerys Creek; BWB. The landform and archaeological characteristics that have been used to define each of the sites are described in **Section 8.6.**

BWB: Badgerys West B

Description: A continuous area of alluvial deposits on the western side of Badgerys Creek, approximately 1.6 kilometres upstream of the South Creek complex (see below). The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits aligned roughly east-west and perpendicular to the creek. The full area of the site was not established however it extends for at least 520 metres on an east-west axis (ie the full length of the line of test pits). A total of 72 flaked stone artefacts were recovered from the site.

Table 10-7 BWB significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The alluvial soils at BWB offer the opportunity to investigate the distribution of artefacts in a moderately deep soil profile at varying distances from reliable water. However, the integrity of the site is low as a result of historic and ongoing disturbance, including large scale earthworks associated with the construction of dams. The site had moderate representativeness/rarity as a sub-surface distribution of stone artefacts, a common type of site on the Cumberland Plain, particularly in close proximity to major water sources. Badgerys West B is assessed as being of **low- moderate scientific significance**.

Criterion	Assessment
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land and heavily modified by the construction of dams and land surface contouring. The site is considered of **low aesthetic significance**.
Summary statement of significance	Overall, Badgerys West B is of **low- moderate significance** at a local level as it provides limited evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate as the site has been subject to disturbance as a result of being located within an agricultural environment. However, the site has moderate representativeness/rarity due to its location within the agricultural environment. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

10.2.3 South Creek complex

Five separate sites have been identified in the South Creek complex, these are:

- BCW
- BCE
- SCW1
- SCW2
- SCE

The landform and archaeological characteristics that have been used to define each of the sites are described in **Section 8.7.**

The South Creek Valley sites represent a rare collection of archaeological features that include:

- A local source of silcrete cobbles with associated primary working of that material
- A dense concentration of artefacts on a low rise, possibly evidence of a base camp
- A hilltop site with a remarkable outlook over the South Creek catchment
- Deep alluvial deposits with the potential to investigate the presence of Pleistocene deposits
- Extensive distributions of stone artefacts across kilometres of creek valley floor.

BCW: Badgerys Creek West

Description: A continuous area of residual soils on a prominent ridge, hills and creek flat immediately to the west of Badgerys Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by two lines of test pits, one aligned roughly north-south and parallel to the creek and the other east –west and perpendicular to the creek. The full area of the site was not established however it extends for at least 400 metres on a north-south axis and 200 metres east- west (ie the full length of the lines of test pits). A total of 46 flaked stone artefacts were recovered from the site.

Table 10-8 BCW significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of high social significance. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, historical significance is considered low to moderate.
Scientific significance	The hilltop sections of the site contain rare evidence of a basecamp activities on a rise immediately above one of the major waterways in the South Creek catchment. The integrity of the site overall is low-moderate as a result of historic and ongoing disturbance by agricultural activities. The site has high representativeness/rarity as a sub-surface distribution of stone artefacts in a gravel-rich soil remnant on an elevated location. Badgerys Creek West is assessed as being of high scientific significance.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform and its connection to the riparian corridor along Badgerys Creek. The site is considered of moderate aesthetic significance.
Summary statement of significance	Overall, Badgerys Creek West is of high significance at a local level as it has the potential to provide extensive evidence of the use of the area by Aboriginal people. The integrity and structure of the site is low-moderate as the shallower soils on the ridgeline have been subject to disturbance through historic and current agricultural activities. The site has high representativeness/ rarity value as a potential focus of activities on a rise immediately above a substantial waterway. The high overall significance rating of the site is a reflection of the exceptional research and educational potential of the South Creek complex as a group.

BCE: Badgerys Creek East

Description: A continuous area of alluvial deposits and residual soils on the eastern bank of Badgerys Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits, aligned roughly east –west and perpendicular to the creek. The full area of the site was not established however it extends for at least 600 metres on a north-south axis (ie the full length of the line of test pits). A total of 219 flaked stone artefacts were recovered from the site.

Table 10-9 BCE significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.

Criterion	Assessment
Scientific significance	The site contains evidence of variations in the distribution of sub-surface artefacts with distance from one of the major waterways in the South Creek catchment. The site is the location of a natural spring fed watercourse that has now been in-filled by land practices. The integrity of the site overall is low-moderate as a result of disturbance by agricultural activities and run-off from an adjacent quarry. The site has high representativeness/rarity as a sub-surface distribution of stone artefacts associated with a natural spring. Badgerys Creek East is assessed as being of **high scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform and its connection to the riparian corridor along Badgerys Creek. A quarry immediately to the south detracts from the visual character. The site is considered of **moderate aesthetic significance**.
Summary statement of significance	Overall, Badgerys Creek East is of **high significance** at a local level as it has the potential to provide extensive evidence of the use of the area by Aboriginal people. The integrity and structure of the site is moderate as a result of disturbance through historic and current agricultural activities. The site has moderate representativeness/ rarity value as an opportunity to investigate the distribution of sub-surface artefacts associated with a substantial waterway. The high overall significance rating of the site is a reflection of the exceptional research and educational potential of the South Creek complex as a group.

SCW T2: South Creek West Transect 2

Description: A continuous area of residual soils on a rise between Badgerys and South Creeks. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by two line of tests pits, one aligned roughly east –west and the other north-south. The full area of the site was not established however it extends for at least 320 metres east-west and 40 metres on a north-south axis (ie the full length of the lines of test pits). A total of 243 flaked stone artefacts were recovered from the site.

Table 10-10 SCW T2 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The site contains evidence of variations in the distribution of sub-surface artefacts over an elevated ridgeline overlooking the floodplain of the South Creek catchment and immediately adjacent to resource rich wetlands. The integrity of the site is moderate as a result of historic disturbance by agricultural activities and scientific facilities. The site has high representativeness/rarity to its location within the local catchment and proximity to high value resources. The site is assessed as being of **high scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform and provides expansive views across the riparian corridor and associated floodplain of South Creek. The site is considered of **high aesthetic significance**.

Criterion	Assessment
Summary statement of significance	Overall, South Creek T2 is of **high significance** at a local level as it has the potential to provide extensive evidence of the use of the area by Aboriginal people. The integrity and structure of the site is moderate as a result of disturbance through historic and current agricultural activities. The site has high representativeness/ rarity value as an opportunity to investigate the distribution of sub-surface artefacts on an elevated landform located between two major waterways and offering expansive views across the associated floodplain. The high overall significance rating of the site is a reflection of the exceptional research and educational potential of the South Creek complex as a group.

SCW T1: South Creek West Transect 1

Description: A continuous area of alluvial deposits and residual soils on the western side of South Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits, aligned roughly east –west and perpendicular to the creek. The full area of the site was not established however it extends for at least 560 metres on an east-west axis (ie the full length of the line of test pits). A total of 136 flaked stone artefacts were recovered from the site. The site incorporates the previously recorded AHIMS 45-5-0496/ 45-5-4749 and 45-5-0528/ 45-5-4750.

SCW: South Creek East

Description: A continuous area of alluvial deposits on the eastern side of South Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits, aligned roughly east-west and perpendicular to the creek. The full area of the site was not established however it extends for at least 360 metres on an east-west axis (ie the full length of the line of test pits). A total of 333 flaked stone artefacts were recovered, the majority from pits immediately adjacent to South Creek.

Table 10-11 SCE significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	The alluvial soils on the banks of South Creek contain dense sub-surface distribution of stone artefacts associated with a local source of silcrete in the creek. This offer the opportunity to investigate the manufacture and reduction of artefacts in a well-developed soil profile. The integrity of the site overall is moderate as a result of historic and ongoing disturbance by agricultural activities. The site had high representativeness/rarity value as a sub-surface distribution of stone artefacts, in close proximity to major water course and stone resource. The site is assessed as being of **high scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is partly agricultural land, with mature trees retained along the creek banks. It retains an overall sense of the contours of the underlying landform and strong visual connections to South Creek and its floodplain. The site is considered of **high aesthetic significance**.

Criterion	Assessment
Summary statement of significance	Overall, South Creek East is of **high significance** at a local level as it has the potential to provide extensive evidence of the use of the area by Aboriginal people. The integrity and structure of the site is moderate to high as a result of limited disturbance through historic and current agricultural activities. The site has high representativeness/ rarity value as it presents evidence of the manufacture of stone artefacts and their movements across the broader landscape. The high overall significance rating of the site is a reflection of the exceptional research and educational potential of the South Creek complex as a group.

10.2.4 Kemps Creek complex

Three separate sites have been identified at Kemps Creek., these are:

- KNW
- KCW
- KCE.

The landform and archaeological characteristics that have been used to define each of the sites are described in **Section 8.7.**

KNW: Kemps North West

Description: A continuous area of alluvial deposits and residual soils on the western side of Kemps Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits, aligned roughly east-west and perpendicular to the creek. The full area of the site was not established however it extends for at least 400 metres on east-west axis (ie the full length of the line of test pits). A total of 53 flaked stone artefacts were recovered from the site.

Table 10-12 KNW significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	This site contains a low-density distribution of sub-surface stone artefacts in shallow alluvial soils. The integrity of the site is low- moderate as a result of historic and ongoing agricultural activities. The site has low to moderate representativeness/rarity value as low density sub-surface distribution of stone artefacts. The site has **low- moderate scientific significance** at a local level.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared agricultural land, which retains an overall sense of the contours of the underlying landform and its connection to Kemps Creek. The site is considered of **moderate aesthetic significance**.
Summary statement of significance	Overall, Kemps North West is of **moderate significance** at a local level as it provides evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate due to disturbance as a result by agricultural activities. The site has moderate representativeness/rarity due to the presence of stone artefacts in an alluvial profile. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

KCW: Kemps Creek West

Description: A continuous area of alluvial deposits on the western side of Kemps Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by two lines of test pits, aligned roughly east –west (perpendicular to the creek) and north-south (parallel with the creek). The full area of the site was not established however it extends for at least 220 metres north-south and 200 metres east- west (ie the full length of the lines of test pits). A total of 53 flaked stone artefacts were recovered from the site.

Table 10-13 KCW significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	This site contains a low-density distribution of sub-surface stone artefacts in deep alluvial soils. The integrity of the site is low- moderate as a result of historic and ongoing agricultural activities. The site has low to moderate representativeness/rarity value as low density sub-surface distribution of stone artefacts. The site has **moderate scientific significance** at a local level.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is heavily modified agricultural land with the visual character dominated by a trotting track and high voltage power lines. The site is considered of **low aesthetic significance**.
Summary statement of significance	Overall, Kemps Creek West is of **moderate significance** at a local level as it provides evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate due to disturbance as a result by agricultural activities. The site has moderate representativeness/rarity due to the presence of stone artefacts in a deep alluvial profile. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

KCE: Kemps Creek East

Description: A continuous area of alluvial deposits and residual soils on the eastern side of Kemps Creek. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a discontinuous line of test pits, aligned roughly east –west (perpendicular to the creek). The full area of the site was not established however it potentially extends over least 180 metres east- west (ie the full length of the line of test pits). A total of eight flaked stone artefacts were recovered from the site.

Table 10-14 KCE significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.

Criterion	Assessment
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	This site contains a very low-density distribution of sub-surface stone artefacts. The integrity of the site is low as a result of historic and ongoing agricultural activities. The site has low representativeness/rarity value as very low density sub-surface distribution of stone artefacts. The site has **low scientific significance** at a local level.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is cleared and heavily modified agricultural land, which retains some visual connection to Kemps Creek. The site is considered of **low aesthetic significance**.
Summary statement of significance	Overall, Kemps Creek East is of **low significance** at a local level as it provides limited evidence of the use of the area by Aboriginal people. The site has moderate scientific significance as the integrity and structure of the site is low-moderate due to disturbance as a result by agricultural activities. The site has moderate representativeness/rarity due to the presence of stone artefacts in a deep alluvial profile. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

10.2.5 Cecil Hills complex

Two separate sites have been identified at Cecil Hills, these are:

- PCP8
- CHRP

The landform and archaeological characteristics that have been used to define each of the sites are described in **Section 8.7.**

PCP8

Description: A continuous area of residual soils along a ridgeline in Cecil Hills. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by a line of test pits, aligned roughly north-south along the crest of the ridge. The full area of the site was not established however it potentially extends over least 80 metres east- west. A total of six flaked stone artefacts were recovered from the test pits. A single piece of ochre ‘pencil’ was also excavated. Another 11 stone artefacts were located on the surface when the site was originally recorded as AHIMS 45-5-2308. These artefacts were not re-located during the test pit program.

Table 10-15 PCP8 significance assessment

Criterion	Assessment
Social significance	The RAPs’ representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.

Criterion	Assessment
Scientific significance	This site exhibits a very low-density distribution of sub-surface stone artefacts. It includes one very rare find, an ochre pencil. The integrity of the site is moderate because of the ridgeline landform's unsuitability for agricultural activities and the retention of woodland vegetation. The low density sub-surface stone artefacts site has low representativeness/rarity value at the local level although the ochre pencil is a rare find on the Cumberland Plain. The site has an overall **low to moderate scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is an eroded track with visual connections to one of the largest remnants of Cumberland Plain woodland in the construction footprint. The site is considered of **moderate aesthetic significance**.
Summary statement of significance	Overall, PCP8 is of **low to moderate significance** at a local level as it provides limited evidence of the use of the area by Aboriginal people. The site has low-moderate scientific significance due to the overall paucity of cultural materials with a single rate object and good structural integrity. The site has moderate representativeness/rarity value, largely due to the presence of a single ochre pencil. The site has low-moderate research and educational potential about the manner in which Aboriginal populations lived in the area.

CHRP: Cecil Hills Ridge PAD

Description: A continuous area of residual soils along an elevated and highly prominent ridgetop on the eastern flank of the Cecil Hills. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by two lines of test pits, one aligned north-south up the ridge-slope and the other east-west along the crest of the ridge. The full area of the site was not established however it potentially extends over least 120 metres east- west and 20 metres north- south. A total of 16 flaked stone artefacts were recovered from the test pits. One additional stone artefact was located on the surface when the site was originally recorded as AHIMS 45-5-4935.

Table 10-16 CHRP significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	This site has moderate integrity with the potential for extensive areas of relatively intact sub-surface deposit. The prominent ridgetop position provides a unique viewpoint to the east and south. The landscape context warrants a high representativeness/rarity value for the site, despite the relative abundance of sub-surface artefact distributions on the Cumberland Plain. Ridgetop artefact exposures to the west contain glass artefacts, which if also present at the site would provide rare material evidence of the contact period. The site has **high scientific significance**.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is an elevated ridge offering expansive views to the east and south of the construction footprint, including remnants of Cumberland Plain woodland. The site is considered of **high aesthetic significance**.
Summary statement of significance	The site has **high significance** at a local level as it has the potential to provide extensive evidence of the use of the area by Aboriginal people. The site has high scientific significance as it has good integrity and high research and educational potential, offering the opportunity for unique insight into how Aboriginal populations lived in the area.

10.2.6 Other sites

RR: Range Road

The landform and archaeological characteristics that have been used to define the Range Road site are described in **Section 8.7.**

Description: A continuous area of residual soils along a minor drainage line. The presence of Aboriginal objects, in the form of flaked stone artefacts, was confirmed by two lines of test pits, one aligned north-south and the other east west across the undulating site. The full area of the site was not established however it potentially extends over least 200 metres east west and 200 metres north south. A total of nine flaked stone artefacts were recovered from the test pits. An additional three flakes were found on the surface when the site was originally recorded as AHIMS 45-5-4937/ 45-5-4007.

Table 10-17 RR significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low to moderate**.
Scientific significance	This site contains a very low-density distribution of sub-surface stone artefacts. The integrity of the site is low as a result of historic and ongoing agricultural activities. The site has low representativeness/rarity value as very low density sub-surface distribution of stone artefacts. The site has **low scientific significance** at a local level.
Aesthetic significance	The artefacts that define the site are a sub-surface scatter which is not visible apart from small areas of exposure and deflation. The surface of the site is partially cleared agricultural land, with visual connections largely limited to heavily modified surrounding landscapes. The site is considered of **low aesthetic significance**.
Summary statement of significance	Overall, Range Road is of **low significance** at a local level as it provides limited evidence of the use of the area by Aboriginal people. The site has low scientific significance as the integrity and structure of the site is low due to past and ongoing agricultural activities, including extensive modification of the ground surface. The site has low representativeness/rarity value due to the paucity of cultural materials and the high levels of disturbance. The site has low research and educational potential about the manner in which Aboriginal populations lived in the area.

M12A1 (AHIMS 45-5-4747)

Description: Stone artefact site near Badgerys Creek. Three flaked stone artefacts exposed on the upper slope of an undulating plain.

Table 10-18 45-5-4747 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of high social significance. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.

Criterion	Assessment
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, historical significance is considered low.
Scientific significance	The site has low integrity and structure due to the instability of the ground surface exposure. The small number of artefacts has very limited capacity for further research or educational purposes. The site is assessed as having low scientific significance.
Aesthetic significance	The artefact was located on an unformed vehicular track. As a result of the highly degraded landscape setting the site is of low aesthetic significance.
Summary statement of significance	The site has very limited capacity for further research or educational purposes. The main value lies in its' contribution to the regional pattern of site distributions across the South Creek catchment. The site has low significance.

Isolated artefact 4 (AHIMS 45-5-3804)

Description: Stone artefact site near Luddenham. The single silcrete artefact was exposed on a knoll above the confluence of two creeks.

Table 10-19 45-5-3804 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of **high social significance**. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, **historical significance is considered low**.
Scientific significance	The site has low integrity and structure due to the instability of the ground surface exposure. The single artefact has very limited capacity for further research or educational purposes. The site is assessed as having **low scientific significance**.
Aesthetic significance	The artefact was located on an unformed vehicular track. As a result of the highly degraded landscape setting the site is of **low aesthetic significance**.
Summary statement of significance	The site has very limited capacity for further research or educational purposes. The main value lies in its' contribution to the regional pattern of site distributions across the South Creek catchment. The site has **low significance**.

TNR-AFT-14 (AHIMS 45-5-4786)

Description: Stone artefact site near Luddenham. The single silcrete artefact was exposed on the crest of a ridge line.

Table 10-20 45-5-4786 significance assessment

Criterion	Assessment
Social significance	The RAPs' representatives confirm that all Aboriginal cultural heritage objects, sites and values in the construction footprint are considered to be of high social significance. The site has a high social significance at the local level as it provides tangible evidence of the use of the area by Aboriginal people.
Historical significance	The historical and ethnographic sources described in this report demonstrate occupation of the construction footprint by Aboriginal peoples from the contact period through to the present. However, no historical references that link Aboriginal individuals to the specific area encompassed by this site have been sourced. In the context of this broad association of the Aboriginal history of the construction footprint with this specific site, historical significance is considered low.
Scientific significance	The site has low integrity and structure due to the instability of the ground surface exposure. The single artefact has very limited capacity for further research or educational purposes. The site is assessed as having low scientific significance.
Aesthetic significance	The artefact was located on an unformed vehicular track. As a result of the highly degraded landscape setting the site is of low aesthetic significance.
Summary statement of significance	The site has very limited capacity for further research or educational purposes. The main value lies in its' contribution to the regional pattern of site distributions across the South Creek catchment. The site has low significance.

10.3 Summary of significance

A summary of the assessments of significance for individual sites and site complexes discussed in this chapter is presented in **Table 10-21**.

Table 10-21 Summary of significance

AHIMS ID	Site name	Social significance	Historical significance	Scientific significance	Aesthetic significance	Overall significance
To be issued	CCW	High	Low-moderate	Moderate	Moderate	Moderate
To be issued	CCE T1	High	Low-moderate	Moderate	Low	Moderate
To be issued	CCE T2	High	Low-moderate	Moderate	Low	Moderate
To be issued	CCE T3	High	Low-moderate	Moderate	Low	Moderate
To be issued	BWB	High	Low-moderate	Low-moderate	Low	Low-moderate
To be issued	BCW	High	Low-moderate	High	Moderate	High
To be issued	BCE	High	Low-moderate	High	Moderate	High
Incorporates 45-5-0496/45-5-4749; 45-5-0528/45-5-4750	SCW T1	High	Low-moderate	High	Moderate	High
To be issued	SCW T2	High	Low-moderate	High	High	High
To be issued	SCE	High	Low-moderate	High	High	High

AHIMS ID	Site name	Social significance	Historical significance	Scientific significance	Aesthetic significance	Overall significance
To be issued	KNW	High	Low-moderate	Low-moderate	Moderate	Moderate
To be issued	KCW	High	Low-moderate	Moderate	Low	Moderate
To be issued	KCE	High	Low-moderate	Low	Low	Low
Incorporates 45-5-2308	PCP8	High	Low-moderate	Low-moderate	Moderate	Low-moderate
Incorporates 45-5-4935	CHRP	High	Low-moderate	High	High	High
Incorporates 45-5-4937/ 45-5-4007	RR	High	Low-moderate	Low	Low	Low
45-5-4747	M12A1	High	Low	Low	Low	Low
45-5-3804	Isolated artefact 4	High	Low	Low	Low	Low
45-5-4786	TNR-AFT-14	High	Low	Low	Low	Low

11. Impact Assessment

This section describes the impacts on Aboriginal cultural heritage associated with the project. It also describes the project development and impact consideration. Cumulative impacts in consideration of other projects occurring in the broader area is discussed in **Chapter 12**.

11.1 Project development and impact consideration

A comprehensive route options and selection process was carried out to identify feasible route options to connect the M12 Motorway between the M7 at Cecil Hills and the Northern Road at Luddenham. This process culminated in the M12 Strategic Route Options Analysis, which included a Heritage Working Paper and a consideration of values in a multi-criteria analysis (Aurecon 2016).

A value management process was used to bring together a wide range of stakeholder interests and expertise to review the revised shortlisted alignment options being put forward for evaluation. One of key issues to consider in the assessment included minimising the impact of the project on the natural, cultural and built environment. Technical, socio-economic and environmental considerations, while achieving a value for money solution for the community, have been at the forefront of decisions during project development.

The design outlined in the M12 Motorway EIS has changed from the original corridor as development has reconsidered key aspects such as project functionality and performance, key design and engineering lessons learnt such as constructing across floodplains and over waterways, and environmental impacts.

A principle of cultural heritage management is to avoid impact before applying mitigation. During project development, the following activities were carried out to identify Aboriginal cultural heritage so, where possible, strategies to avoid impacts could be developed:

- Consultation with relevant Aboriginal stakeholders and EESG (see **Chapter 2**)
- Site archaeological survey
- Assessment to identify regionally or nationally significant features.

Design and alignment refinements were made, and the location of ancillary facilities were selected to avoid impacts to Aboriginal cultural heritage sites where possible, while considering engineering, environmental, social and economic requirements. For example, the design for the project has adopted as narrow a footprint as possible in all areas in order to minimise various impacts, including those to Aboriginal heritage sites. The design has also placed the alignment as close as practicable to existing development and infrastructure to limit regional fragmentation impacts by consolidating the project corridor with existing development, utilities and road corridors.

The ancillary sites in the South Creek area were located and sized to align with existing disturbed areas on farm land and to avoid adjacent undisturbed areas close to creek lines in this landform. A total of 19 Aboriginal sites may be directly impacted by the project. **Chapter 9** provides recommendations on impact avoidance, minimisation and mitigation.

11.2 Aspects of activity

Aboriginal heritage sites within the construction footprint would be impacted by ground disturbance works (**Figure 1-2**).

The construction footprint is indicative only and may be refined during detailed design. Factors that could affect the final footprint include the location and size of water quality basins, the construction methodology, and arrangements made with affected landowners. The detailed investigation area for this assessment is larger than the construction footprint and provides flexibility for minor amendments to the impact footprint.

Areas of fill over Aboriginal heritage are regarded as an impact adversely affecting heritage values. Any works on existing roads within the detailed investigation area are considered to be highly disturbed areas not affecting Aboriginal heritage.

11.3 Impacts

The terminology employed in this section to discuss “harm” to Aboriginal objects and sites reflects that used in the current EESG Aboriginal Heritage Impact Permit application form. These terms are not defined in EESG guidelines. The terms ‘type of harm’, ‘degree of harm’ and ‘consequence of harm’ as used below are defined in the glossary. This assessment assesses the proposed harm from the development and recommends appropriate mitigation strategies.

It is assumed that the 19 Aboriginal objects and Aboriginal sites that occur within the construction footprint would be subject to direct harm. The seven Aboriginal sites located outside of the construction footprint but within the detailed investigation area are not expected to be impacted as a result of the project (**Table 11-2**). However, environmental management measures have been considered for these sites (**Chapter 13**) given their proximity to the construction footprint.

Most of the Aboriginal sites described in **Table 11-1** consist of broad distributions of Aboriginal stone artefacts associated with major creeks which can be reasonably inferred to continue into adjacent comparable landscapes beyond the construction footprint and detailed investigation area. For this reason, impacts are assessed as being partial impacts for many of the larger sites, despite the total removal of those portions defined through the test excavation program.

These sites are areas of observed artefact occurrence defined (possibly imperfectly) for management purposes by landform. This includes separate transect areas within artefact continuums as described in this report.

As described above, many of the extensive artefact distribution sites defined through the test excavation encapsulate previously recorded surface sites. These combined sites are treated as single entities for the purpose of the impact assessment.

Sites within the construction footprint are provided **Table 11-1** and sites within the detailed investigation area (outside the construction footprint) are provided in **Table 11-2**.

Table 11-1 Aboriginal site impact assessment for sites within the construction footprint

Site Name	AHIMS ID	Previously recorded sites included	Assessed significance of site	Type of harm	Degree of harm	Consequence of harm
Sites within the construction footprint						
CCW	TBC	-	Moderate	Directly harmed (5 ha)	Partial	Partial loss of value; site estimated to extend to the north and south of the construction footprint for approximately 1 km
CCE T1	TBC	-	Moderate	Directly harmed (4.5 ha)	Partial	Partial loss of value; site estimated to extend to the north and south of the construction footprint for approximately 1 km
CCE T2	TBC	-	Moderate	Directly harmed (6.6 ha)	Partial	Partial loss of value; site estimated to extend to the north and south of the construction footprint for approximately 1 km
CCE T3	TBC	-	Moderate	Directly harmed (20 ha)	Partial	Partial loss of value; very diffuse background scatter estimated to extend to the north and south of the construction footprint for approximately 1 km
BWB	TBC	-	Moderate	Directly harmed (1.7 ha)	Partial	Partial loss of value; site estimated to extend to the north of the construction footprint several hundred metres

Site Name	AHIMS ID	Previously recorded sites included	Assessed significance of site	Type of harm	Degree of harm	Consequence of harm
BCW	TBC	-	High	Directly harmed (1.4 ha)	Total	Total loss of value
BCE	TBC	45-5-0528 (Fleurs 2)/45-5-4750 (M12 A3); 45-5-4748 (M12 A2)	High	Directly harmed (5.8 ha)	Partial	Partial loss of value; site estimated to extend to the north of the construction footprint for approximately 800 metres
SCW T1	TBC	45-5-0496/45-5-4749; 45-5-0528/45-5-4750	High	Directly harmed (3.6 ha)	Partial	Partial loss of value; site estimated to extend to the north and south of the construction footprint for several hundred metres
SCW T2	TBC	-	High	Directly harmed (0.9 ha)	Partial	Partial loss of value; site estimated to extend to the north of the construction footprint for 200 metres
SCE	TBC	45-5-0496 (Fleurs 1)/45-5-4749 (M12 A4)	High	Directly harmed (5.6 ha)	Partial	Partial loss of value; site estimated to extend to the north of the construction footprint for several hundred metres; loss of silcrete source and associated quarrying evidence
KNW	TBC	-	Moderate	Directly harmed (11.4 ha)	Partial	Partial loss of value; site estimated to extend to the east and north of the construction footprint for several hundred metres
KCW	TBC	-	Moderate	Directly harmed (3.6 ha)	Partial	Partial loss of value; site estimated to extend to the east and north of the construction footprint for several hundred metres
KCE	TBC	-	Low	Directly harmed (1.5 ha)	Total	Total loss of value
PCP8	45-5-2308	-	Moderate	Directly harmed (0.1 ha)	Total	Total loss of value
CHRP	-	45-5-4935	High	Directly harmed (0.4 ha)	Total	Total loss of value
RR	45-5-4937/ 45-5-4007	-	Low	Directly harmed (0.5 ha)	Total	Total loss of value
M12A1	45-5-4747	-	Low	Directly harmed (0.02 ha)	Total	Total loss of value
Isolated artefact 4	45-5-3804	-	Low	Directly harmed	Total	Total loss of value
TNR-AFT-14	45-5-4786	-	Low	Directly harmed	Total	Total loss of value

Table 11-2 Aboriginal site impact assessment for sites within the detailed investigation area (outside the construction footprint)

Site Name	AHIMS ID	Previously recorded sites included	Assessed significance of site	Type of harm	Degree of harm	Consequence of harm
Sites within the detailed investigation area (outside the construction footprint)						
CP AS1	45-5-4374	-	(not assessed)	No harm	None	No loss of value as this site is located over 200 m from the construction footprint
P-CP9	45-5-2307	-	(not assessed)	No harm	None	No loss of value as this site is about 140 m from the construction footprint
PAD-OS-7	45-5-2721	-	(not assessed)	No harm	None	No loss of value as this site is about 130 m from the construction footprint
PAD-OS-5	45-5-2723	-	(not assessed)	No harm	None	No loss of value as this site is about 200 m from the construction footprint
DLC 2	45-5-2563	-	(not assessed)	No harm	None	No loss of value as this site is about 50 m from the construction footprint and on private property that wont be impacted.
M12A5	45-5-4767	-	(not assessed)	No harm	None	No loss of value as this site is about 200 m from the construction footprint
KC/ED2	45-5-2310	-	(not assessed)	No harm	None	No loss of value as this site is 50 m from the construction footprint and is located on private property.

11.4 Residual impacts

It is assumed that all of the land surfaces within the proposed construction footprint would be impacted to the degree that none of the original soils or any Aboriginal sites or objects would be retained. In this context the residual impacts after mitigation are effectively the same as the initial impact. However, there are a number of potential management measures that would reduce this 'total' residual impact. These include:

1) The preservation of the portions of the individual sites that fall outside the construction footprint
2) The preservation of archaeologically sensitive soils within the construction footprint where design solutions involving the careful positioning of bridge pylons provides some degree of flexibility
3) Collection of surface exposed objects by the local Aboriginal communities for curation and use in educational and interpretive programs
4) Salvage of selected high significance sites to obtain a representative sample of their contents for curation by the local Aboriginal communities and the extraction of the maximise feasible information about the sites that would be lost
5) Representation of information about the cultural meaning and significance of the impacted landscape through artistic, educational and interpretive mediums.

11.5 Justification of impacts

The impacts of the development on the cultural landscape where the project is located range from historic clearing and land use practices to major infrastructure projects such as the M7 Motorway and the Western Sydney Airport. In this context any further impact on the remaining resource need careful justification.

Alternative route options were evaluated in the strategic options assessment that preceded the current assessment (Aurecon 2016). This demonstrated that all potential alignments would impact on Aboriginal heritage.

The archaeological investigations reported in this document confirm that there is a continuous but variable distribution of Aboriginal objects across the study area. This conclusion is consistent with previous studies in comparable environment contexts on the Cumberland Plain. A key factor driving the ubiquitous distribution of cultural materials may be the close proximity of most of the construction footprint to high quality and reliable sources of freshwater.

The consequence is that, rather than defining discrete areas as Aboriginal sites, it is more appropriate to regard the study area as being divided into a series of adjoining sites described as landform-scale distributions of cultural materials.

This situation suggests that design solutions such as re-routing the proposed motorway cannot avoid all impacts on Aboriginal heritage. Instead, the focus must be on minimising impacts on the areas of highest Aboriginal heritage significance. In the case of the study area this includes the defined sites on either side of the proposed crossings of Badgerys (BCE and BCW) and South Creeks (SCW 1, SCW2 and SCE) and the elevated ridge overlooking the M7 Motorway (CCRP).

The Aboriginal sites along Badgerys and South Creeks appear to extend both upstream and downstream of the selected route. There is no reason to presume that the section of the sites potentially impacted by the route is of greater or lesser significance than comparable areas of creek banks to the north or south. Accordingly, it is concluded that there are no grounds for recommending a different crossing point for either creek.

A mitigation that could reduce the impact of the creek crossings would be to investigate design solutions that maximise the retention of intact top soils under bridge crossing. This might involve the judicious placement of pylons 25 metres or more from the alluvial flats above the creek banks. In order for such a measure to be effective it would need to be supported by active management measures (see below) such as fencing and installing a protective layer of geotextile fabric and clean fill.

The other high significance Aboriginal site is CHRP. This ridgetop site occupies a unique location on the highest point in the surrounding landscape, offering unsurpassed views to the east and south. While the feasibility of rerouting the construction footprint to avoid direct impacts on CHRP must consider constructability, existing infrastructure, threatened ecological species and cost, consideration on minimising the impact to this site where practicable should be considered.

A more detailed assessment of the comparative impacts of each of the alternative routes would need to employ a similar methodology and intensity of testing as was applied to the current project. However, the testing of the current construction footprint would suggest that such broad scale and intensive testing across a larger sample of landscape is unlikely to reveal areas where impacts on Aboriginal cultural heritage would be significantly lower.

The only strategy which would substantially reduce impacts on Aboriginal cultural heritage values would be to position the construction footprint on areas with existing high levels of ground surface disturbance, such as the existing Elizabeth Road corridor or over the operational quarries. This option was not considered operationally feasible in the strategic options assessment due to the unacceptable impacts on existing infrastructure, transport links and commercial operations.

12. Cumulative impacts

Cumulative Aboriginal cultural heritage impacts may arise from the interaction of construction and operation activities of the project and other approved or proposed projects in the area. When considered in isolation, specific project impacts may be considered minor. These minor impacts may be more substantial, however, when the impact of multiple projects on the same receivers is considered. As such, the Aboriginal cultural heritage impacts discussed in **Chapter 10** were assessed in consideration of the following recently completed, ongoing and proposed projects:

- Western Sydney Airport
- Sydney Metro Greater West
- The Northern Road Upgrade
  - Stage 5 (Littlefields Road to Glenmore Park)
  - Stage 6 (Littlefields Road to Eaton Road)
- Other existing road network upgrades and potential road projects, including:
  - Elizabeth Drive Upgrade
  - Mamre Road Upgrade
  - Outer Sydney Orbital
- Major land releases, including:
  - Western Sydney Aerotropolis
  - South West Growth Area
  - Western Sydney Employment Area.

The above projects are in varying stages of delivery and planning. This chapter provides an assessment of cumulative Aboriginal cultural heritage impacts based on the most current and publicly available information on the above. In many instances this is a high-level qualitative assessment. The assessment of cumulative impacts per project is discussed in the sections that follow.

Since the early 1800s impacts to the land forms surrounding the M12 in the Cumberland Plains has been primarily agricultural, consisting of varied phases of stock grazing, cropping, orcharding, dairying and market gardening. In more recent times use of the land has intensified and a wide variety of activities have had substantial impacts on the land. The landscape has been subdivided into small holdings and agricultural blocks since WWII, with a wide variety of market gardening and farming uses in the last 50 years. As recently as 2009 a wide range of land use activities (including chicken farming, market gardening, horticulture, and nursery/garden plant production) were being undertaken on blocks within the areas surrounding the construction footprint (Balarinji 2018).

All of these activities have had a substantial impact on the Aboriginal archaeological record, especially regarding artefacts in the top soil and the plough zone. Vegetation clearance and repeated ploughing and cropping have removed nearly all trees with the potential for Aboriginal scarring. Artefact occurrences have been impacted by soil loss, lateral and vertical soil movement across the land surface, and to a depth of the relevant plough zone.

Prior to environmental and heritage legislation being made law in NSW in the 1970s an unknown but presumably large number of Aboriginal cultural sites were likely to have been lost to development, particularly along transport corridors. In consideration of these historical matters, the design of the project has adopted as narrow a footprint as possible in all areas in order to minimise the impacts to sites. All identified Aboriginal archaeological sites within the project area have been considered in relation to the project. Some level of impact is unavoidable in relation to such a large project.

The test excavation program has allowed the description of extensive subsurface distributions of cultural materials in the construction footprint. These large sites compare to most of the sites in AHIMS which have been detected through surface exposures, where the size of the site is largely determined by the extent of exposure and erosion. In this situation it is not appropriate assess cumulative impacts on the basis of the number of Aboriginal sites that have been impacted across the region. A more appropriate measure of cumulative impact considers the project in terms of the proportion of archaeologically sensitive soils within the South Creek catchment that would potentially be impacted by the project in consideration of other projects in the wider area.

The construction footprint is 331 hectares in extent. The combined areas of Aboriginal sites is estimated as 48.6 hectares, or 14.7% of the construction footprint. This figure does not include the highly diffuse and discontinuous background scatter at CCW 3, which extends for another 20 hectares.

The most significant sites from an archaeological perspective occur within the South Creek alluvium along the major creeks in the local area. Development along the South Creek valley is constrained by the flood-prone nature of the land, but can be subject to development pressures for playing fields and industrial development on filled land. A total of 40 hectares of artefact-bearing South Creek alluvium across Cosgroves, Badgerys, South and Kemps creeks would be impacted by the project along the construction footprint. There is over 1,000 hectares of South Creek alluvium on land north and south of the construction footprint in the South Creek valley alone, not including Cosgroves, Badgerys and Kemps Creeks. For example, the property bounded by Elizabeth Drive, South Creek, the Kemps Creek Waste Depot and the construction footprint boundary comprises over 125 hectares of archaeologically sensitive alluvium.

On land at the confluence of Badgerys and South creeks to the north of the construction footprint there is over 135 hectares of archaeologically sensitive alluvium. Between Elizabeth Drive and Catherine Field there is over 1,000 hectares of South Creek alluvium, not including tributary valleys. The impact on the potential archaeological resource within this area is accumulating as development continues. In this context the contribution of 40 hectares of South Creek alluvium in from the construction footprint is relatively minor.

There are over 140 SSI projects underway at various stages in Western Sydney, all of which would have some impact to Aboriginal heritage and the archaeological records. Combined, the cumulative impact of planned developments on landforms and waterways relevant to the project is substantial and difficult to quantify. Projects such as Badgerys Creek Quarry and Brickworks, the Northern Road upgrade, Oakdale South Industrial Estate and the North West Growth Centre would cause a massive cumulative impact to what is left of the archaeological remnants of Aboriginal life prior to European invasion. Heritage, for all its connection to a fixed past, is alive and dynamic and mutable; its significance changes with the times and from person to person, community to community. Critical infrastructure would seem more important than preserving heritage until what is left is precious enough to outweigh the benefit of its loss.

12.1 Western Sydney Airport

The Australian Government is currently constructing the Western Sydney Airport on the 1,780-hectare Commonwealth-owned land at Badgerys Creek. The Western Sydney Airport is directly related to the project and is identified as an additional contributor the sustained and cumulative loss of Aboriginal sites and cultural values in western Sydney and on the Cumberland Pain. The airport would service both domestic and international markets and development would be staged in response to ongoing growth in aviation demand. Stage 1 includes the establishment of the following to provide operational capacity for about 10 million passengers per year and freight traffic:

- A single 3,700 metre runway in the north-western portion of the site
- A terminal
- Other support facilities
- Foundation for further expansion.

It is anticipated that the demand in relation to this airport would reach about 82 million passengers a year by 2063. To cater for this, a second parallel runway would be constructed at a later stage.

The EIS for the Western Sydney Airport was placed on display in October 2015 and finalised on 15 September 2016 with a Revised Draft Airport Plan. The assessment found that the airport would result in some adverse impacts on the environment and community, particularly in relation to the following:

- Air quality
- Biodiversity
- Health
- Noise
- Water quality.

Mitigation measures were proposed to reduce these potential impacts during construction.

12.1.1 Western Sydney Airport construction cumulative impacts

Construction of Western Sydney Airport is now under way and the airport is set to open in 2026. Construction activities for Stage 1 involve three major work phases:

- Site preparation works, including:
  - Securing the construction impact zone
  - Establishing site services and construction facilities
  - Clearing vegetation
  - Undertaking major earthworks
- Aviation infrastructure works, including construction of the:
  - Runway, taxiways and apron areas
  - Internal road network
  - Terminal complex
  - Air traffic control tower
  - Freight, cargo and maintenance facilities
  - Fuel farm
- Site commissioning activities at the completion of the aviation infrastructure works
  - Involves testing and commissioning of all facilities in readiness for the operation.

There would be moderate cumulative Aboriginal cultural heritage impacts associated with the operation of the project and the Western Sydney Airport. However, the full impact on alluvium within the Badgerys Creek valley has not been clearly defined in the Aboriginal heritage reports reviewed for the Western Sydney Airport (Godden Mackay 1997; Haglund 1978; Jacobs 2016; Navin Officer 2015; 2016; Roberts 2016; RPS Manidis Roberts 2016). A conservative estimate based on the extent of alluvium mapped on the 1:100,000 soil landscape data is that 150 hectares of archaeologically sensitive alluvium would be impacted by the Western Sydney airport. The area of alluvium with the Badgerys Creek valley to be impacted in the detailed investigation area is 6.6 hectares. The cumulative impact of the project on Aboriginal heritage is therefore not considered to be of a degree that represents an unacceptable impact on the Aboriginal cultural heritage of the study area.

12.1.2 Western Sydney Airport operation cumulative impacts

The Western Sydney Airport and the project would be operational at the same time. There would be no cumulative Aboriginal cultural heritage impacts associated with the operation of the project and the Western Sydney Airport.

12.2 Sydney Metro Greater West

Transport for NSW (TfNSW) recently identified recommended corridors for a rail option to provide a major transport link between the North West Growth Area, Western Sydney Airport, and the South West and Greater MacArthur Growth Area. This rail option would connect the existing Main South Line (T8) near Macarthur Station on to the existing Main Western Line (T1) near St Marys Station, via the Western Sydney Airport.

This railway servicing the new Western Sydney Airport would be developed and delivered by Sydney Metro. It is referred to as the Sydney Metro Greater West. Planning for this project is currently underway and, as such, environmental assessment results are not yet unavailable.

12.2.1 Construction cumulative impacts

The magnitude of cumulative construction impacts will be dependent on the specific construction locations, activities and impacts which are yet to be determined for the Sydney Metro Greater West. However, moderate Aboriginal cultural heritage impacts are anticipated as the project will traverse the current project in areas where moderate to high significant sites and landscape features were identified.

Depending on the final design outcomes, this project may have a greater impact on Aboriginal heritage, in particular where impacts occur close to the waterway and creek complexes in the Cumberland Plain.

12.2.2 Operation cumulative impacts

The Sydney Metro Greater West and the project would both be operational at the same time in the longer term (ie opening of the Metro may occur after the opening of the project).

There would be no cumulative Aboriginal cultural heritage impacts associated with the operation of the project and the Sydney Metro Greater West.

12.3 The Northern Road Upgrade

An upgrade of the Northern Road was approved in May 2018 as part of the Western Sydney Infrastructure Plan. The upgrade would improve the capacity of the existing road and create about eight kilometres of new road between Mersey Road, Bringelly and just south of the existing Elizabeth Drive, Luddenham to realign the section of The Northern Road that currently runs through the Western Sydney Airport site. Once the upgrade is complete, The Northern Road would connect the project and the M4 Western Motorway and improve connectivity with the Western Sydney Airport (Roads and Maritime, 2017). The upgrade is being carried out in six stages:

- Stage 1 – between The Old Northern Road, Narellan and Peter Brock Drive, Oran Park
  - Completed
- Stage 2 – between Peter Brock Drive, Oran Park and Mersey Road, Bringelly
  - Under construction
- Stage 3 – between Glenmore Parkway, Glenmore Park and Jamison Road, South Penrith
  - Under construction
- Stage 4 – between Mersey Road, Bringelly and Eaton Road, Luddenham
  - Under construction
- Stage 5 – between Littlefields Road, Luddenham and Glenmore Parkway, Glenmore Park
  - Construction to start early 2019
- Stage 6 – between Eaton Road, Luddenham and Littlefields Road, Luddenham
  - Construction to start mid-2019.

12.3.1 Construction cumulative impacts

Stages 1 through 4 of The Northern Road upgrade would be completed by the time construction of the project commences. The construction for Stage 5 is scheduled for early 2019 to end of 2022. The construction for Stage 6 is scheduled for mid-2019 to end of 2021. Construction activities associated with these two stages may overlap with the project construction. Both these stages are in the vicinity of the project.

The Aboriginal cultural heritage assessment for The Northern Road upgrade identified 28 Aboriginal archaeological sites, all of which would be impacted at least partially by the project. Salvage excavation at 20 archaeological sites was recommended.

Only one of these heritage items will be impacted by the current project, the TNR-AFT-14 site (AHIMS ID: 45-5-4786). This site is of low scientific significance and does not have any cultural deposit associated with it..

12.3.2 Operation cumulative impacts

There would be no cumulative Aboriginal cultural heritage impacts associated with the operation of the project and The Northern Road Upgrade Stages 5 and 6.

12.4 Other road network upgrades

There are a number of other planned and potential road upgrade projects in the western Sydney area that may contribute to cumulative Aboriginal cultural heritage impacts. These potential projects include:

- Elizabeth Drive upgrade – Roads and Maritime has started site investigations, including preliminary engineering, preliminary/strategic designs, environmental field investigations, and strategic modelling. These investigations are expected to be completed by mid-2019
- Mamre Road upgrade – the NSW Government has started early planning for a future upgrade of a 10 kilometre section of Mamre Road, between the M4 Motorway and Kerrs Road to support economic and residential growth in the area
- Outer Sydney Orbital – a future north-south motorway and freight rail line in Sydney's West to support the growth of western Sydney and the distribution of freight across Sydney and regional NSW. While the Outer Sydney Orbital is in early stages of planning, it would provide connections to the Western Sydney Airport.

These projects are currently at varying stages of planning and no design or environmental assessment information is currently publicly available.

12.4.1 Construction cumulative impacts

The timing for construction of the above projects has not yet been announced. However, there is potential for overlaps in construction timing between the project and some of these road upgrade works however as overlapping construction or operational timeframes do not usually add to the overall level of heritage impact.

As there has not been environmental assessment carried out for the planned and potential road upgrade projects in the western Sydney area, it is currently unknown whether there would be cumulative Aboriginal heritage impacts associated with the construction of the project and other road projects.

12.4.2 Operation cumulative impacts

There would be no cumulative Aboriginal cultural heritage impacts associated with the operation of the project and other road projects.

12.5 Growth areas

Western Sydney is the focus of a number of plans and policies to promote changes in land use and to increase employment opportunities, in particular within the following defined areas:

- Western Sydney Aerotropolis – The area surrounding the Western Sydney Airport that was previously known as the Western Sydney Airport Growth Area (see **Figure 1-1**). The Aerotropolis would establish a new high-skill jobs hub across aerospace and defence, manufacturing, healthcare, freight and logistics, agribusiness, education and research industries, and is expected to contribute to establishing 200,000 new jobs for Western Sydney.
- South West Growth Area – The broader area surrounding the Western Sydney Airport (see **Figure 1-1**). This would guide new infrastructure investment, identify new homes and jobs close to transport, and coordinate services in the area. The NSW Government is currently at the early stages of investigations.
- Western Sydney Employment Area – The area north-east of the Western Sydney Growth Area (see **Figure 1-1**). Established by the NSW Government to be a new employment space, providing opportunities for local people to work closer to home.

The land within the areas above would be developed by individual developers at varying timeframes. Each would be subject to their own environmental assessments, based on the scale and potential impact of each project. There are currently no defined plans available for the individual developments within these growth areas.

The project would traverse the South West Growth Area and service the Western Sydney Aerotropolis, and indirectly, the Western Sydney Employment Area. The project would serve and facilitate the growth by providing increased road capacity and reducing congestion and travel times in the area.

12.5.1 Construction cumulative impacts

As there has not been environmental assessment carried out for the Growth Areas projects, it is currently unknown whether there would be cumulative Aboriginal heritage impacts associated with the construction of the project and the development associated with the nearby growth areas. However, it can be surmised that this area will undergo substantial changes in the near future.

While individual proposals will be subject to assessment for heritage impacts and other environmental assessments, there is likely to be long-term impacts that will change the landscape and the heritage character of this area substantially. Therefore, it is likely that there would be moderate cumulative Aboriginal cultural heritage impacts associated with the construction of the project and the development associated with the nearby growth areas.

12.5.2 Operation cumulative impacts

No Aboriginal cultural heritage impacts are expected during operation of the project. As such, it is likely that there would be minimal cumulative Aboriginal cultural heritage impacts associated with the operation of the project and the development associated with the nearby growth areas.

12.6 Conclusion

Overall, the project would have moderate cumulative Aboriginal cultural heritage impacts associated with the construction; and no cumulative Aboriginal cultural heritage impacts associated with operation of the project and the other ongoing and planned developments in the area.

12.7 Cumulative impacts to cultural values

Following European settlement, the Aboriginal population of NSW went into steep decline, and in less than a century many aspects of traditional Aboriginal life and society could no longer be practiced or were prevented by European policy. The Darug people were one of the first cultural groups to bear the initial impact of Sydney's European settlement due to their lands being situated on the Sydney peninsula and the adjoining hinterlands of the Cumberland Plain (Tindale 1974). The Darug's neighbours also suffered from early incursions into their land as the Europeans searched for arable lands to feed the colony. While the coastal Sydney area and its embankments became the residential and commercial focus of the settlement, the fertile lowlands and woodland of the hinterland were developed for agricultural production and the granting of freehold lands.

The Cumberland Plain was an integral component of Darug Country and cultural identity from which they were incrementally excluded and dispossessed by European land use and occupation. Forced movement of people resulted in the loss of many aspects of Aboriginal culture and the emergence of new groups incorporating people from diverse areas and ensuring the preservation of the core cultural practices and knowledge in Aboriginal communities (Hinkson 2001).

The introduction of European land management practices and associated social disruption has had a substantial impact on the Aboriginal cultural values, especially regarding access to traditional lands and cultural practices. Large scale vegetation clearance and agricultural practices have removed nearly all Aboriginal scarred trees in the study area. The project would have a relatively small impact on this, but by implementing a cultural interpretation strategy and distributing the results of the archaeological investigations to the broader community, some of these cumulative impacts can be offset and ameliorated. These management measures are further discussed in **Chapter 13.**

13. Environmental management measures

This chapter describes the management measures for Aboriginal sites identified within the construction footprint. The management measures proposed here respond to the:

- Impacts identified in the preceding chapter
- Cultural significance of the Aboriginal sites
- Need to address intergenerational equity in the enjoyment of Aboriginal heritage
- Need to protect sites not impacted by the project but under the care of the proponent
- Need to mitigate the loss and disturbance of impacted Aboriginal sites.

While Aboriginal sites cannot be replaced once lost, the salvage of Aboriginal heritage impacted by the development will provide a tangible monument to those sites. Furthermore, with care in curation, those salvaged materials can be better studied to help understand other Aboriginal sites present in the landscape.

Management of Aboriginal sites includes protection and salvage measures, development of a curation policy for salvaged Aboriginal objects and procedures for unexpected discovery of Aboriginal objects. Site specific management measures will be described in a Construction Cultural Heritage Management Plan (CCHMP).

Management measures are described to protect Aboriginal sites from impacts or mitigate the impacts on those sites occurring within the construction footprint. Several sites are partially within the construction footprint, requiring both mitigation and protection measures.

Further discussion of the management measures as applied to Aboriginal cultural values are included in Section 6 and Section 10 of the ACHAR. The mitigation and management measures in the ACHAR comprise Aboriginal heritage interpretation and the ways in which local Aboriginal voices have been invited, heard and considered in the early stages of the project. This early consultation results will inform the eventual shape of the art, design and interpretive opportunities to embed Aboriginal sensibility across the M12 route.

13.1 Management principles

Aboriginal heritage management is predicated on the principle of *intergenerational equity*. This means that the current generation should allow for future generations an opportunity to enjoy the cultural legacy of past generations. Although total equity between generations is never possible, the intention of the principle is for present generations to consider future generations when making management decisions. For this reason, the principle of intergenerational equity is a core element of the notion of ecologically sustainable development (ESD) which commonly guides regulators in their review of Aboriginal heritage management.

This may be achieved by a regional program of protection for representative cultural landscapes and sites. At a local level, the project achieves this by protection and salvage of Aboriginal sites. Both of these measures allow retention of cultural materials for the enjoyment and education of future generations. Measures which respond to development impacts on cultural heritage should be of a nature which passes on knowledge and access to Aboriginal cultural materials, allowing options for future enjoyment, study and curation of those materials.

The management of Aboriginal cultural heritage values within the project is based on:

- The identification of Aboriginal heritage values
- The extensive distribution of Aboriginal objects within defined landscapes
- The assessed significance of individual sites
- The nature of proposed project impacts on Aboriginal heritage value
- The views of the Aboriginal community, represented by RAPs.

13.2 Management measures

The management measures detailed below and summarised in **Table 13-1**, including timing of implementation and assigned responsibility.

Table 13-1 Management and mitigation strategies for Aboriginal heritage

Impact	Reference	Environmental management measure	Responsibility	Timing
General	AH1	A Construction Cultural Heritage Management Plan (CCHMP) will be developed in consultation with the RAPs to document standard procedures for: • Unexpected finds procedure for the discovery of Aboriginal ancestral remains, Aboriginal objects or new Aboriginal sites consistent with RMS (2015) Standard Management Procedure Unexpected Heritage Items • Detailed site salvage strategy • Management and curation of salvaged Aboriginal objects • Detailed locations and installation procedures for fencing and protective coverings • Details of permissible activities and permissible vehicle access inside protected Aboriginal areas • Heritage components of induction package for construction workers and supervisors • Any other heritage matters addressed in Conditions of Approval for the project.	Contractor/ Roads and Maritime	Prior to construction
Opportunities to minimise impacts to CHRP site	AH2	Where feasible, detailed design will investigate options to minimise impacts to the CHRP site	Contractor	Detailed design
Impacts to Aboriginal heritage during construction	AH3	Construction works are closely confined to the minimum possible area required for construction activities. Haulage and other access roads should be designed and located to minimise potential disturbance of soils. Maximising the protection is particularly important in the zone within 100 m of creeks and may require covering the original cultural deposits in temporary protective barriers such as geotextile fabric and a layer of clean fill.	Contractor	Construction
CCW	AH4	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
	AH5	Salvage excavation (20 m²) to define western limit of artefact distribution	Contractor/ Roads and Maritime	Prior to construction
CCE T1	AH6	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
CCE T2	AH7	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
CCE T3	AH8	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction

Impact	Reference	Environmental management measure	Responsibility	Timing
BWB	AH9	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
	AH10	Salvage excavation (20 m²) to define western limit of artefact distribution;	Contractor/ Roads and Maritime	Prior to construction
BCW	AH11	Investigate feasibility of retaining cultural deposits between the pylons of bridges or elevated structures	Contractor	Detailed design
	AH12	Temporary protective fencing of site along the construction footprint;	Contractor	Prior to construction
	AH13	Salvage excavation (100 m²) to recover area of artefact concentration	Contractor/ Roads and Maritime	Prior to construction
BCE	AH14	Investigate feasibility of retaining cultural deposits between the pylons of bridges or elevated structures	Contractor	Detailed design
	AH15	Temporary protective fencing of site along the construction footprint;	Contractor	Prior to construction
	AH16	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction
SCW T1	AH17	Investigate feasibility of retaining cultural deposits between the pylons of bridges or elevated structures	Contractor	Detailed design
	AH18	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
	AH19	Salvage excavation (20-50 m²) to investigate possible cultural stratification in deep alluvium; temporary protective fencing of site along construction footprint boundary;	Contractor/ Roads and Maritime	Prior to construction
SCW T2	AH20	Investigate feasibility of retaining cultural deposits between the pylons of bridges or elevated structures	Contractor	Detailed design
	AH21	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
	AH22	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction
	AH23	Salvage excavation (140 m²) to recover artefact concentrations	Contractor/ Roads and Maritime	Prior to construction
SCE	AH24	Investigate feasibility of retaining cultural deposits between the pylons of bridges or elevated structures	Contractor	Detailed design
	AH25	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction

Impact	Reference	Environmental management measure	Responsibility	Timing
	AH26	Salvage excavation (50 m²) to recover artefact concentrations and quarrying evidence	Contractor/ Roads and Maritime	Prior to construction
KNW	AH27	Temporary protective fencing of site along the construction footprint	Contractor	Prior to construction
KCW	AH28	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
	AH29	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined.	Contractor/ Roads and Maritime	Prior to construction
	AH30	Salvage excavation (20-50 m² plus 190 m²) to investigate possible cultural stratification in deep alluvium.	Contractor/ Roads and Maritime	Prior to construction
PCP8	AH31	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction
CHRP	AH32	Temporary protective fencing of site along construction footprint boundary	Contractor	Prior to construction
	AH33	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined.	Contractor/ Roads and Maritime	Prior to construction
	AH34	Salvage excavation: Salvage excavation (100 m²) to investigate archaeological potential of this highly culturally significant site	Contractor/ Roads and Maritime	Prior to construction
RR	AH35	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction
M12A1	AH36	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction
Isolated artefact 4	AH37	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction
TNR-AFT-14	AH38	Salvage collection: Surface artefacts will be collected and removed off-site for detailed analysis to be carried out. Once analysed the material will be permanently reburied on country near the project at a location to be determined	Contractor/ Roads and Maritime	Prior to construction

13.2.1 Construction Cultural Heritage Management Plan

A CCHMP will be prepared prior to the commencement of any works that impact on the existing ground surface, including temporary excavation and pavement, fencing and vegetation clearance works. The AHMP will be developed in consultation with the RAPs to document:

- Unexpected finds procedure for the discovery of Aboriginal ancestral remains, Aboriginal objects or new Aboriginal sites consistent with the *Standard Management Procedure Unexpected Heritage Items* (Roads and Maritime 2015)
- Detailed site salvage strategy
- Management and curation of salvaged Aboriginal objects
- Detailed locations and installation procedures for fencing and protective coverings
- Heritage components of induction package for construction workers and supervisors
- Any other heritage matters addressed in Conditions of Approval for the project

13.2.2 Active avoidance

It is recommended that impacts to site CHRP be minimised where feasible. This site is located at a unique point in the landscape and has no alternative representation of such to mitigate the proposed impact.

It is recommended that the feasibility of retaining portions of that are located under elevated structures (bridges) over Badgerys and South Creeks be investigated as part of the detailed design process, including the following sites:

- BCW
- BCE
- SCW T1
- SCW T2
- SCE.

The objective will be to maximise the retention of intact, cultural deposits in the zone between bridge pylons. This strategy will depend upon the effectiveness of measures to protect the deposits during construction. Potential protective strategies might include fencing and covering the cultural deposits with geotextile fabric and clean fill to reduce the potential for inadvertent damage.

Another active avoidance strategy is to ensure that construction works are closely confined to the minimum possible area required for construction activities. Haulage and other access roads should be designed and located to minimise potential disturbance of soils. Maximising the protection is particularly important in the zone within 100m of creeks and may require covering the original cultural deposits in temporary protective barriers such as geotextile fabric and a layer of clean fill.

13.2.3 Passive avoidance

Sites that don’t require active protection measures include:

- KCE
- CP AS1
- P-CP9
- PAD-OS-7
- PAD-OS-5
- DLC2
- M12A5
- KC/ED2.

One site within the construction footprint, KCE does not require active protection measures due to low archaeological significance primarily due to the disturbed nature of the Kemps Creek landform in that location. Several Aboriginal sites in the detailed investigation area are of sufficient distance from the construction footprint to not require active protection measures.

13.2.4 Active protection

Active protection is necessary on the boundaries of all Aboriginal sites that are partially impacted by the project. The intent is to limit impacts to the portion of the site inside the construction footprint. Protection will include suitable temporary fencing with signage notifying construction personnel to avoid ground impacts in protected areas. Details of fencing locations, permissible activities and permissible vehicle access inside protected Aboriginal areas should be documented in an AHMP.

Sites to be fenced along the boundary of the construction footprint include

- CCW
- CCE T1
- CCE T2
- CCE T3
- BWB
- BCW
- BCE
- SCW T1
- SCW T2
- SCE
- KNW
- KCW
- CHRP.

13.2.5 Salvage collection

Salvage collection is warranted at those Aboriginal sites in the construction footprint where stone artefacts have been recorded on the surface. Salvage collection is to record MGA coordinates of each artefact by GPS and relevant artefact attributes consistent with the broader archaeological salvage analysis. The results of salvage collection should be collated in an Aboriginal Site Salvage Report (ASSR).

Salvage collection will be undertaken by a suitably qualified archaeologist.

Sites requiring salvage collection include:

- BCE (incorporating surface stone artefacts sites 45-5-528 (Fleurs 2)/45-5-4750 (M12A3) 45-5-4748 (M12A2)),
- SCW T2
- KCW
- PCP8 (45-5-2308)
- CHRP (incorporating 45-5-4935)
- RR (45-5-4937/45-5-4007)
- M12A1 (45-5-4747)
- Isolated artefact 4 (45-5-3804)
- TNR-AFT-14 (45-5-4786).

13.2.6 Salvage excavation

Salvage excavation is warranted at those Aboriginal sites that were assessed as having high scientific and high overall significance. Salvage excavation will be undertaken by a suitably qualified archaeologist. Sites requiring salvage excavation include:

- CCW
- BWB
- BCW
- SCW T1
- SCW T2
- SCE (incorporating site 45-5-0496 (Fleurs 1)/45-5-4749 (M12 A4)),
- KCW
- CHRP (incorporating 45-5-4935).

Salvage excavation will be conducted by appropriately qualified and experienced archaeologists (as per Section 1.6 of the Code of Practice) and nominated site officers for the relevant RAP

In general, it is proposed that an excavation team consisting of five field archaeologists and a maximum of eight nominated site officers conduct the open area excavation. Where additional resources are required, it is proposed that a ratio of three site officers to one field archaeologist is preferred, with a maximum of seven field archaeologists and 12 site officers engaged at any one time.

If required, a dedicated artefact specialist may also be engaged during the test excavation program to assist with the analysis of large volumes of artefacts. The artefacts will be analysed with assistance from nominated site officers for the RAPs.

The excavation strategy should address specific questions about each site and be elaborated in the AHMP. The extent of salvage excavation is estimated here subject to development of a detailed salvage methodology in the AHMP. Issues for investigation include:

- Potential cultural stratification in deep alluviums at SCW T1 and KCW through open plan excavation of one area at each site of at least 20 square metres in area subject to consistent identification of Aboriginal objects in the lower half of the topsoil profile and up to 50 metres if consistent numbers of Aboriginal artefacts are found in contiguous squares which are indicative of culturally stratified deposit ie having distinct technological or raw material characteristics
- Geomorphological analysis and dating of sediments associated with deep assemblages if archaeological results suggest older assemblages at depth
- The technological characteristics of artefact concentrations at SCE, SCW T2, KCW through excavation of an area sufficient to yield an artefact assemblage of 3,000 artefacts (following the PhD research findings of White 2018: 328 who concludes in part, “On the Cumberland Plain excavations should continue to seek to recover several thousand artefacts at least.”) which is estimated to be 50 metre squared at SCE, 140 metre squared at SCW T2 and 190 metre squared at KCW subject to broadly consistent artefact densities being identified in contiguous squares
- The characteristics of artefact assemblages in atypical elevated outlook areas at BCW and CHRP through excavation of 100 metre squared at each site
- The extent of artefact distribution away from creek systems in the Luddenham Rolling Hills at BCB and CCW through extension of the test pit transect to the west at 200 metre intervals for at least two kilometres or until no artefacts are found in four consecutive test pits, and with supplementary test pits where artefacts are found consistent with the methodology adopted for this project at CCE T3, being approximately 20 metre squared.

The results of salvage excavation and artefact analysis will be documented in an Archaeological Salvage Excavation Report.

13.2.7 Radiometric dating

During archaeological salvage, samples of organic material suitable for radiometric dating (charcoal, bone, shell, wood) will be collected for the dating of archaeological deposits. The number of samples sent for dating will be determined on the suitability of the sample and the significance of the site. Samples will be collected as follows:

- Samples will be collected using clean nitrile gloves and placed in clean plastic sample bags
- Charcoal samples will also be wrapped in aluminium foil to prevent crushing
- Samples will be removed to the relevant temporary keeping place and dried out to avoid fungal growth during transport
- Samples will be packaged within hard plastic cases for transport to a radiocarbon dating laboratory.

13.2.8 Research questions

The results of the archaeological assessment suggest a series of research questions that should guide any salvage excavations in the sites identified above. The principle questions relate to the types of information that could be gleaned from the analysis of stone tools, temporal changes within or between sites or proximity to certain resource areas or landscapes as they are encountered across the project.

Due to their durability and abundance throughout cultural deposits, stone tools are most often the principle evidence that informs analysis of past modes of behaviour and subsequently provide the greatest opportunity to delve deeper into archaeological analysis. The following key research question concentrated on the stone tool evidence that was revealed during test excavations:

1) Are there any variations in stone tool typologies across the different landscape regions, between sites or even within sites?

The results of the archaeological assessment cast light on the types of questions that could be asked of the stone tool analysis during further salvage excavation including the following:

1a. Are there variations in cortex percentages on stone tools at sites east and west of the South Creek?

1b. Are these changes related to material types?

1c. If so, what do these variations suggest?

1d. Does previous research in the region inform on these results?

1e. Are there variations in the tool typology, density and distribution across sites in the study area and are these comparable to other sites in the broader region or variations in the Australian Small Tool Tradition / late Holocene assemblages?

1f. Is there evidence for intra-site temporal changes in tool typology?

1g. How does this inform on cultural changes in adaptations to the local environment?

A further key research question was posed that relates to temporal changes evidenced in sites as follows:

2) What is the chronology of the sites identified in the detailed investigation area and are there variations in stone tool typologies across time?

A further key research question was posed that attempts to explain site characteristics that are related to resource availability as follows:

3) Are there variations in site usage that relate to proximity to resource areas or water sources?

   a. Is there archaeological evidence (hearths, oven mounds) to suggest the area adjacent to the creeks were used for camping?

This led to a further subset of questions being posed as follows:

b. Are there correlations between the intensity of site usage and distance to ephemeral and permanent water sources?

c. Is there evidence for site use being seasonal, permanent or opportunistic?

d. Can the evidence contribute information not available from any other source, location or environmental setting?

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Appendix A. Glossary

Aboriginal cultural heritage: The material (objects) and intangible (mythological places, dreaming stories etc.) traditions and practices associated with past and present day Aboriginal communities.

Aboriginal Cultural Heritage Assessment report: A report combining an Aboriginal archaeological assessment and Aboriginal cultural assessment, required to be submitted to EESG for any Part 6 National Parks and Wildlife Act 1974 approval or prepared for projects under Division 5.2 of the *Environmental Planning and Assessment Act 1979* where Aboriginal cultural heritage is identified as a key issue.

Aboriginal object: Any deposit, object or material evidence (not being a handicraft made for sale), including Aboriginal remains, relating to the Aboriginal habitation of NSW.

Aboriginal place: Any place declared to be an Aboriginal place under s.94 of the *National Parks and Wildlife Act 1974.*

AFG: An acronym for 'Aboriginal Focus Group'. This refers to organised meetings where RAPs can be consulted on Roads and Maritime projects.

Angular fragment: A flaked piece of stone that does not have characteristic features which allow for it to be positively identified as a flake, core or tool.

Archaeological site: A location that has evidence of past Aboriginal activity (both material and mythological/ritual).

Area of archaeological sensitivity: A part of the landscape that contains demonstrated occurrences of cultural material. The precise level of sensitivity will depend on the density and significance of the material.

Artefact scatter: Where two or more stone artefacts are found within an area of potential archaeological deposit or a site.

Assemblage: The name given to encompass the entire collection of artefacts recovered by archaeologists, typically classified into diagnostic items used to describe the material culture.

Backed: When one margin of a flake is retouched at a steep angle, and that margin is opposite a sharp edge. The steep margin is formed by bi-polar or hammer and anvil knapping.

Backed artefact: A class of artefact employed by archaeologists to describe artefacts which are backed. Sometimes divided into Elouera, Bondi point, and geometric microlith implement forms.

Bipolar: A flaking technique where the object to be reduced is rested on an anvil and struck. This process is identified by flakes with platform angles close to 90 degrees as well as apparent initiation from both ends. Some crushing may also be visible.

Chert: A fine grained rock composed of cryptocrystalline silica. It exhibits a range of textures and colours including red, green or black. Chert is easy to work and retains a sharp edge for an extensive period of time before resharpening is required. It has a low to medium fracture toughness.

Complete flake: Characterised by a bulb of percussion, striking platform remnant, and clear termination.

Conjoin analysis: The process of physically (re-)fitting artefacts back together.

Consequence of harm: for the purpose of impact assessment the consequence of harm is defined as:

- "Total loss of value", meaning the site is destroyed to the extent that its embodiment of any heritage value is irretrievably lost;
- "Partial loss of value", meaning the site is harmed to the extent that there is still some incomplete representation of its original fabric, retaining potential for the site to be appreciated to some degree by present and future generation; and
- "No loss of value", meaning that the site retains its full intact potential to be valued and enjoyed by present and future generations.

Core: A stone piece from which a flake has been removed by percussion (striking it) or by pressure. It is identified by the presence of flake scars showing the negative attributes of flakes, from where flakes have been removed.

Cortex: The outer weathered surface of stone; if smooth, it can indicate the source of stone was a pebble.

Crushed platform: This term is used to describe a flake that has a damaged platform and where the platform's attributes cannot be recorded as a result.

Degree of harm: for the purpose of impact assessment the degree of harm is defined as:

- "Total", meaning that the entire site will be harmed;
- "Partial", meaning that a part of the site will be harmed; and
- "None", meaning there will be no movement of any Aboriginal object from a site or within a site, including covering sites by burial or inundation.

Detached piece: a piece of stone removed from another piece of stone (the "objective piece"). A term used in reference to artefacts derived from flaking processes and can include such types as flakes and flaked pieces.

Flake: A stone piece removed from a core by percussion (striking it) or by pressure. It is identified by the presence of a striking platform and bulb of percussion, not usually found on a naturally shattered stone.

Flake scar: Often called a 'negative flake scar', it is the remnant of a previous flake that was struck from the core. This appears on the dorsal surface of a flake.

Flaked piece: An artefact which has technologically diagnostic features but has no discernible ventral or dorsal surface and hence is unidentifiable as either a flake or a core.

Flaked platform: This term is used to describe a platform that has been worked previously; one or more flakes were removed prior.

Geomorphic: Relating to the structure, shape and development of landforms.

Heat shatter: Stone which has been reduced by exposure to heat. This stone can be identified by a number of features which include among others discolouration, texture changes and pot-lidding.

Hinge termination: A hinge termination occurs when "the fracture meets the surface of the core at approximately right angles to the longitudinal axis of the flake" (Holdaway and Stern 2008:130). This can present as a rounded surface that curves downwards at the distal end of a flake.

Humic: Soil that contains organic matter (from 'humus').

Indurated mudstone/tuff (IMT): A sedimentary stone indurated with silica to form a siliceous stone suitable for flaking. Since Hughes et.al. 2011 the abbreviation "IMT" is now the appropriate term for the characteristic stone with brown cortex available from Hawkesbury-Nepean River cobble beds as common in stone artefact sites throughout the Hawkesbury-Nepean Valley. The terms indurated mudstone and tuff have been used separately to describe this distinctive stone type present throughout the Cumberland Plain.

In situ: A description of any cultural material that lies undisturbed in its original point of deposition.

Knapping: The removal of flakes and flaked pieces from a stone core by the use of percussion.

Knapping floor: A concentrated identifiable area where flaking (reduction) has taken place (also referred to as a reduction floor

Layer: In stratigraphy, it is used to describe a horizon (soil, rock, charcoal) that is distinct from its surrounds.

Longitudinally split flake: This is a flake that is broken (split) from the point of percussion (the strike) through to the termination.

Manuport: An object which has been carried by humans to a site.

Midden: The term midden is a Danish word meaning a mound of kitchen refuse. In archaeological terms, a midden refers to an accumulation of shell deposited after people had collected and eaten shellfish. These could contain estuarine and fresh water shellfish species in addition to faunal remains, stone artefacts and charcoal from cooking fires. In northern NSW in many areas, burials have been recorded in direct association with midden deposits.

Mudstone: A sedimentary rock formed from mud/clay.

Munsell colour: This is a colour code chart used to standardise colour specifications.

Objective piece: A piece of stone from which another piece of stone has been detached – used in relation to artefacts, grouping together such types as cores and retouched flakes.

pH: A measure of the acidity or alkalinity of the soil. Neutral is indicated by a pH of 7, with strongly acidic being 0 and strongly basic (alkaline) being 14. The 'pH' is said to stand for 'potential of hydrogen'.

Platform: On a flake, this is a core remnant from where the flake was struck off the core.

Platform width: This is a measurement taken across the width of a platform between the two lateral margins of a flake.

Platform thickness: This is a measurement taken from the ventral to dorsal surfaces of a flake (beginning at the point of impact/percussion).

Potential Archaeological Deposit (PAD): A PAD is a location that is considered to have a potential for sub-surface cultural material. This is determined from a visual inspection of the site, background research of the area and the landform's cultural importance.

Primary flake: The initial flake removals detached from a cobble, evident in the high proportion of cortex on the detached pieces.

Quartz: A mineral composed of silica with an irregular fracture pattern. The quartz used in artefact manufacture is generally semi-translucent, although it varies from milky white to glassy. Glassy quartz can be used for conchoidal flaking, but poorer quality material is more commonly used for block fracturing techniques. Quartz can be derived from water worn pebbles, crystalline or vein (terrestrial) sources.

Quartzite: A form of metamorphosed sandstone. It is often white or grey in colour, but can occur in other shades due to mineral impurities.

Raw material: The kind of stone the artefacts were manufactured from.

Reduction: The process of removing stone flakes from another piece of stone. Generally this is performed by striking (hard hammer percussion) one rock with another to remove a flake.

RAPs: Members of a local Aboriginal land council, Aboriginal groups or other Aboriginal people who have registered their interest with Roads and Maritime to be consulted about a proposed project or activity.

Retouch: Retouch is when a flake is removed after the manufacture of the original flake. This sequence can be observed when a flake scar is present and encroaches over the ventral surface and thus must have been made after the initial flake removal. Recorded whether retouch was absent or present on the artefact.

Sandstone: Is a sedimentary rock formed from sand-sized predominantly quartz grains.

Scarred trees: Trees that feature Aboriginal derived scars are distinct due to the scar's oval or symmetrical shape and the occasional use of steel, or more rarely, stone axe marks on the scar's surface. Scarred trees are identified by the purposeful removal of bark for use in the manufacture of artefacts such as containers, shields and canoes. The bark was also used for the construction of shelters. Other types of scarring include toeholds cut in the trunks or branches of trees for climbing purposes and the removal of bark to indicate the presence of burials in the area.

Silcrete: Soil, clay or sand sediments that have silicified under basalt through groundwater percolation. It ranges in texture from very fine grained to coarse grained. At one extreme it is cryptocrystalline with very few clasts. It generally has characteristic yellow streaks of titanium oxide that occur within a grey and less commonly reddish background. Used for flaked stone artefacts.

Site: a location across which a continuous distribution of surface or sub-surface Aboriginal objects are distributed. Often conforms to a landform element such as the side of a creek and may extend for several hundreds of metres. The term is not a behavioural descriptor.

Stone artefact site: refers to Aboriginal sites on AHIMS where one or more stone artefacts are present in an open context. It encompasses “isolated finds”, “artefact scatters” and “open campsites”.

Spit: Refers to an arbitrarily defined strata of soil removed during excavation (often 50 to 100 millimetres (mm) in depth).

Stratification: The way in which soil forms in layers.

Stratigraphy: The study of soil stratification (layers) and deposition.

Sub-surface testing: An archaeological method used to determine the cultural sensitivity of an area by excavating small (0.5 m x 0.5 m) pits and recording the stratigraphy, material remains (such as stone tools) and disturbance.

Technology: A form of artefact analysis which is based upon the knapping/ manufacturing process, commonly used to subsequently infer behaviour patterns, cultural-selection and responses to raw material or the environment.

Termination: Refers to the shape of the distal end of a flake.

Test pit: refers to the entirety of a one metre square archaeological test pit.

Tool: A stone flake that has undergone secondary flaking or retouch.

TP: Acronym for ‘test pit’. Generally, this refers to a 1 m x 1 m or 2 m x 1 m pit dug by shovel, trowel or mattock. Test pits were used to determine the extent of possible features (such as shell middens) in a controlled excavation of 50 mm spits.

Type of harm: for the purpose of impact assessment the types of harm are defined as:

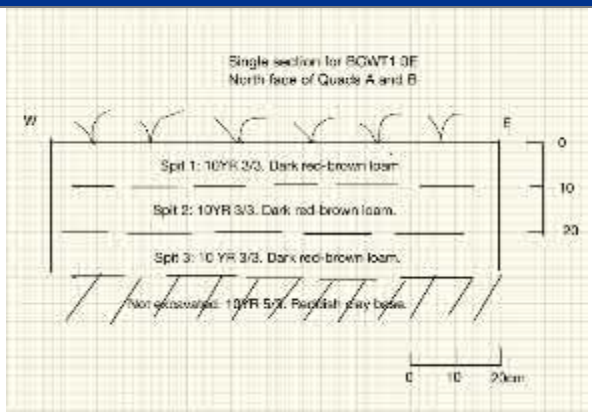
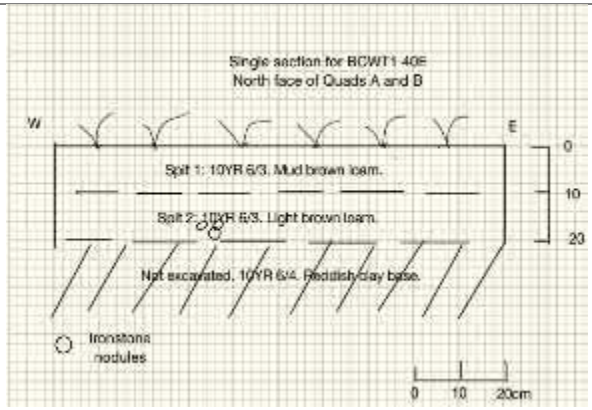
- “Will not be harmed”, meaning there may be no movement of any Aboriginal object from a site or within a site;
- “Movement (collection) only”, meaning that surface artefacts may be moved within a site, but not moved from a site;
- “Excavation”, meaning that Aboriginal objects may be removed from a site by archaeological excavation;
- ”Community collection”, meaning that Aboriginal objects may be removed from the site by members of the local Aboriginal community; and
- “Directly harmed”, meaning that Aboriginal objects may be removed or destroyed by any process.

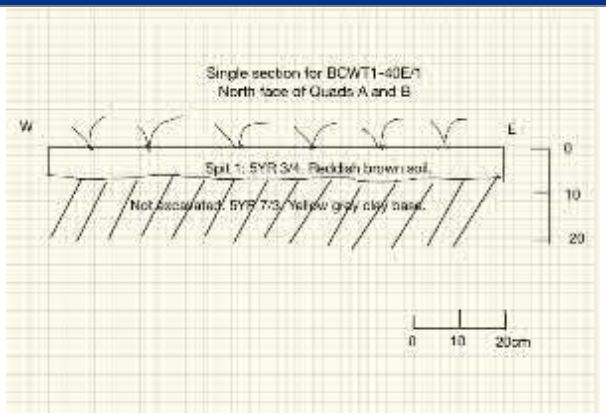
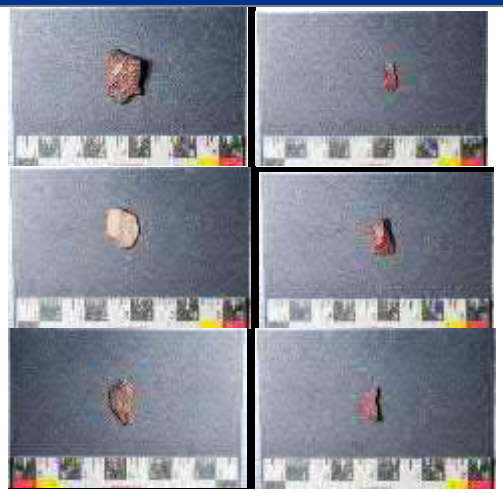
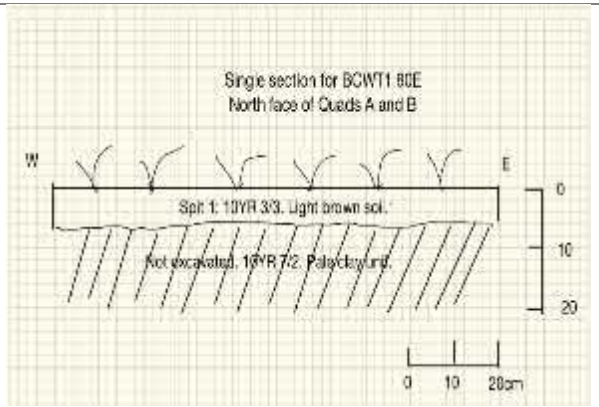
Unit: a 500 millimetres by 500 millimetres volumetric unit of soil from which artefacts derived.

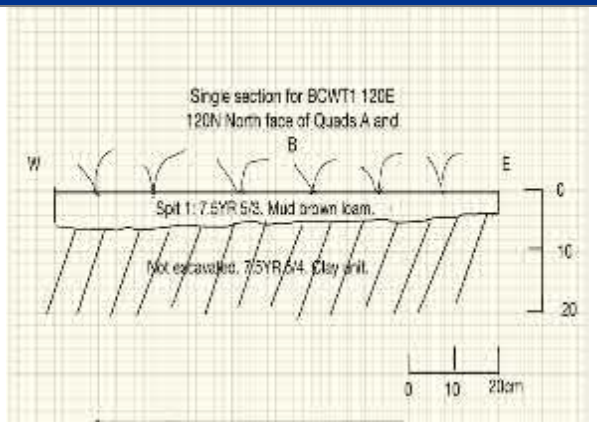
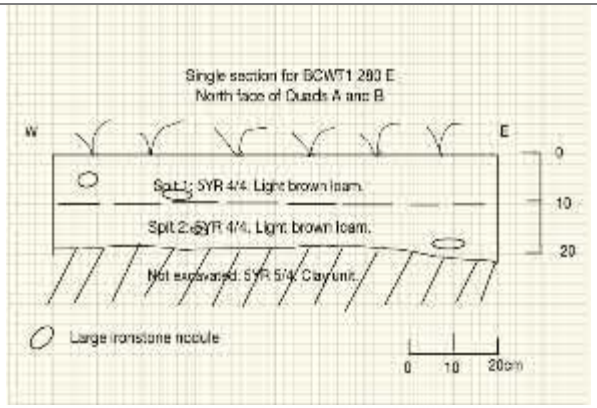
Visibility: Refers to the degree to which the surface of the ground can be observed. This may be influenced by natural processes such as wind erosion or the character of the native vegetation, and by land use practices, such as ploughing or grading. It is generally expressed in terms of the percentage of the ground surface visible for an observer on foot.

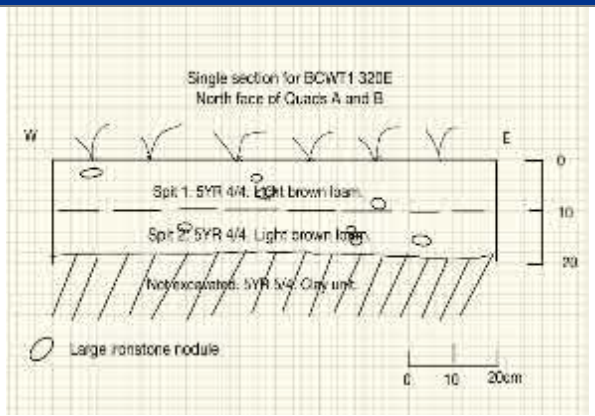
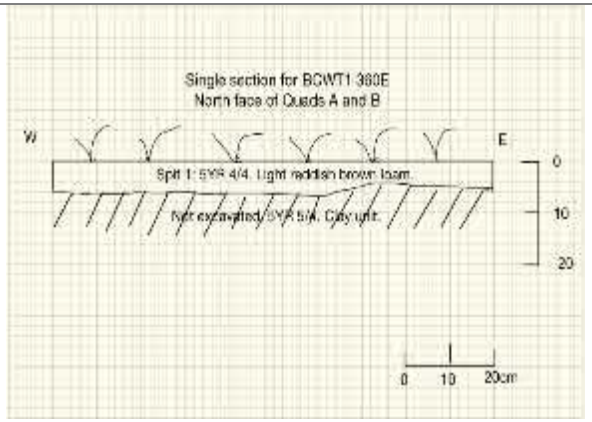
Appendix B. Section drawings with artefact photos

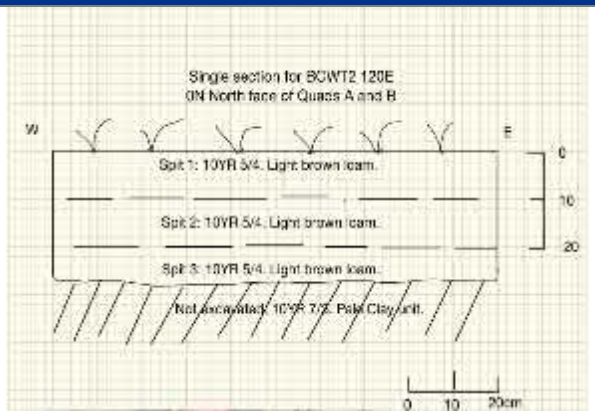
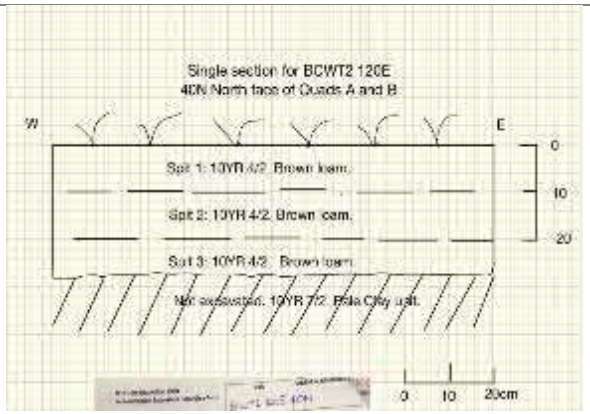
All photos by Gary Dunnett. All section drawings drafted by Chelsea Jones from field drawings by Gary Dunnett.

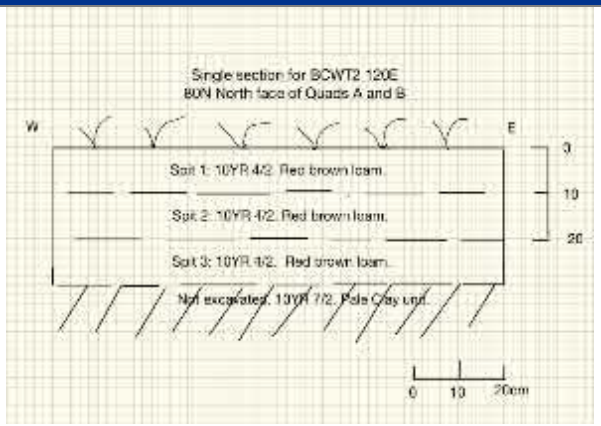
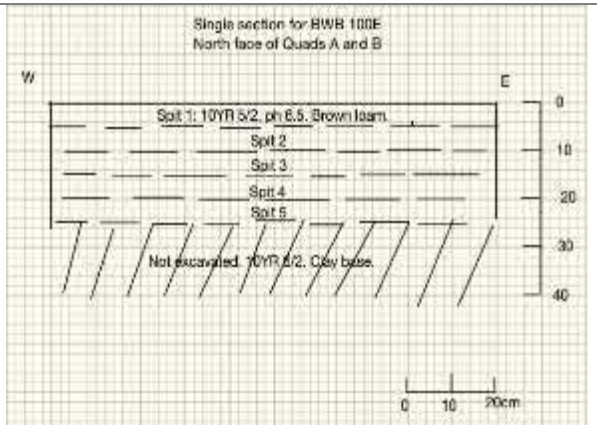
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCW T1 0E (1 m²)			
BCW T1 40E (1 m²)			

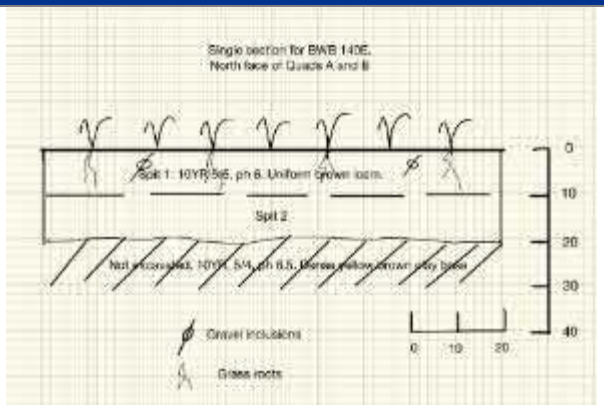
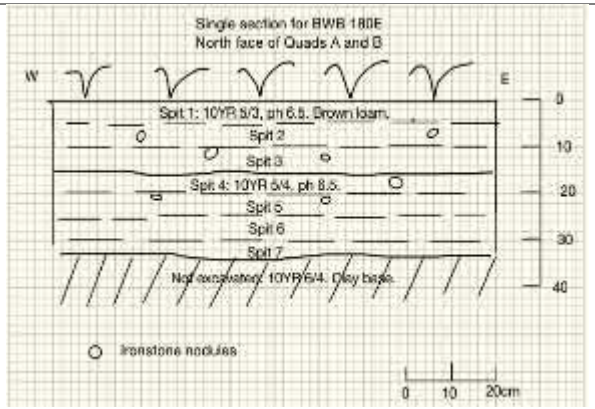
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCW T1 -40E (1 m²)			 
BCW T1 80E (1 m²)			

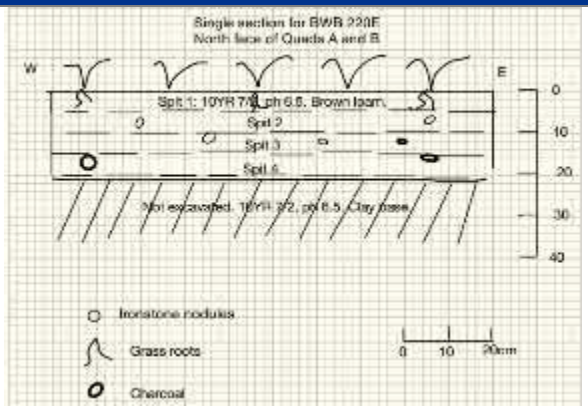
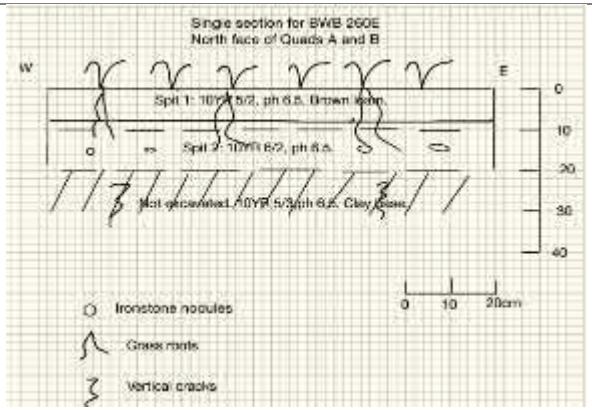
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCW T1 120E (1 m²)			
BCW T1 280E (1 m²)			

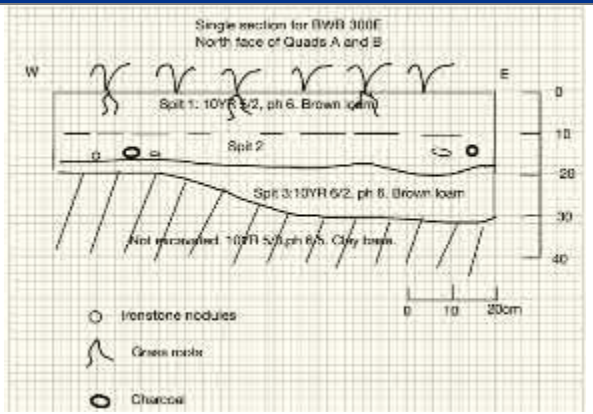
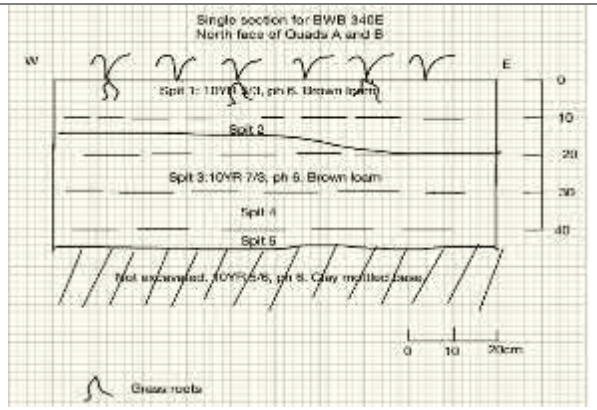
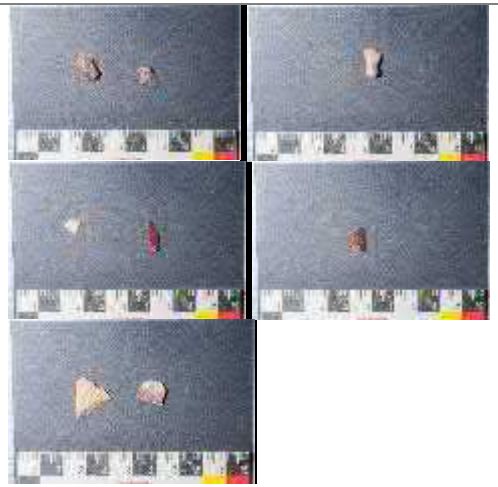
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCW T1 320E (1 m²)			
BCW T1 360E (1 m²)			

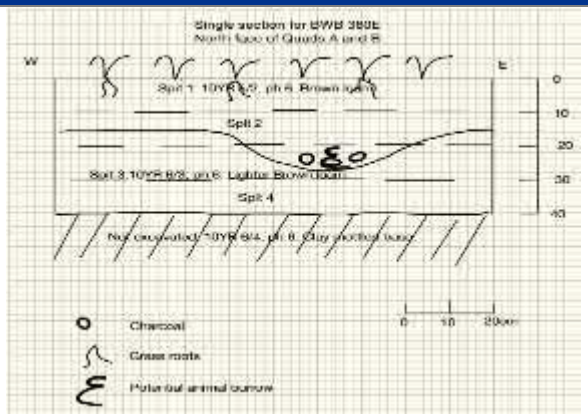
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCW T2 120E0N (1 m²)			
BCW T2 120E40N (1 m²)			N/A

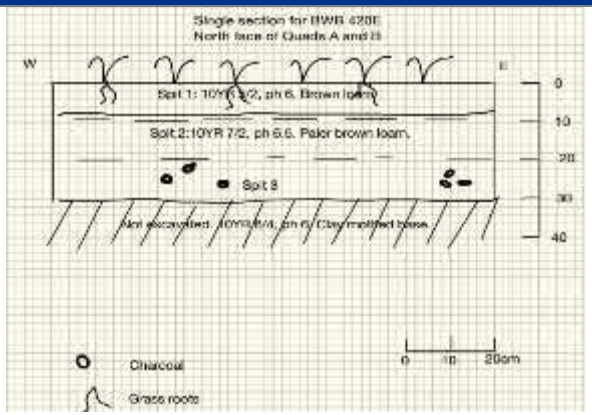
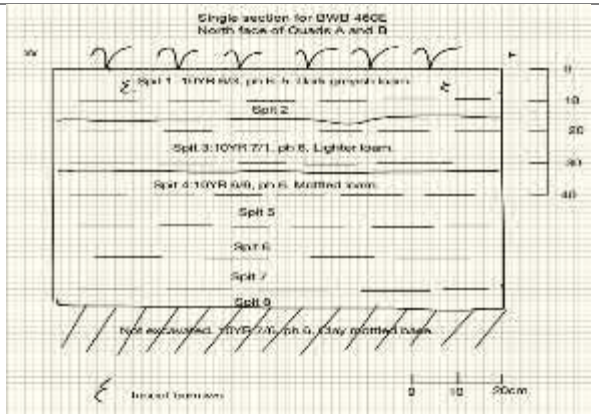
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCW T2 120E80N (1 m²)			N/A
BWB 100E (1 m²)			

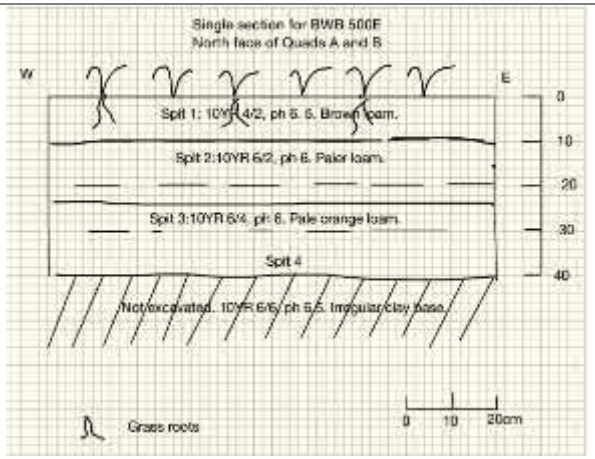
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BWB 140E (1 m²)			
BWB 180E (1 m²)			

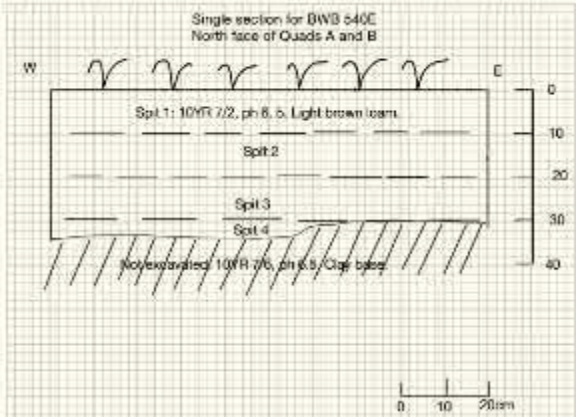
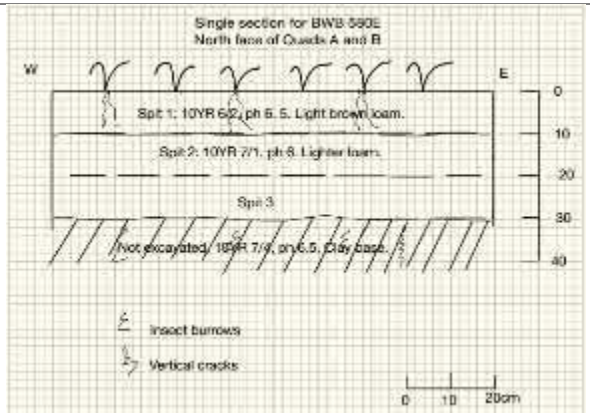
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BWB 220E (1 m²)			
BWB 260E (1 m²)			

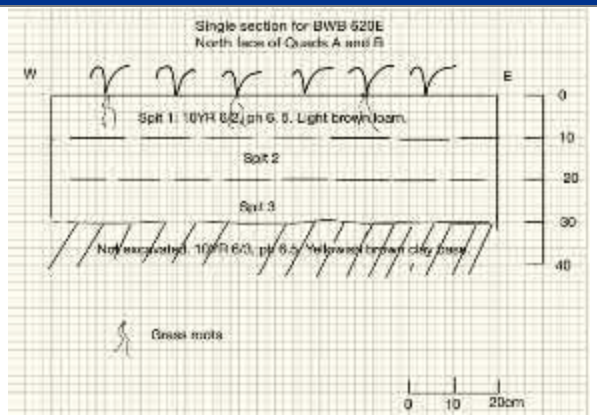
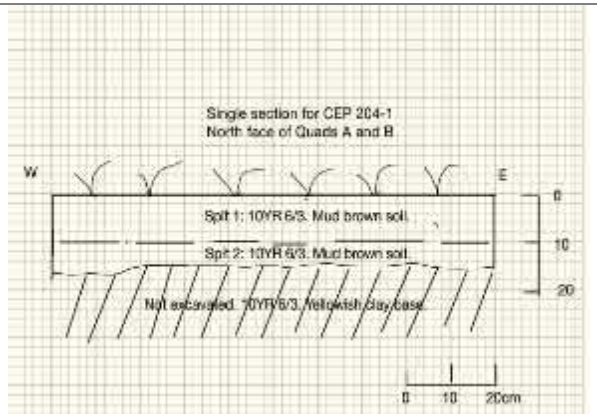
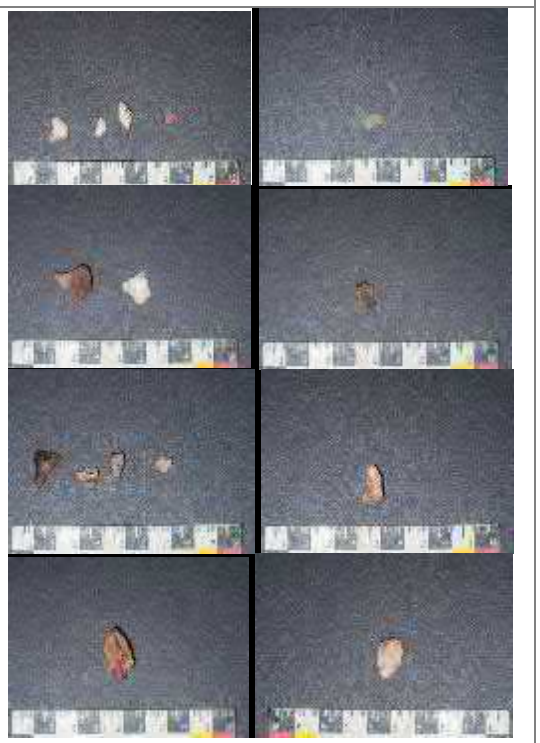
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BWB 300E (1 m²)			N/A
BWB 340E (1 m²)			

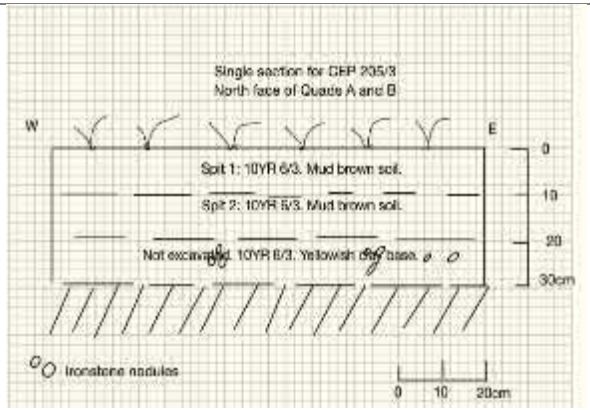
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BWB 380E (1 m²)			
BWB 380E detail		See above.	See above.

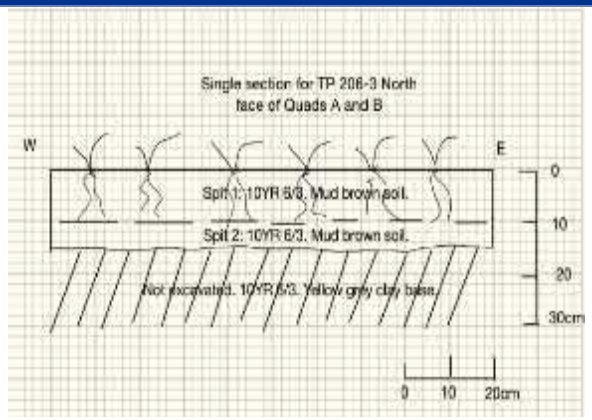
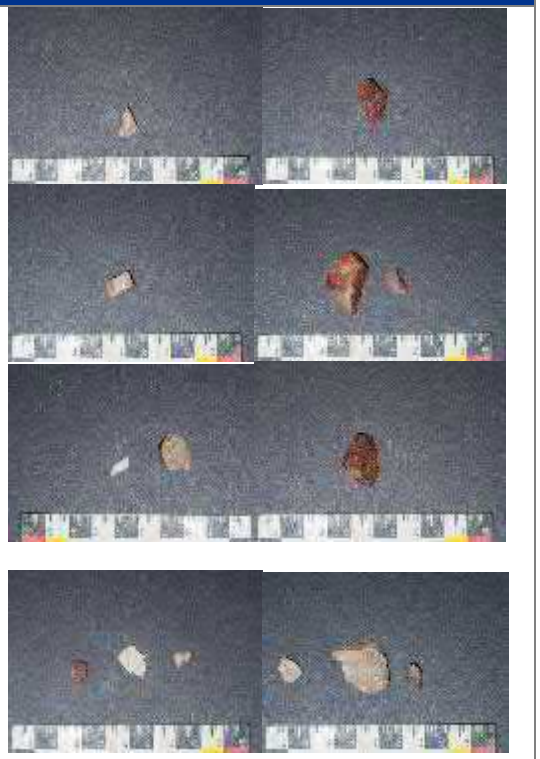
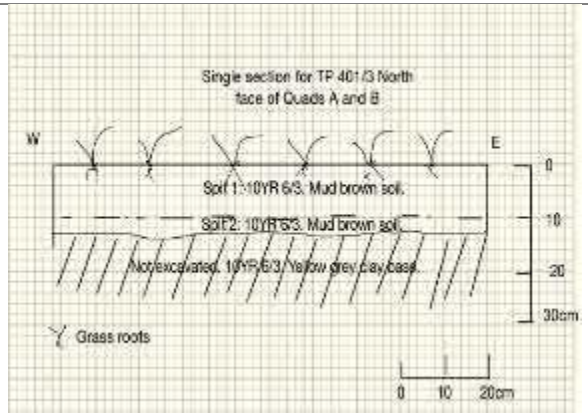
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BWB 420E (1 m²)			
BWB 460E (1 m²)			

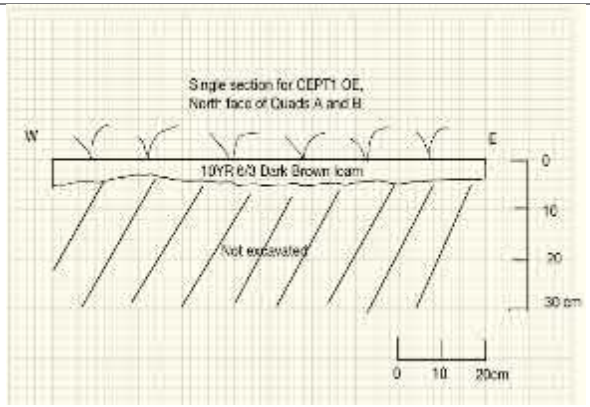
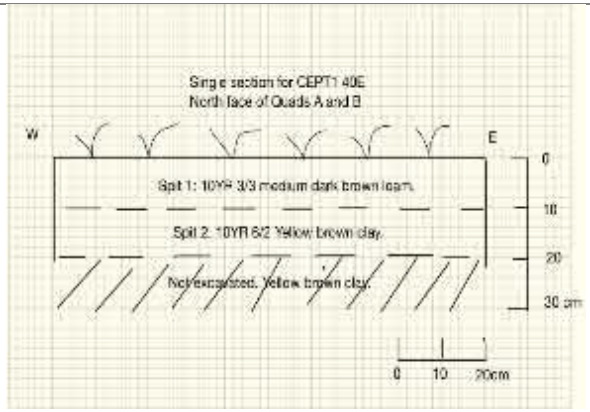
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BWB 460E detail		See above.	See above.
BWB 500E (1 m²)			

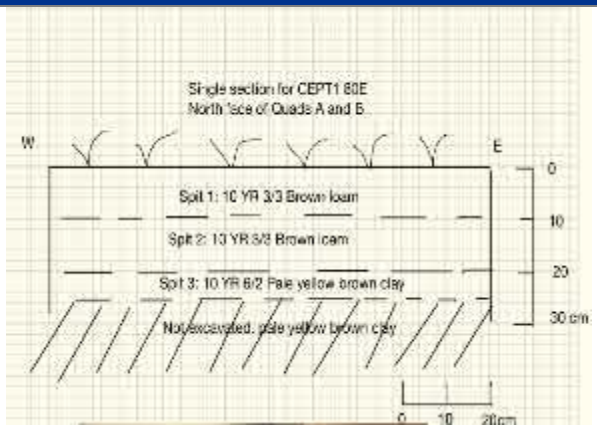
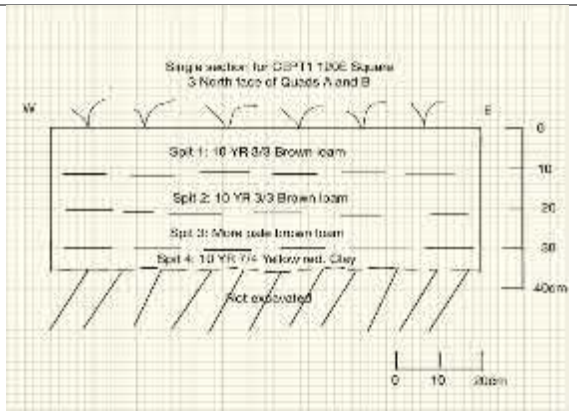
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BWB 540E (1 m²)			
BWB 580E (1 m²)			

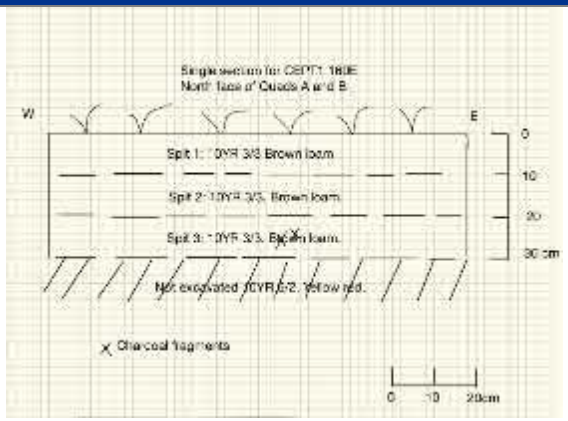
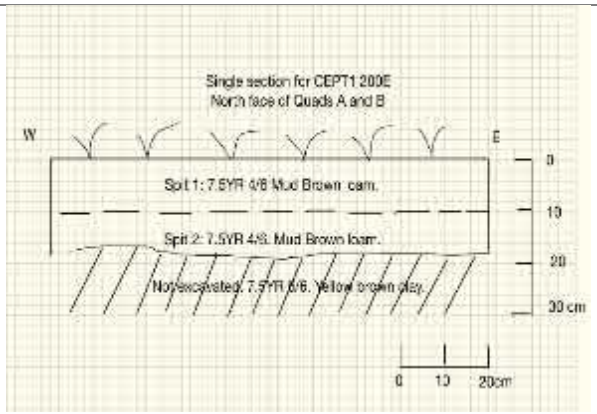
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BWB 620E (1 m²)			
CCE T2 TP204 (3 m²)			

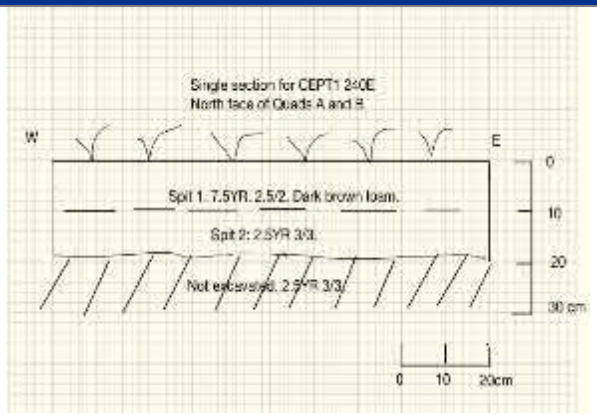
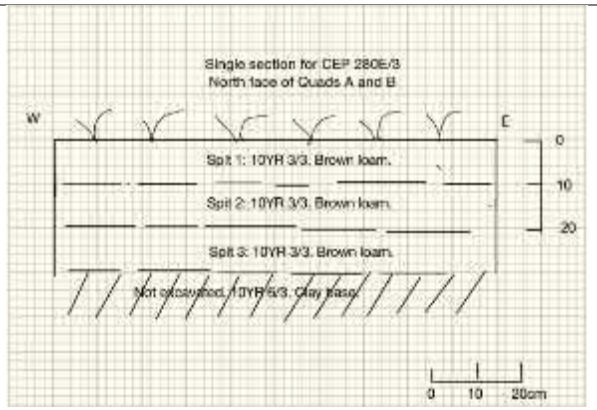
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T2 TP205 (3 m²)			

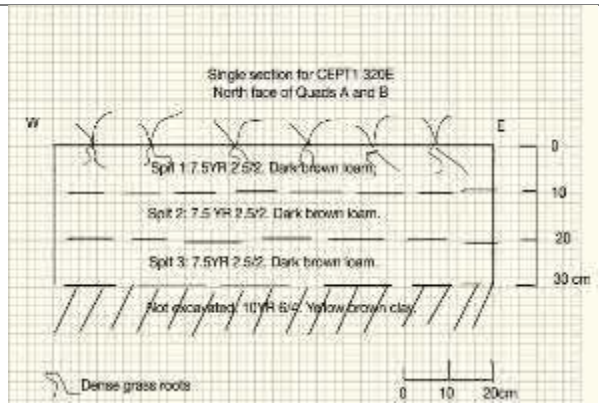
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T2 TP206 (3 m²)			
CCE T2 TP401 (3 m²)			

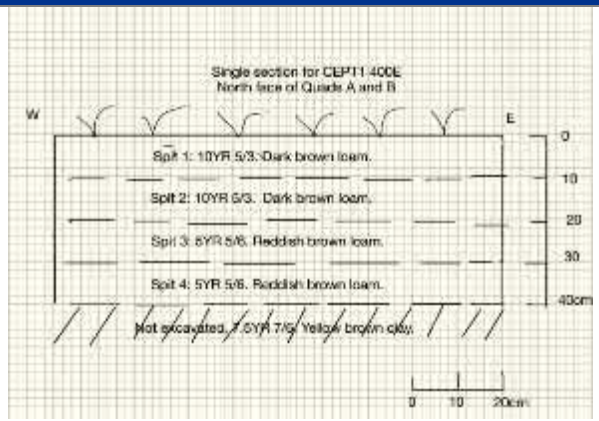
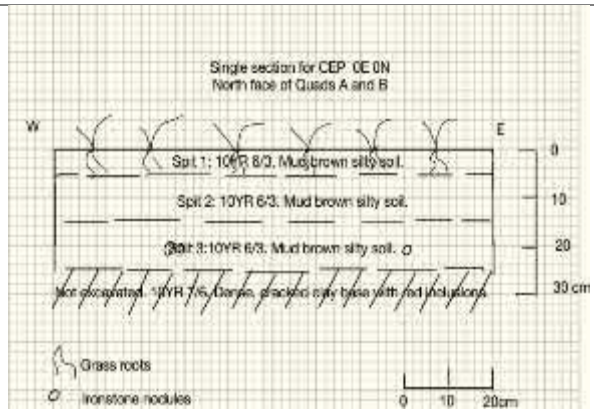
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T1 0E (1 m²)			
CCE T1 40E (1 m²)			

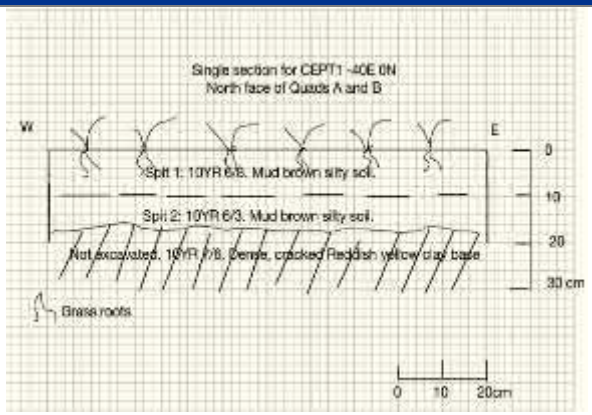
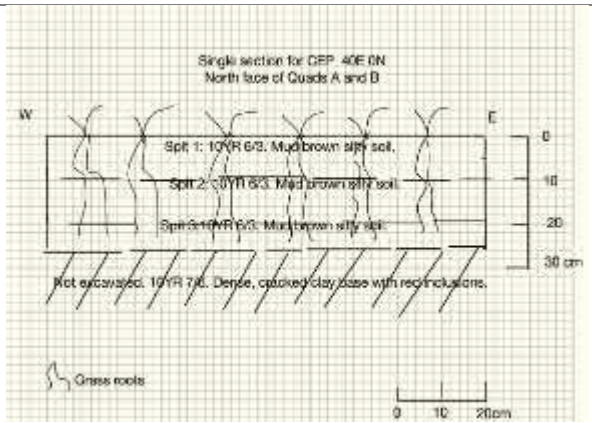
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T1 80E (1 m²)			
CCE T1 120E (1 m²)			

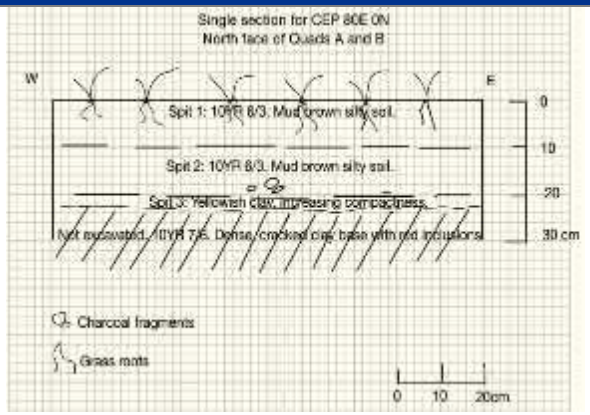
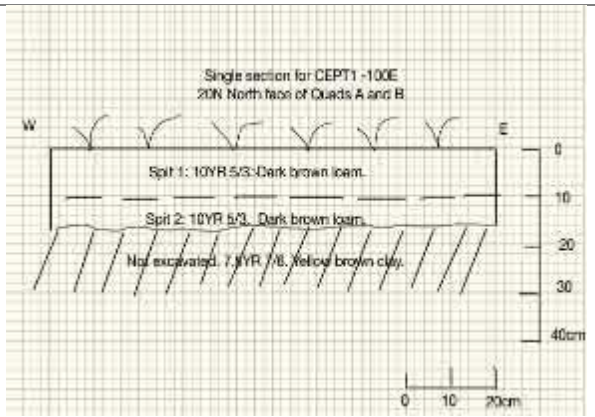
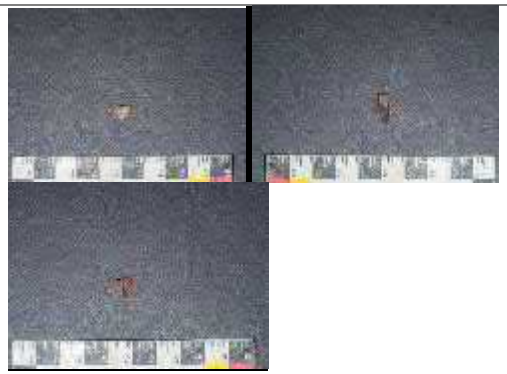
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T1 160E (1 m²)			
CCE T1 200E (1 m²)			

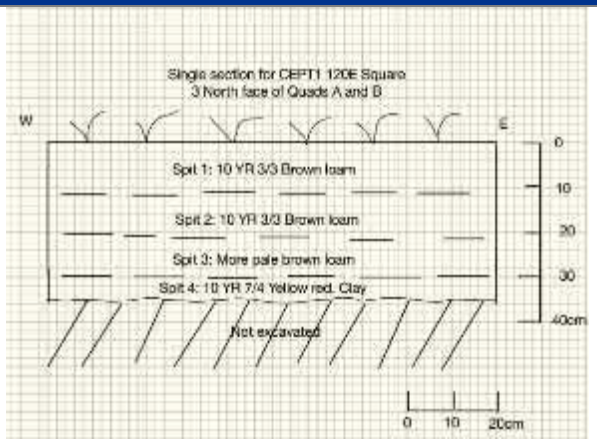
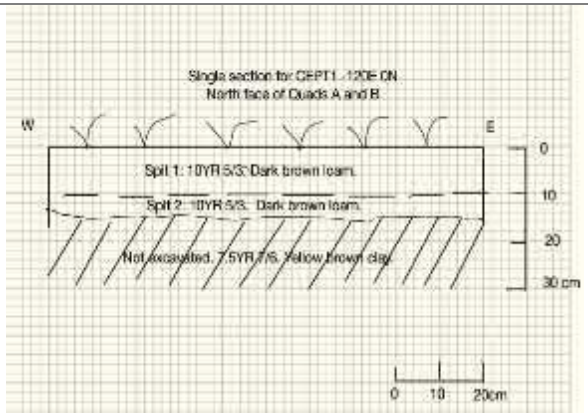
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T1 240E (1 m²)			
CCE T1 280E (1 m²)			

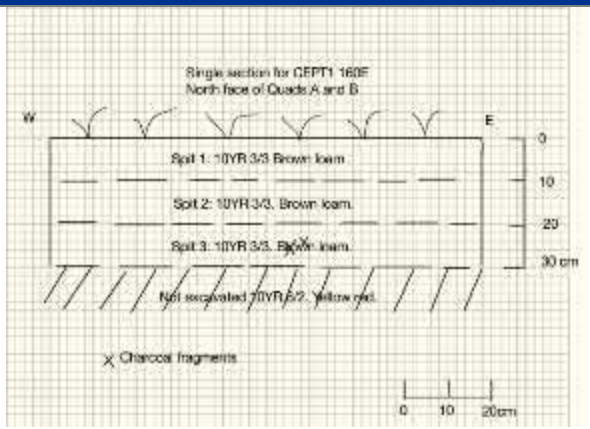
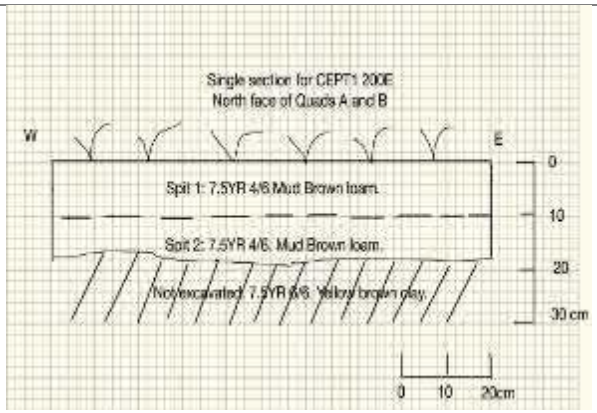
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
			
CCE T1 320E (1 m²)			

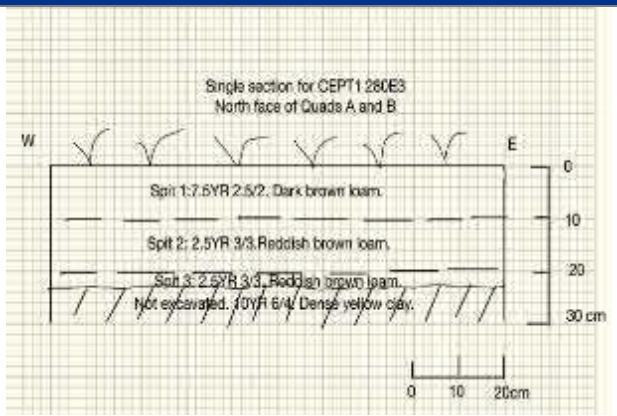
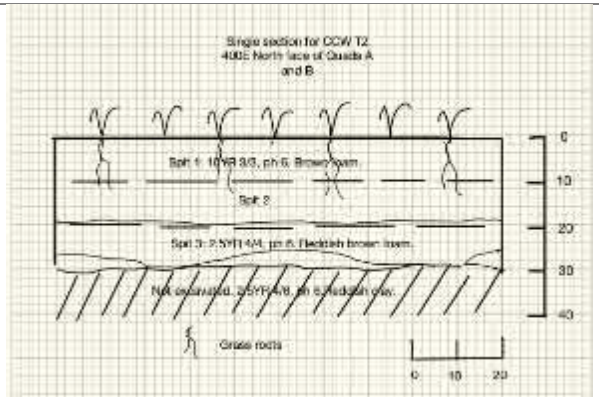
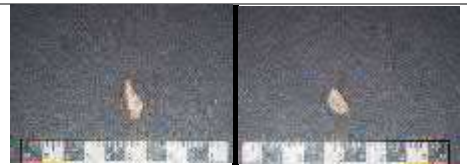
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T1 400E (1 m²)			
CCE T2 0E0N (1 m²)			

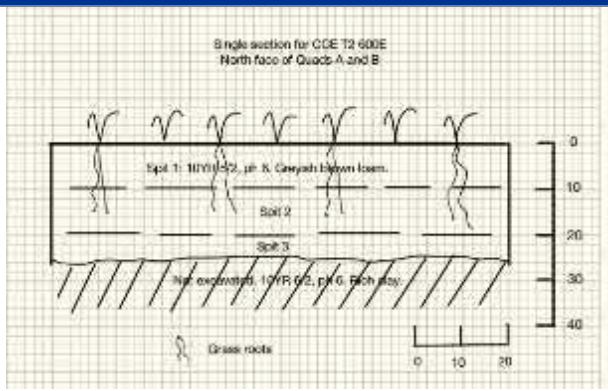
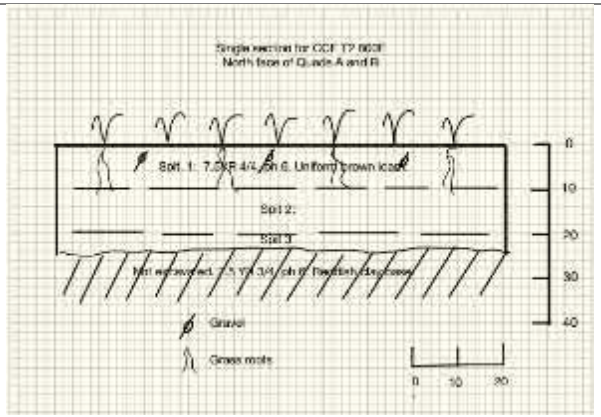
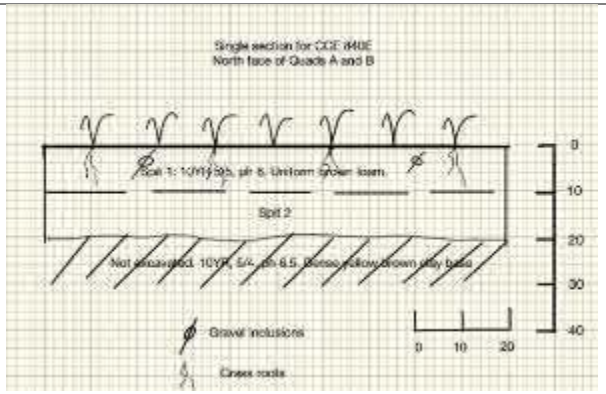
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T2 -40E (1 m²)			N/A
CCE T2 40E0N (1 m²)			 

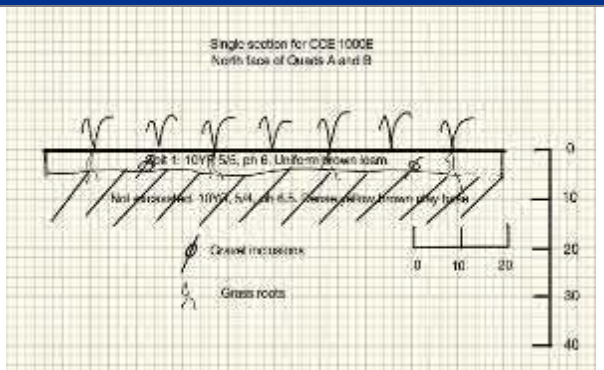
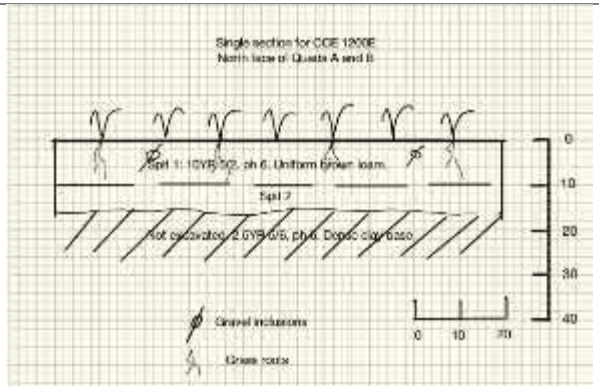
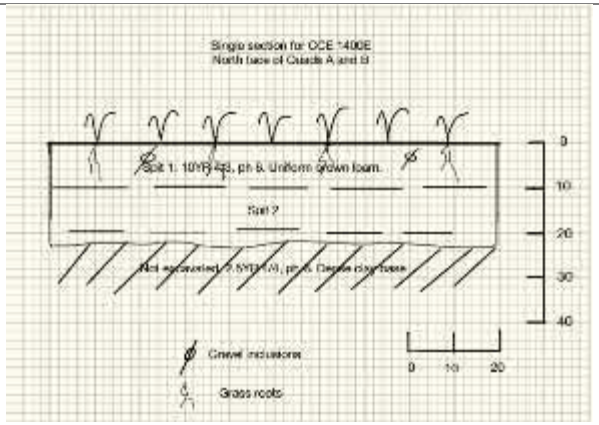
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T2 80E0N (1 m²)			
CCE T2 -100E (1 m²)			

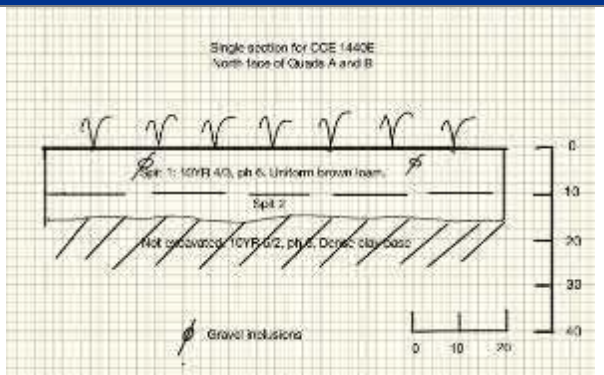
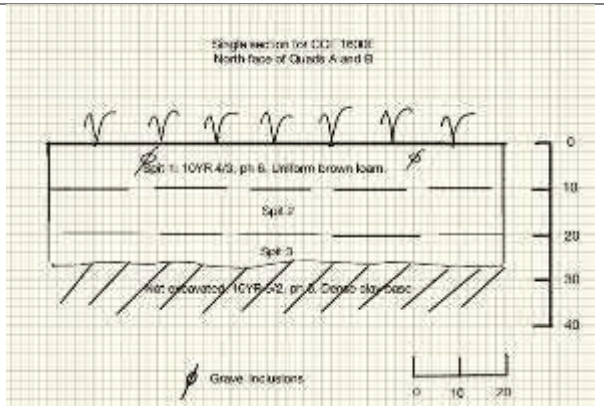
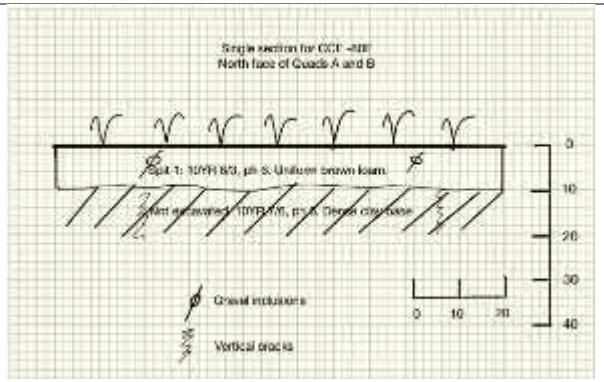
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T2 120E0N (1 m²)			
CCE T2 -120E (1 m²)			N/A

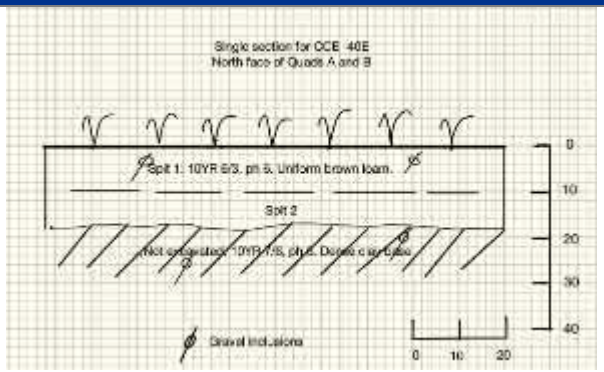
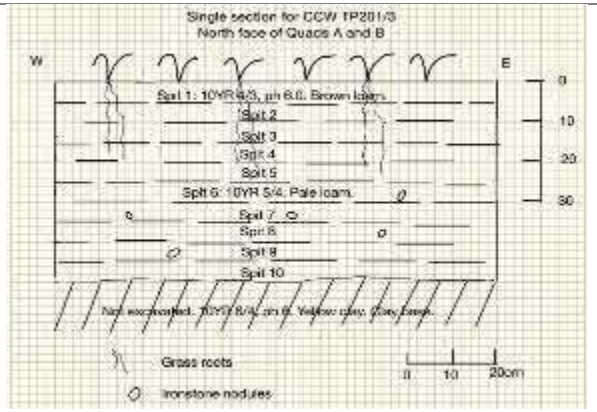
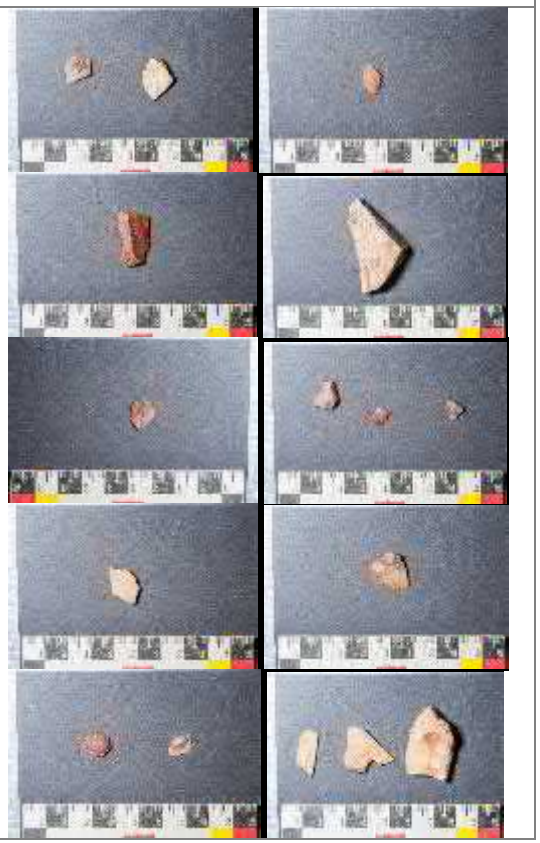
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T2 160E0N (1 m²)			N/A
CCE T2 200E0N (1 m²)			

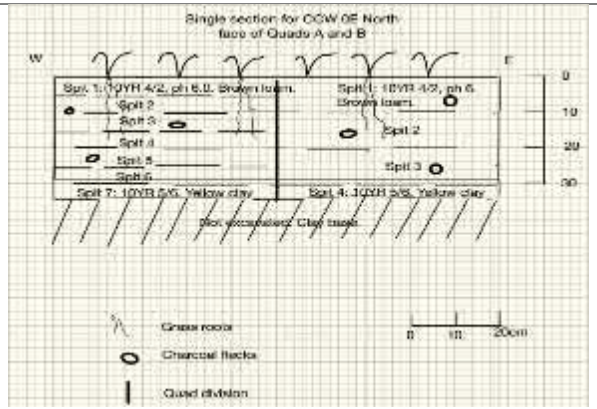
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T2 280E (1 m²)			
CCE T3 400E (1 m²)			

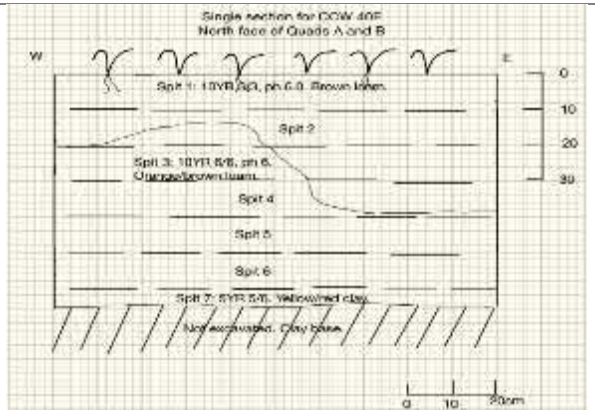
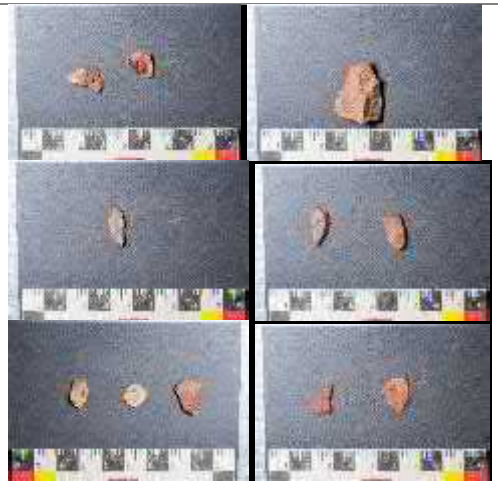
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T3 600E (1 m²)			N/A
CCE T3 800E (1 m²)			 
CCE T3 840E (1 m²)			

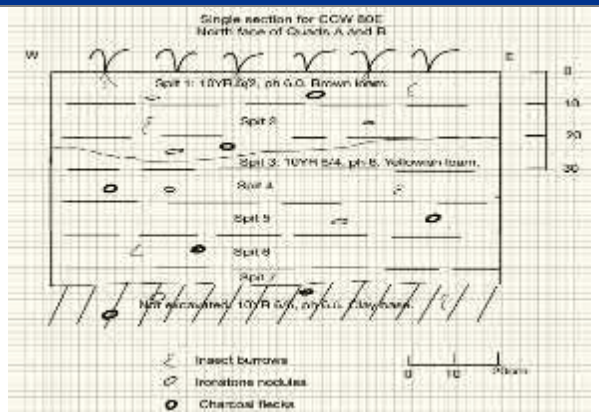
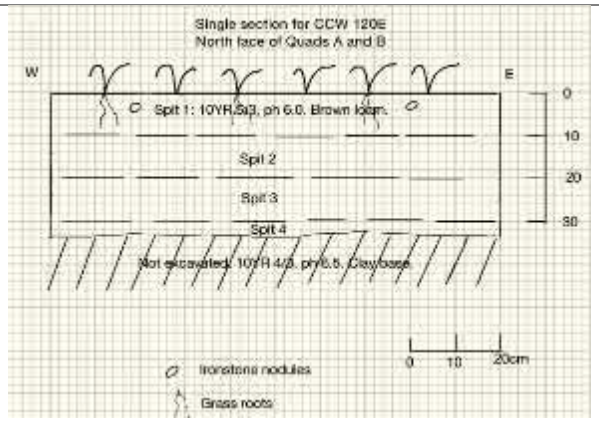
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T3 1000E (1 m²)			N/A
CCE T3 120E (1 m²)			N/A
CCE T3 1400E (1 m²)			

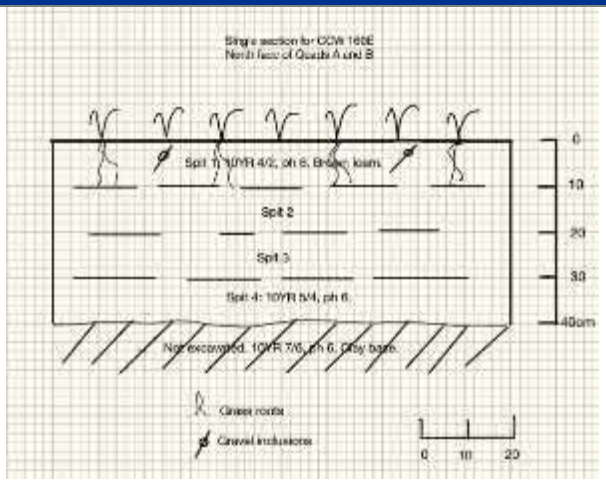
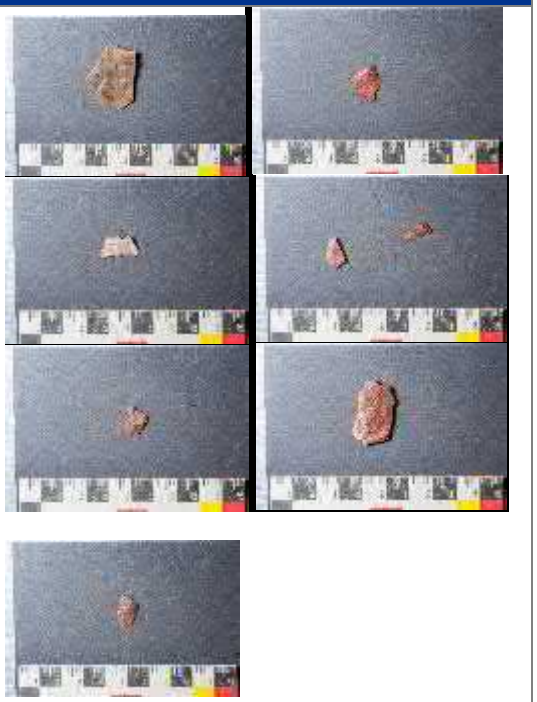
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T3 1440E (1 m²)			
CCE T3 1600E (1 m²)			N/A
CCE T2 -80E (1 m²)			N/A

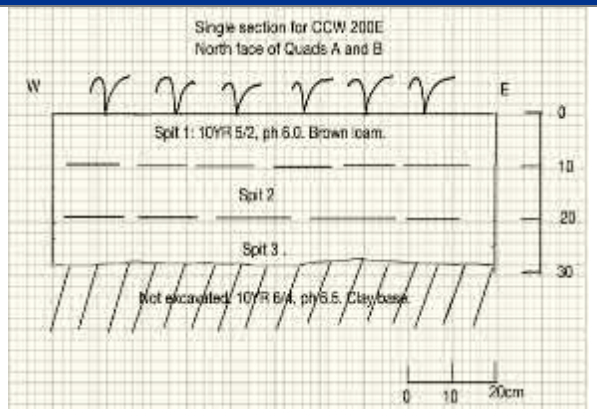
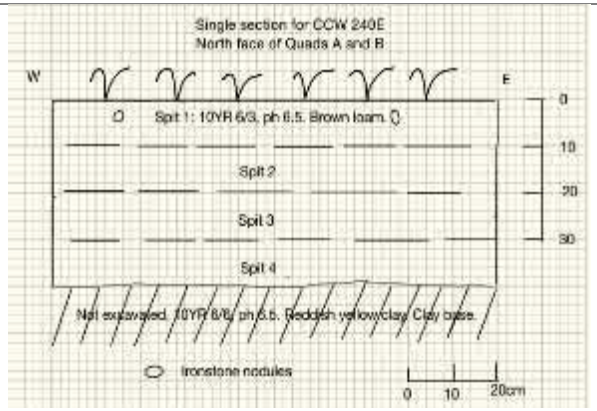
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCE T2 -40E (1 m²)			N/A
CCW TP201 (3 m²)			

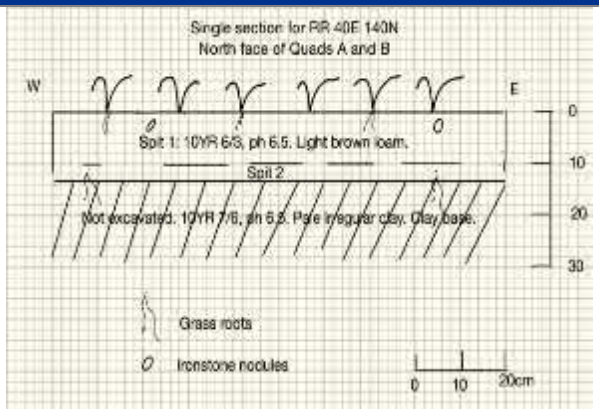
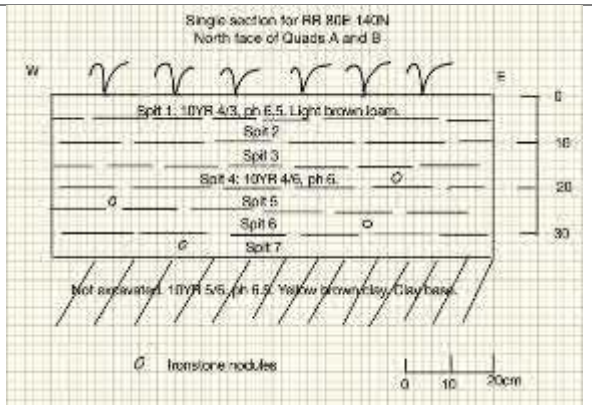
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
			
CCW 0E (1 m²)			

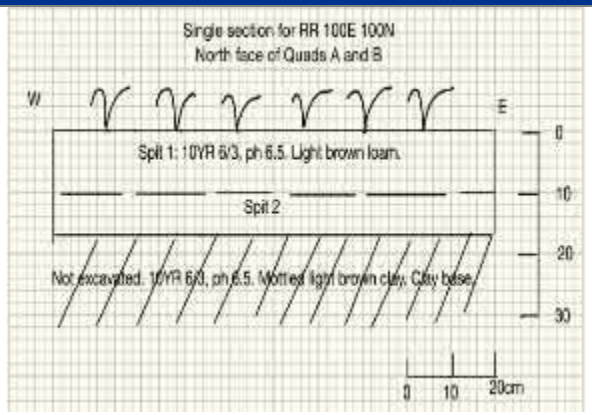
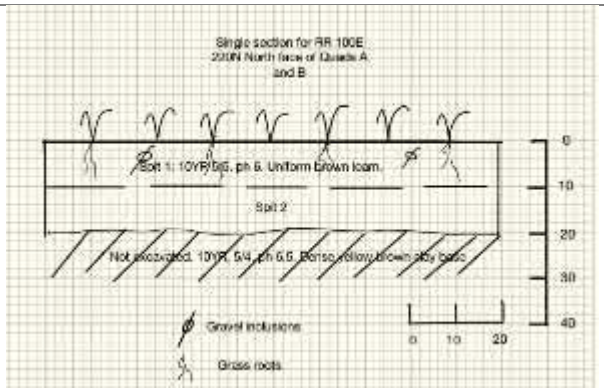
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCW 40E (1 m²)			
CCW 40E (1 m²)		See above.	See above.

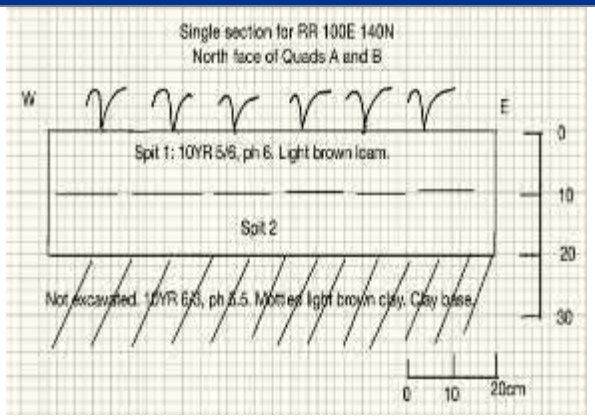
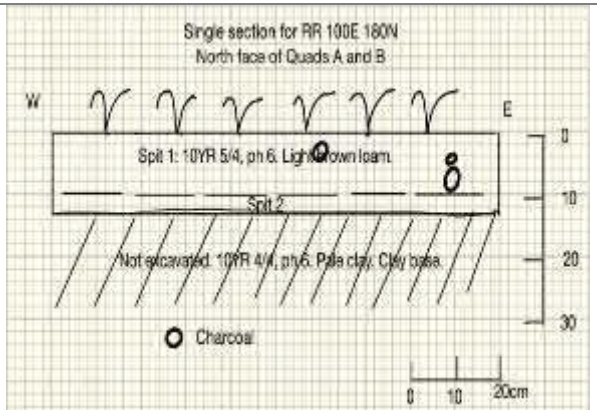
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCW 80E (1 m²)			
CCW 120E (1 m²)			

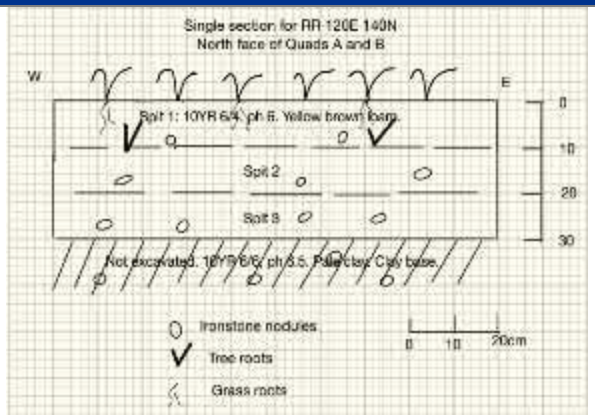
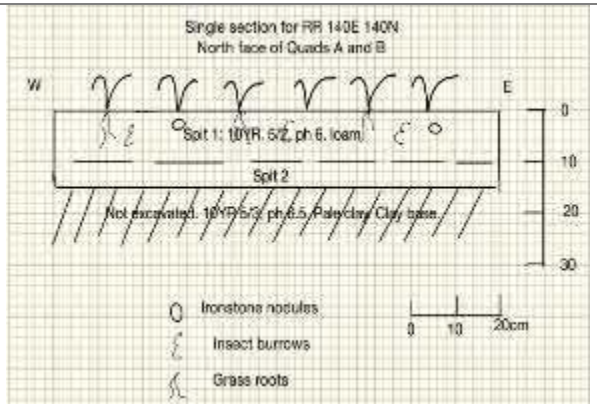
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCW 160E (1 m²)			

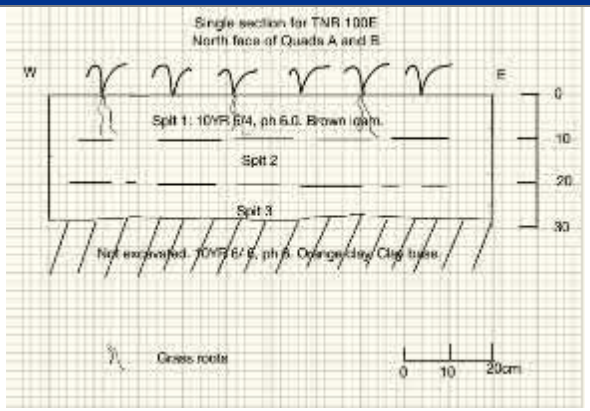
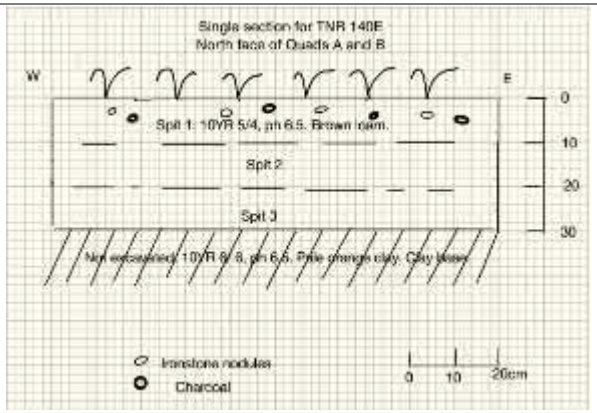
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CCW 200E (1 m²)			
CCW 240E (1 m²)			

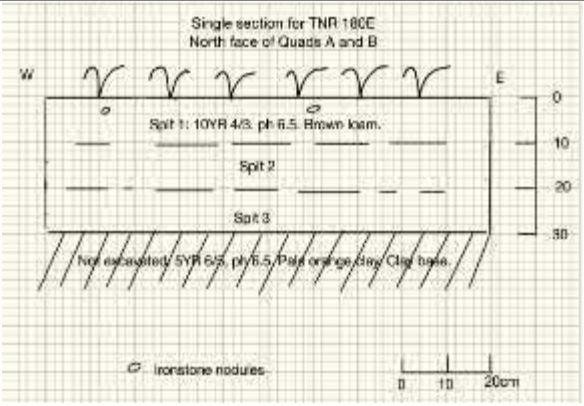
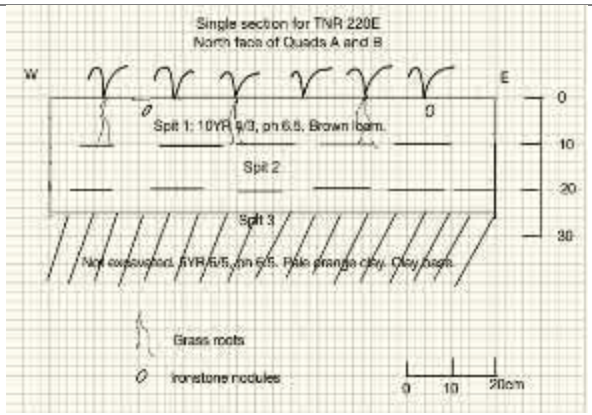
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
RR 40E140N (1 m²)			N/A
RR 80E140N (1 m²)			

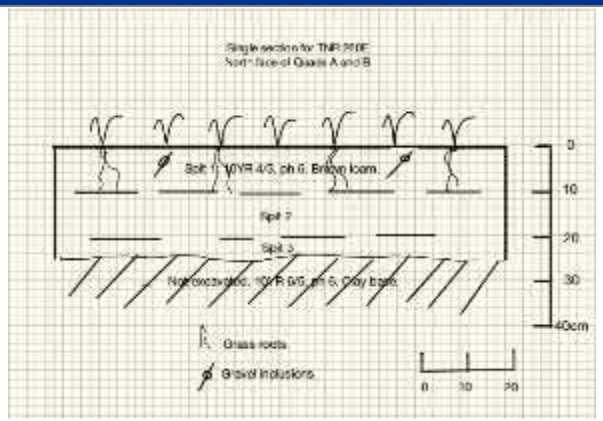
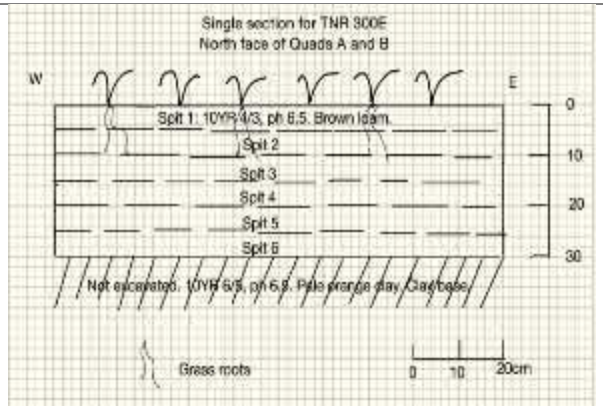
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
RR 100E100N (1 m²)			
RR 100E220N (1 m²)			N/A

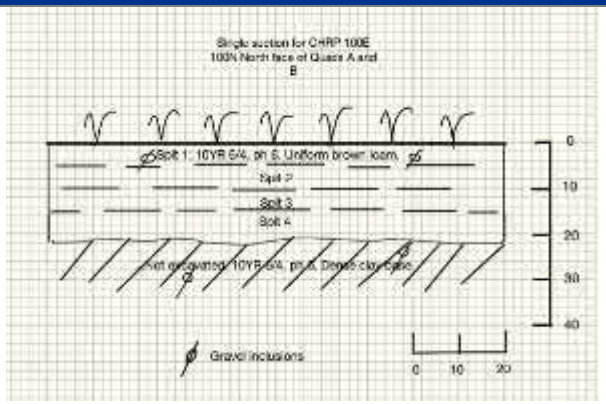
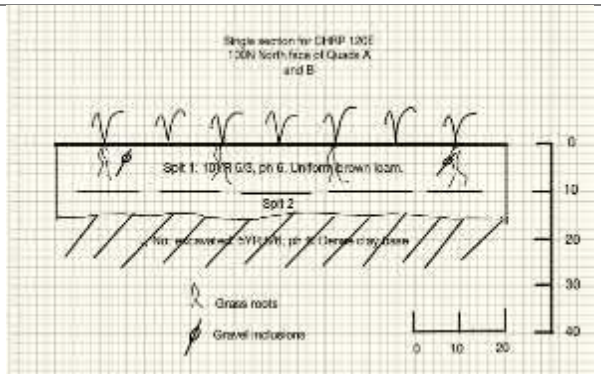
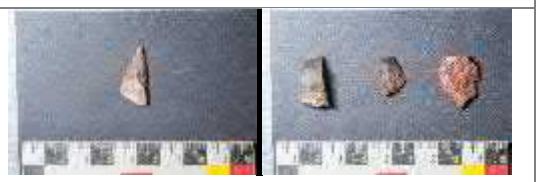
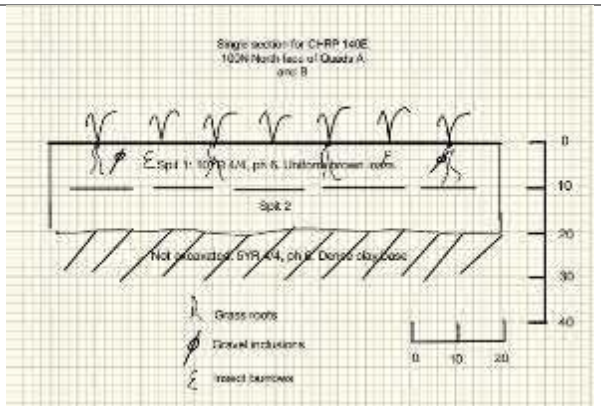
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
RR 100E140N (1 m²)			
RR 100E180N (1 m²)			

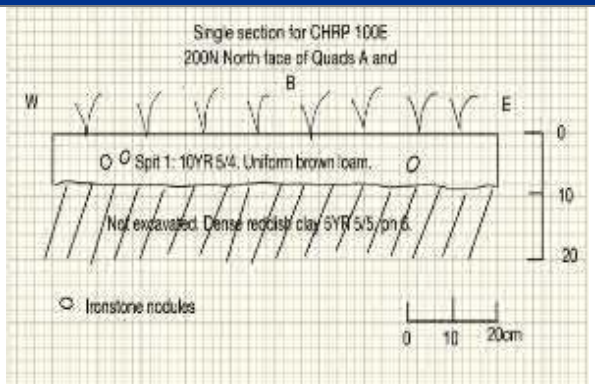
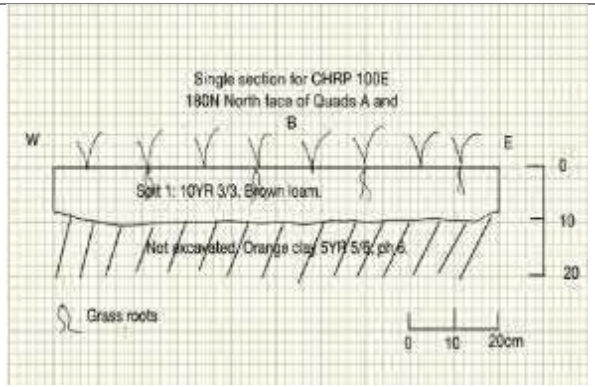
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
RR 120E140N (1 m²)			
RR 140E140N (1 m²)			

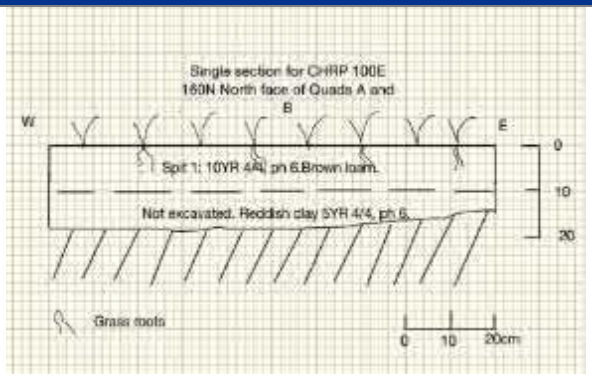
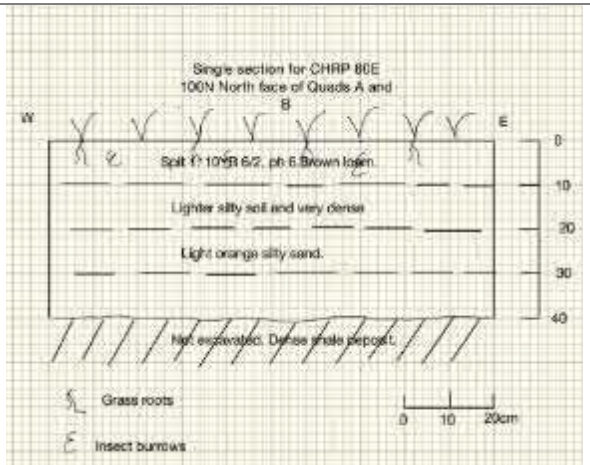
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
TNR 100E (1 m²)			N/A
TNR 140E (1 m²)			N/A

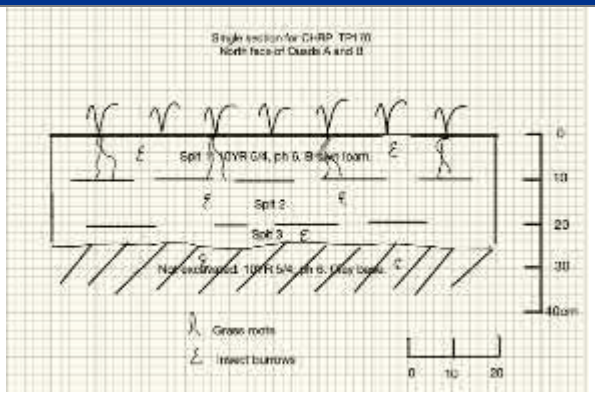
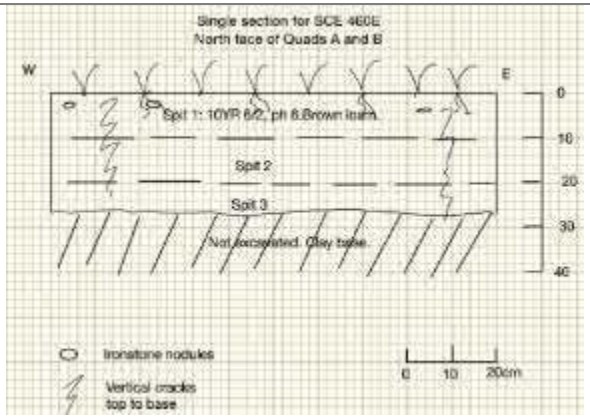
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
TNR 180E (1 m²)			N/A
TNR 220E (1 m²)			N/A

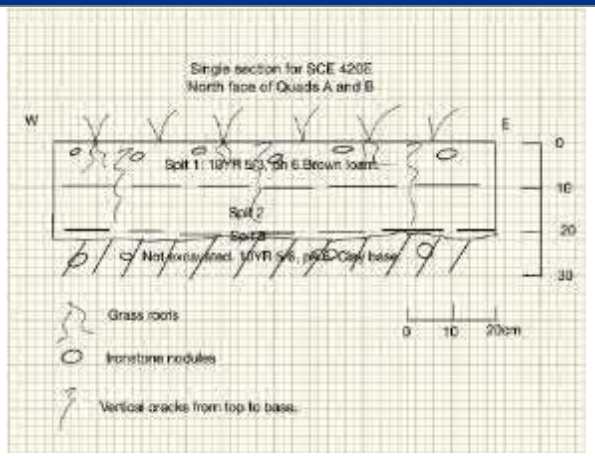
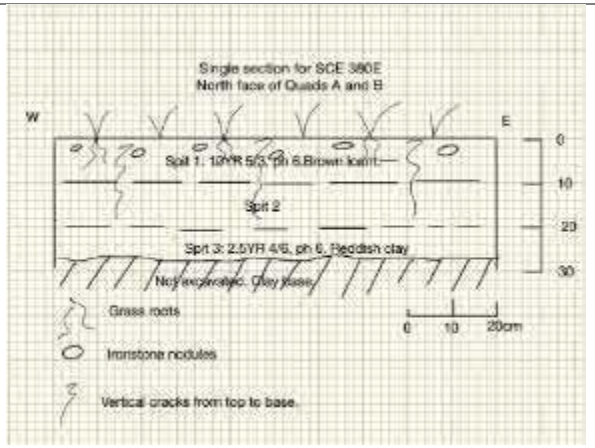
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
TNR 260E (1 m²)			N/A
TNR 300E (1 m²)			N/A

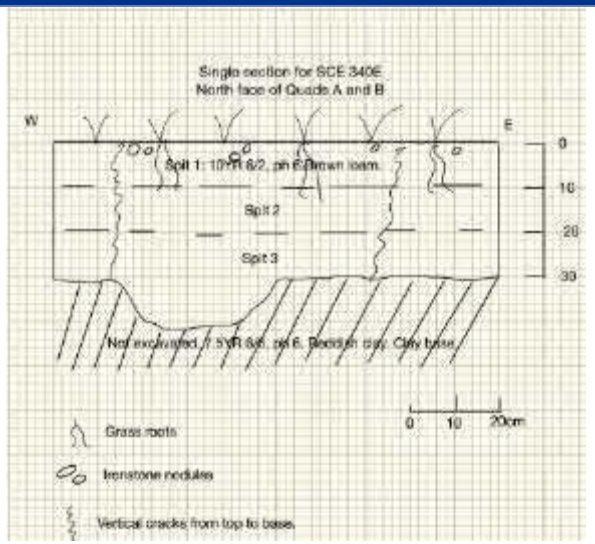
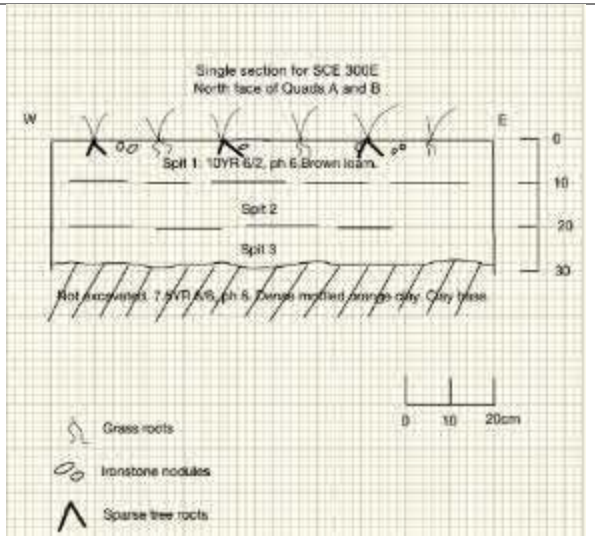
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CHRP 100E00N (1 m²)			
CHRP 120E100N (1 m²)			
CHRP 140E100N (1 m²)			N/A

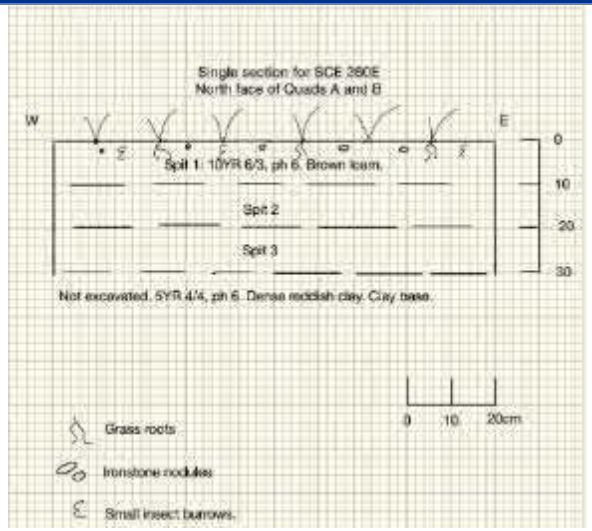
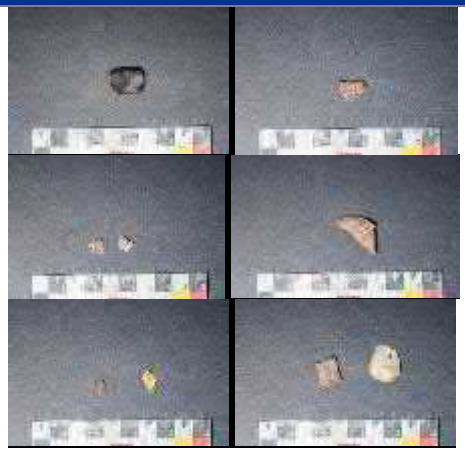
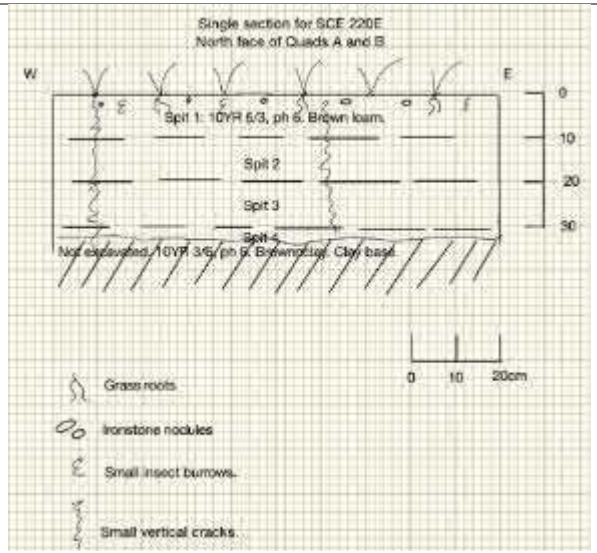
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CHRP 100E200N (1 m²)			
CHRP 100E180N (1 m²)			N/A

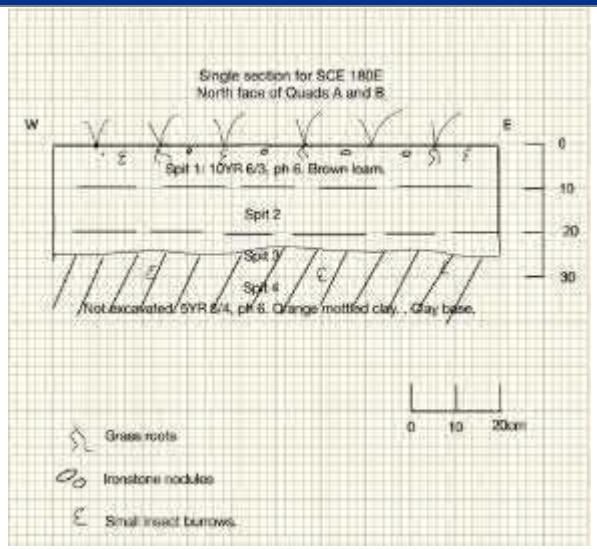
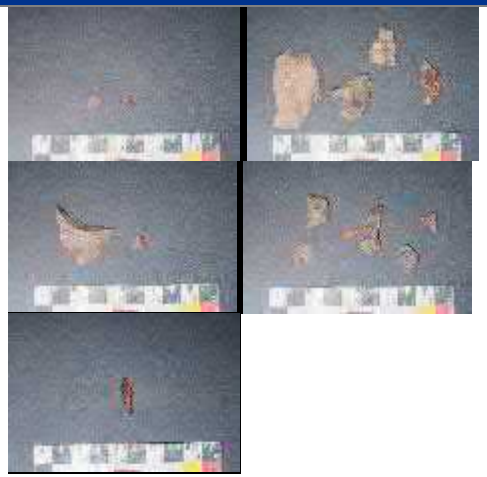
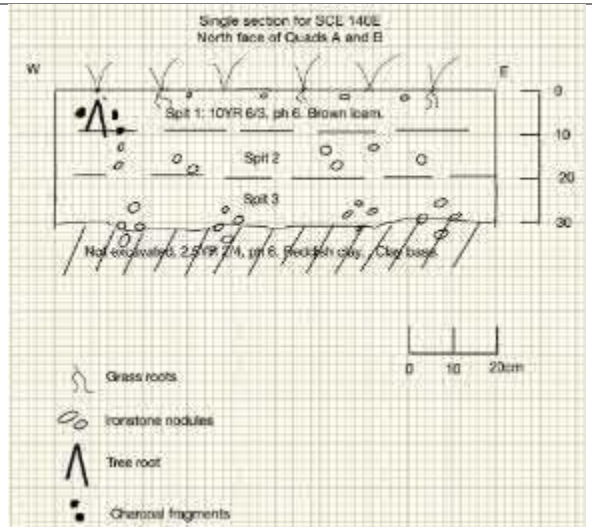
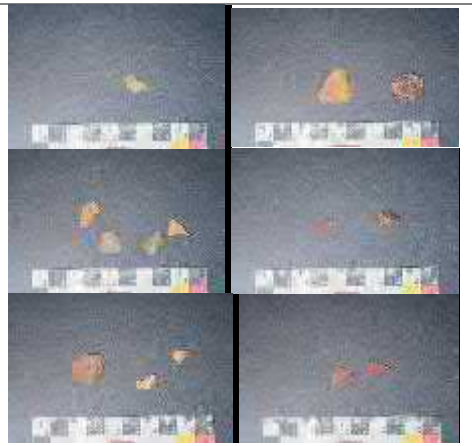
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CHRP 100E160N (1 m²)			
CHRP 80E100N (1 m²)			

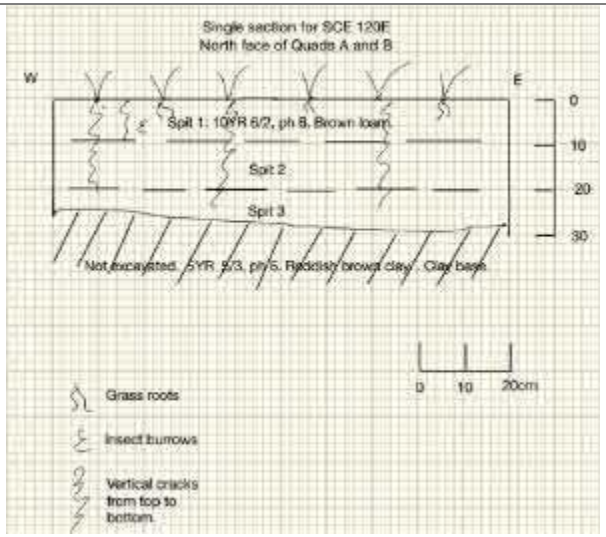
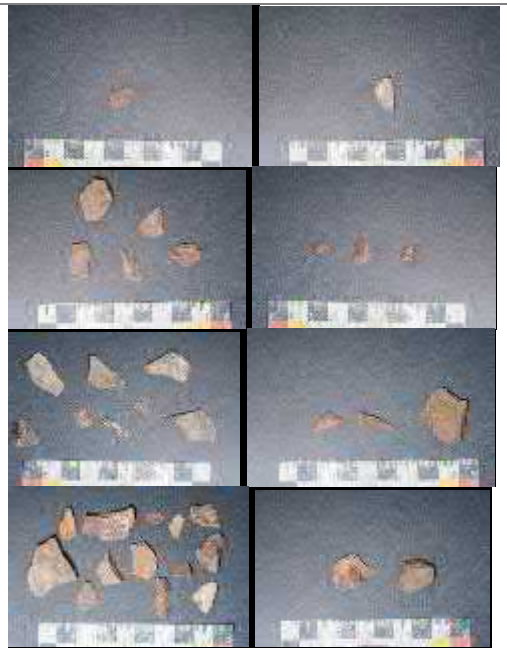
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
CHRP TP170 (3 m²)			N/A
SCE 460E (1 m²)			

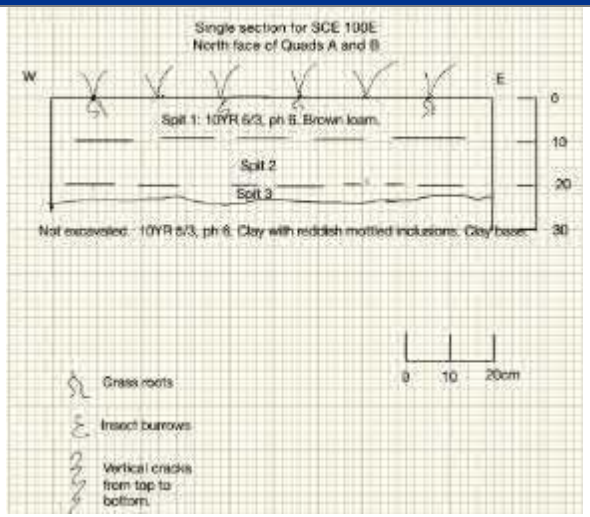
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCE 420E (1 m²)			
SCE 380E (1 m²)			

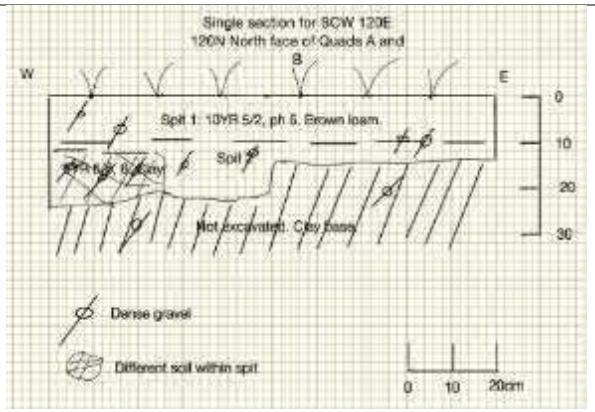
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCE 340E (1 m²)			
SCE 300E (1 m²)			

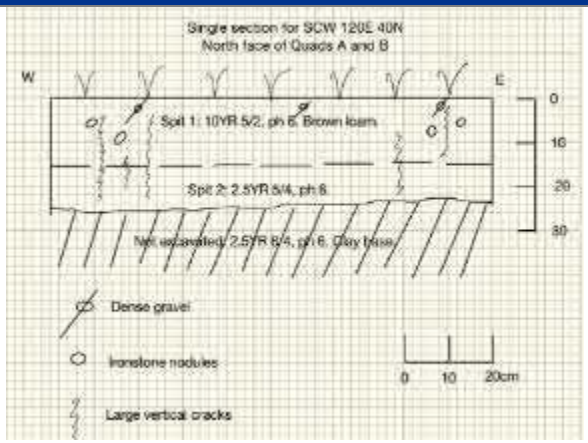
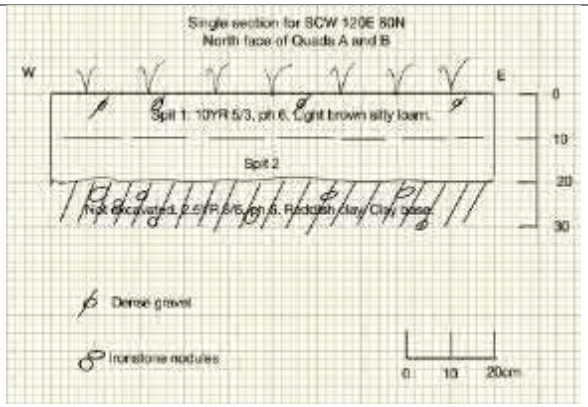
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCE 260E (1 m²)			
SCE 220E (1 m²)			

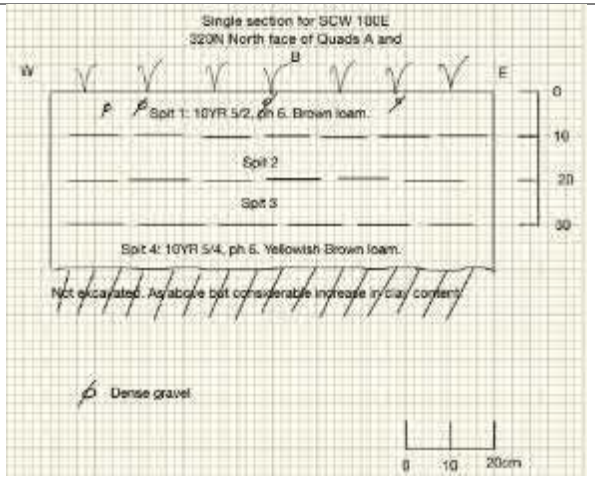
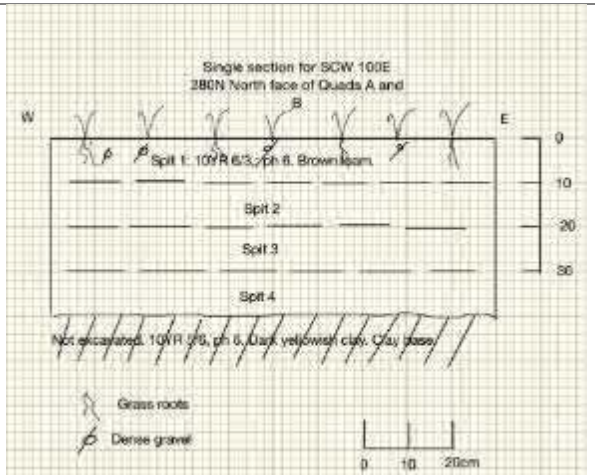
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCE 180E (1 m²)			
SCE 140E (1 m²)			

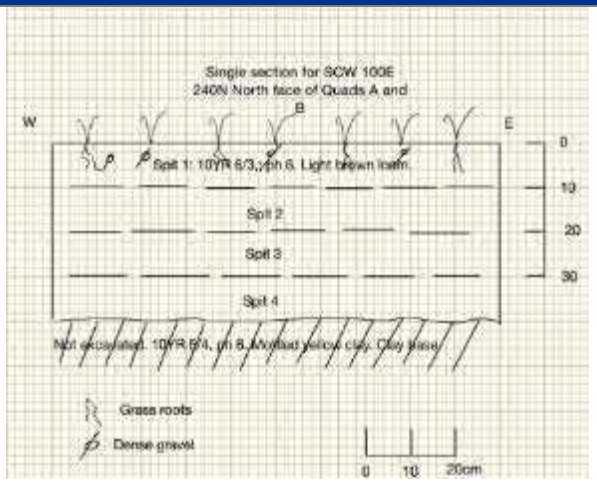
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
			
SCE 120E (1 m²)			

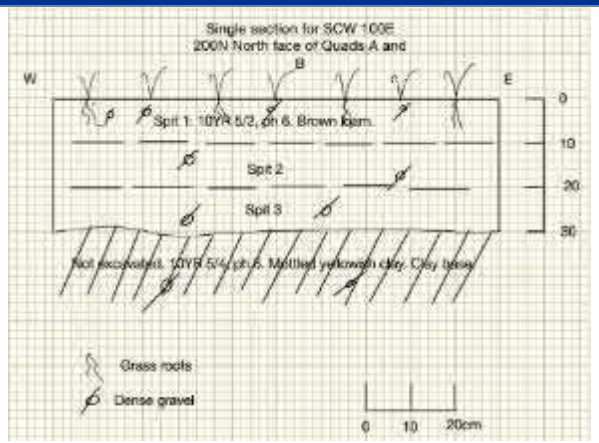
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCE 100E (1 m²)			

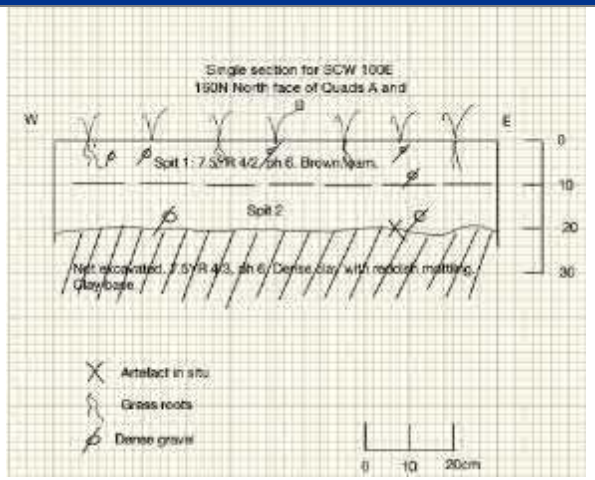
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
			
SCW T1 120E (1 m²)			

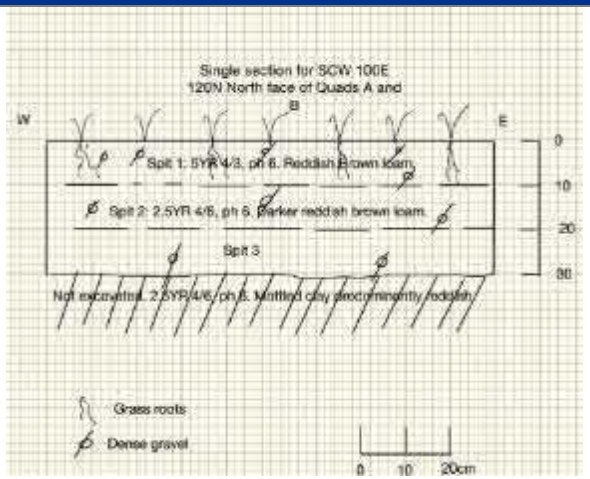
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T2 120E40N (1 m²)			
SCW T2 120E80N (1 m²)			

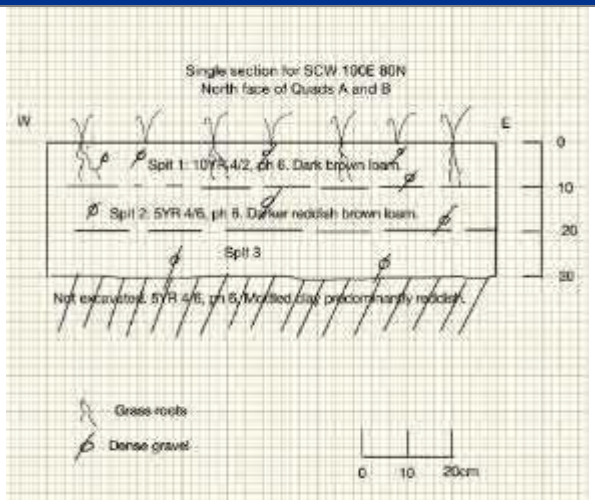
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T2 100E320N (1 m²)			
SCW T2 100E280N (1 m²)			

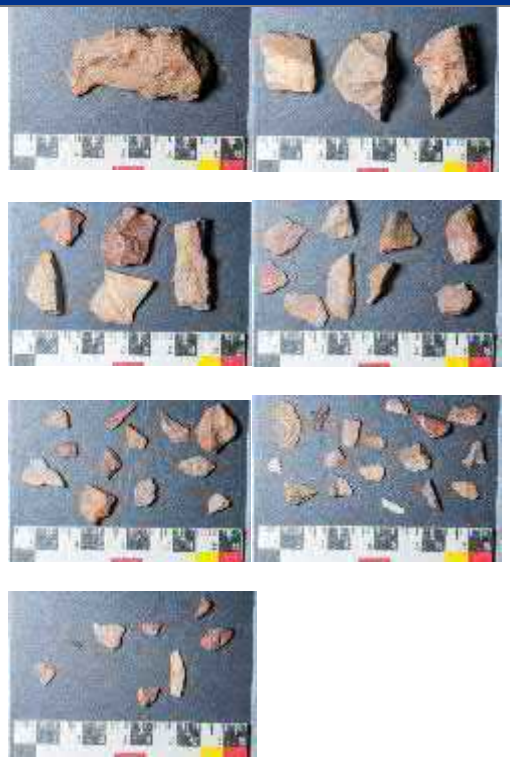
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T2 100E240N (1 m²)			

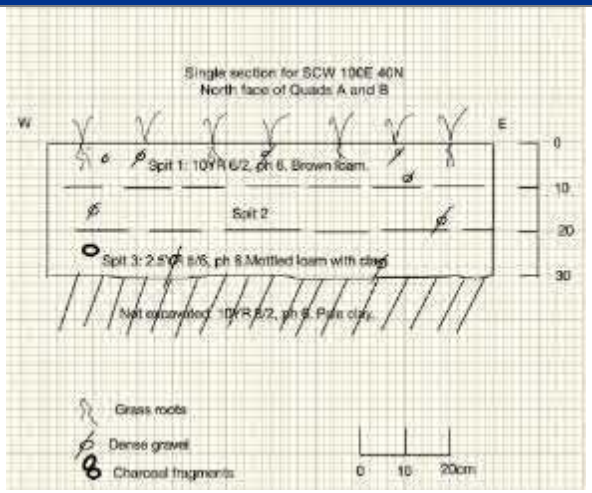
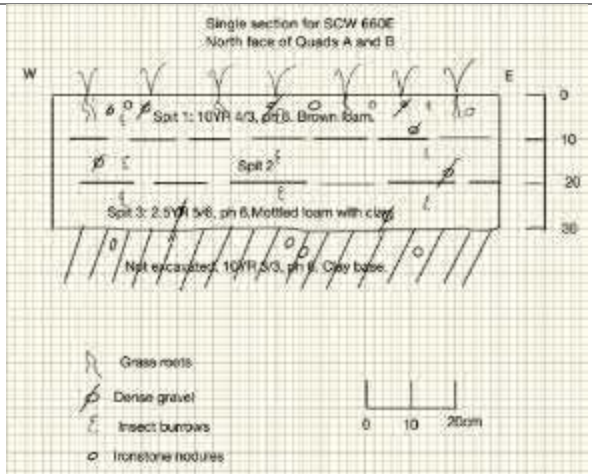
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T2 100E200N (1 m²)			

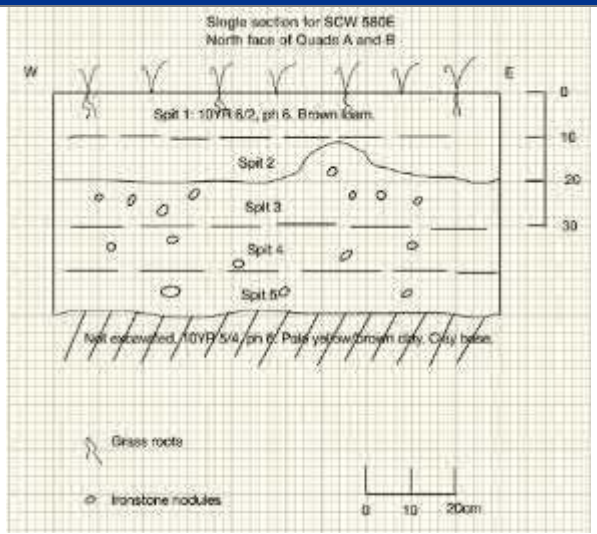
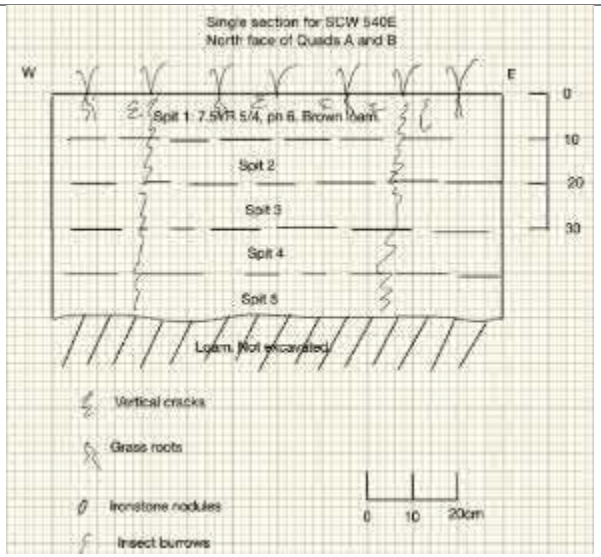
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T2 100E160N (1 m²)			

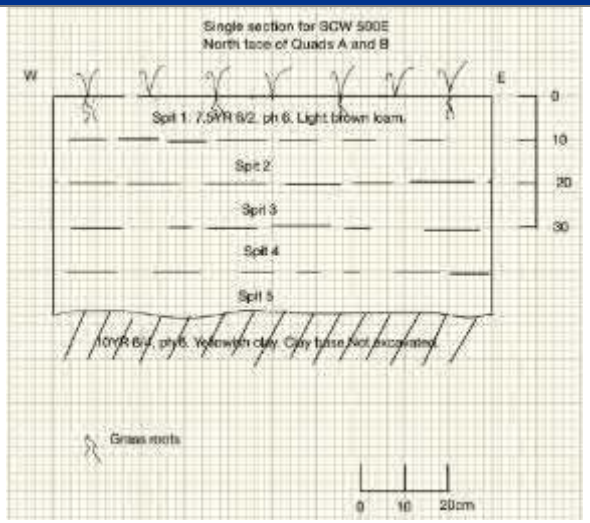
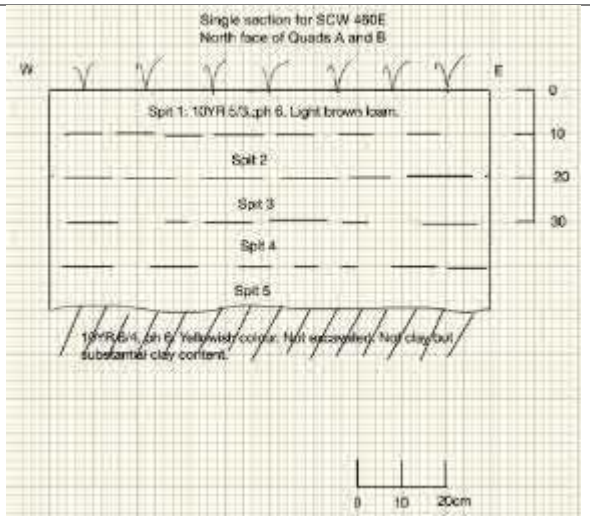
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T2 100E120N (1 m²)			
SCW T2 100E120N (1 m²)			

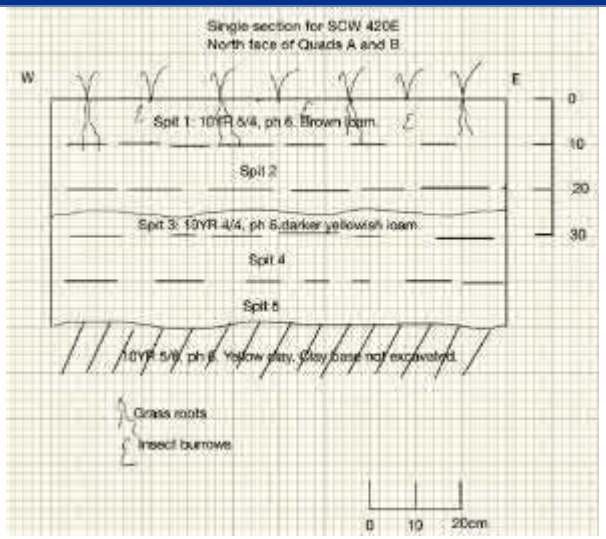
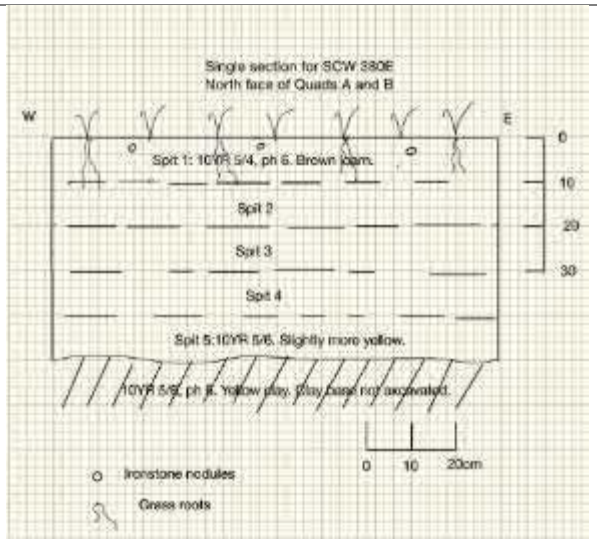
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T2 100E80N (1 m²)			

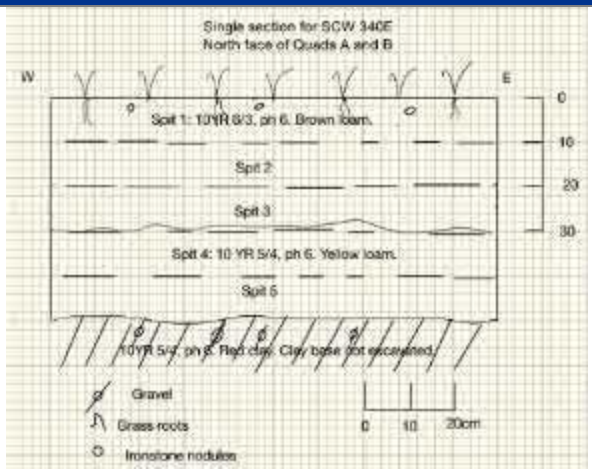
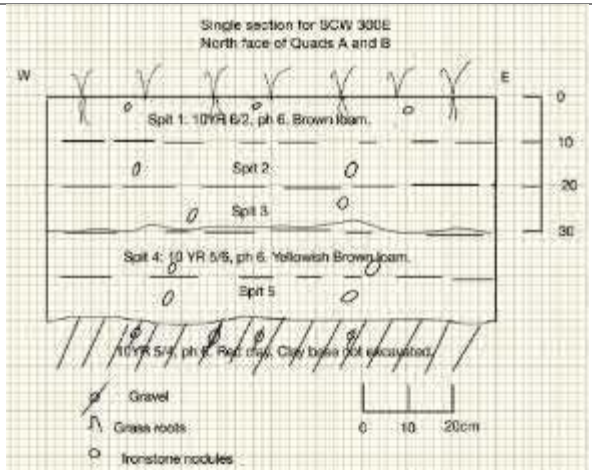
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
			

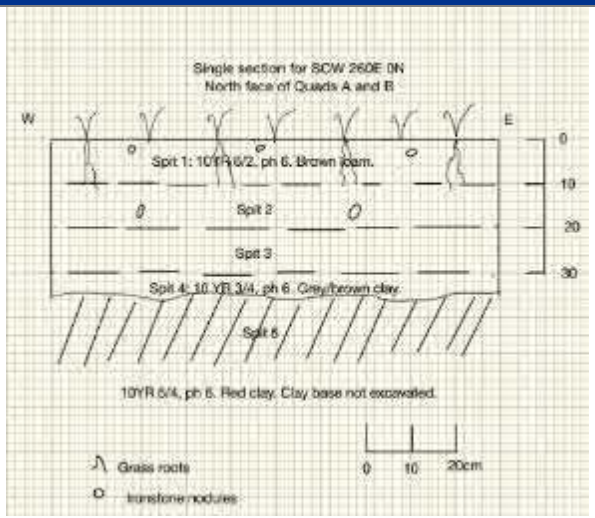
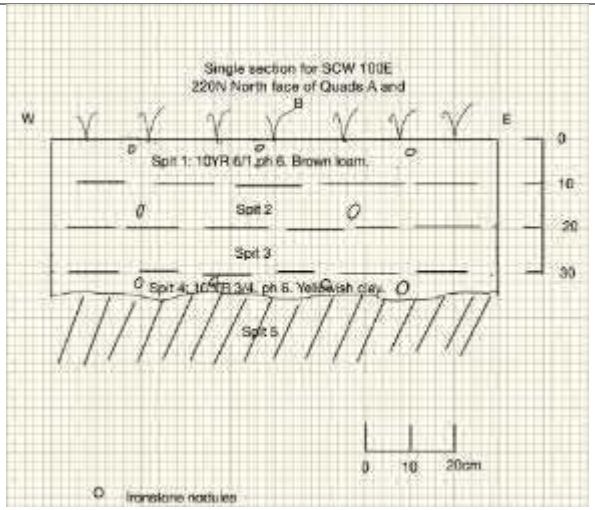
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T2 100E40N (1 m²)			N/A
SCW T1 660E (1 m²)			N/A

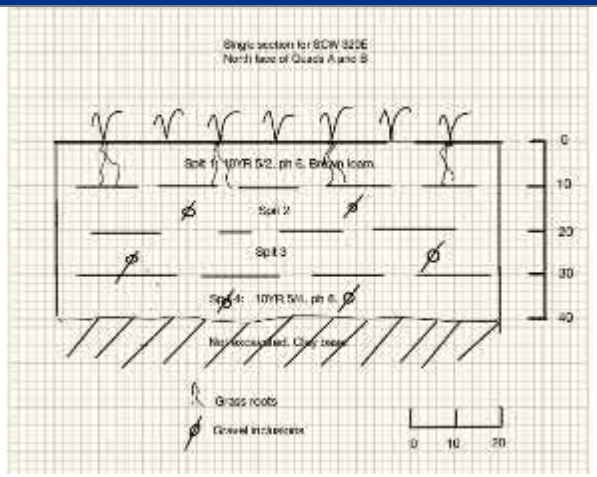
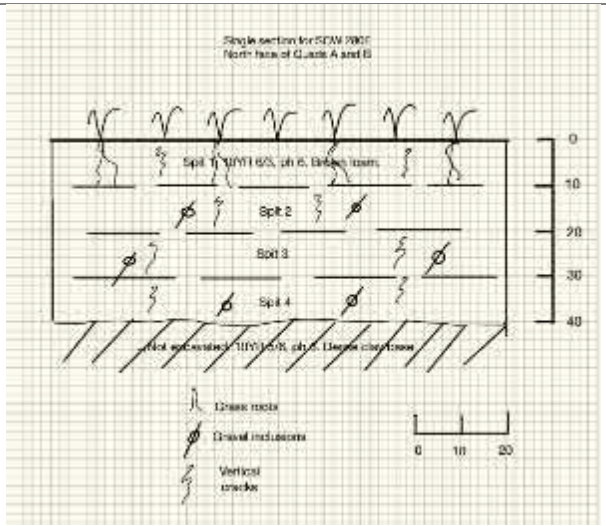
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T1 580E (1 m²)			N/A
SCW T1 540E (1 m²)			N/A

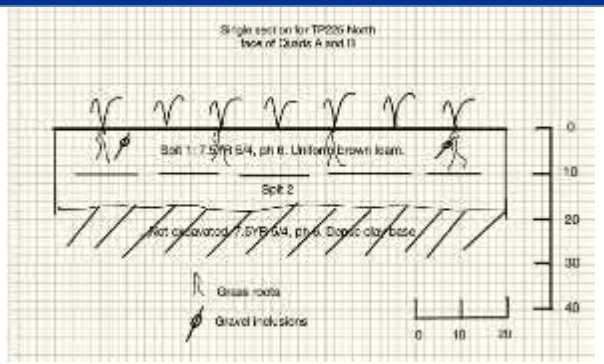
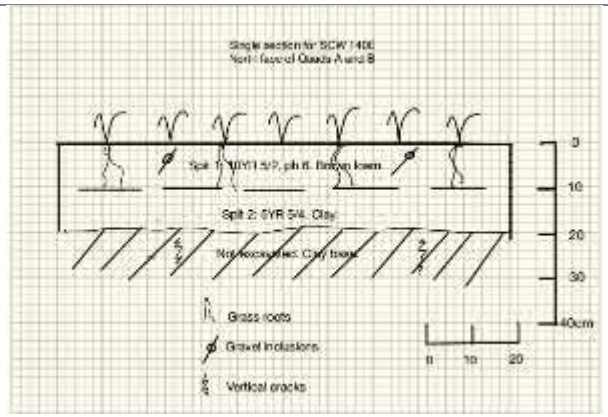
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T1 500E (1 m²)			N/A
SCW T1 460E (1 m²)			N/A

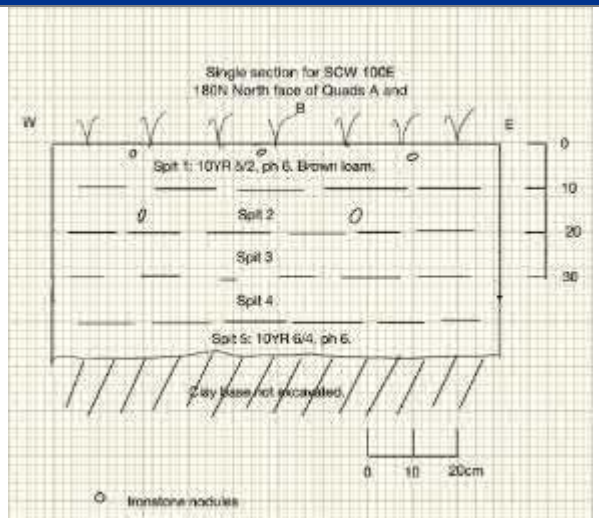
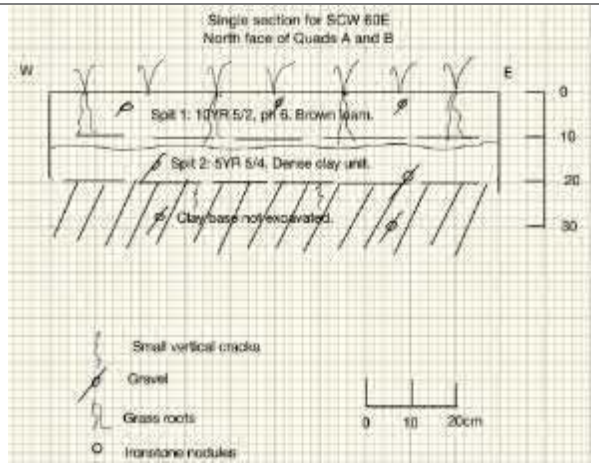
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T1 460E (1 m²)			N/A
SCW T1 380E (1 m²)			

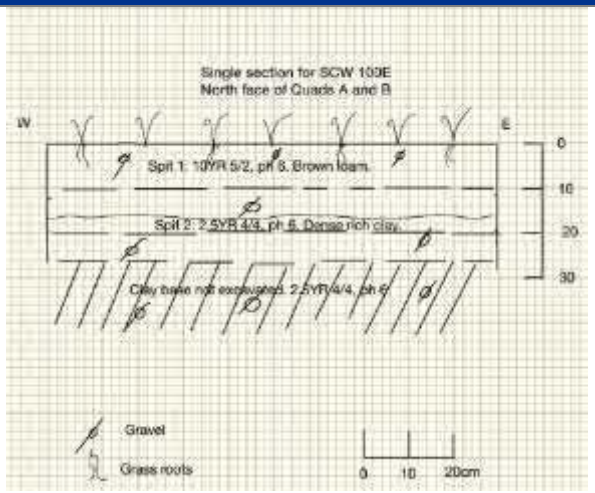
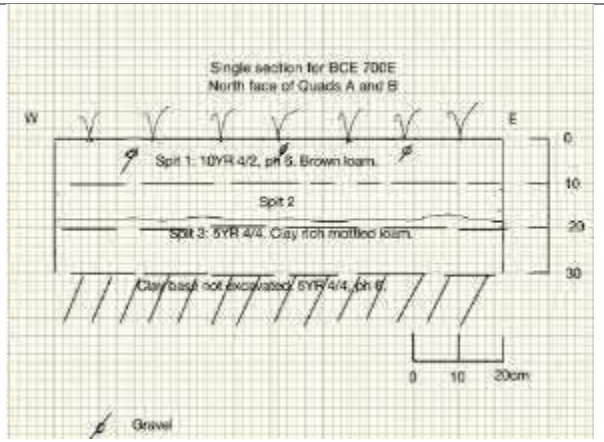
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T1 340E (1 m²)			N/A
SCW T1 300E (1 m²)			N/A

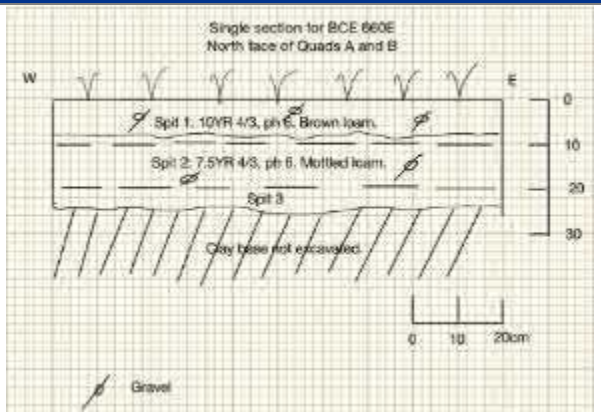
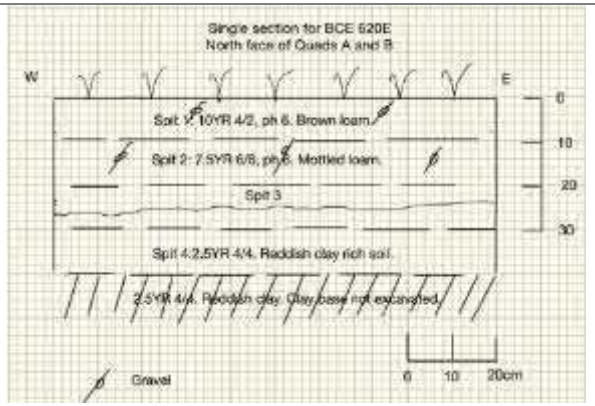
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T1 260E0N (1 m²)			N/A
SCW T2 100E200N (1 m²)			N/A

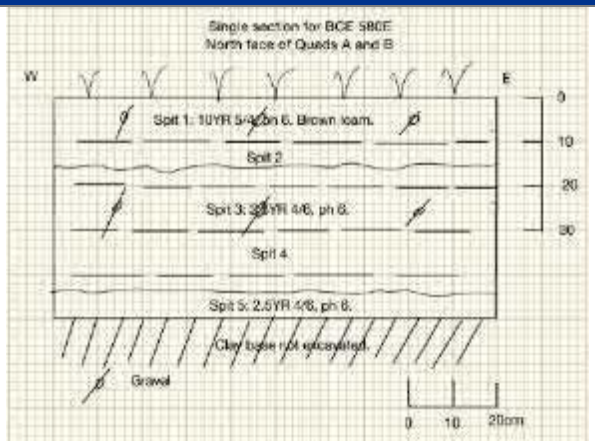
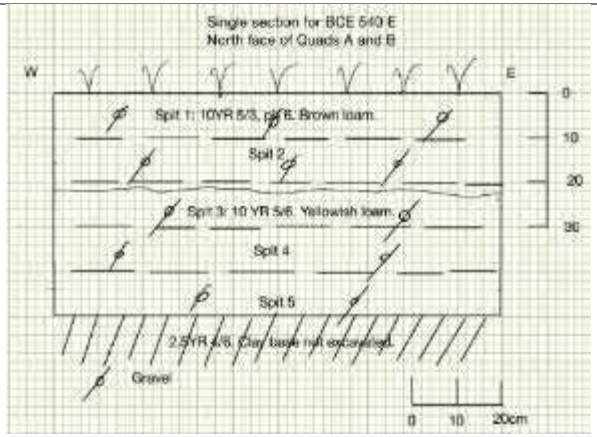
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T2 100E240N (1 m²)			N/A
SCW T2 100E280N (1 m²)			N/A

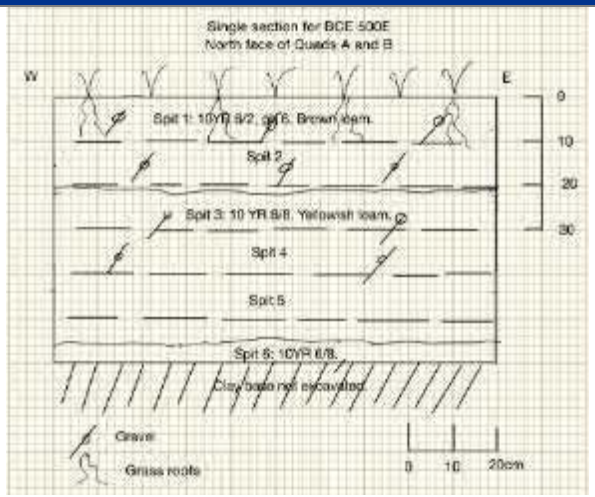
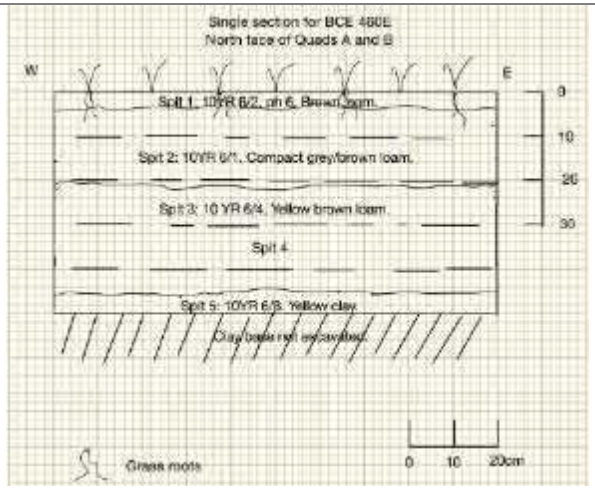
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T1 TP225 (3 m²)			N/A
SCW T1 140E (1 m²)			N/A

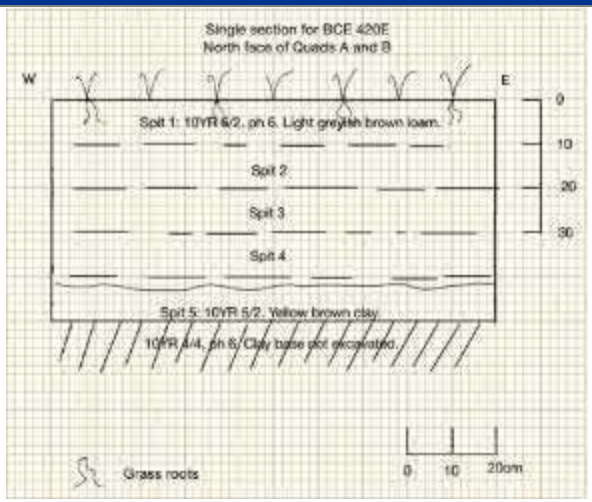
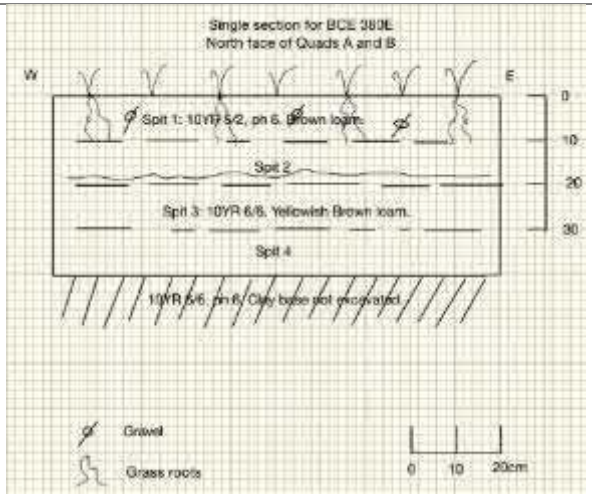
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T2 100E80N (1 m²)			N/A
SCW T2 100E160E (1 m²)			N/A

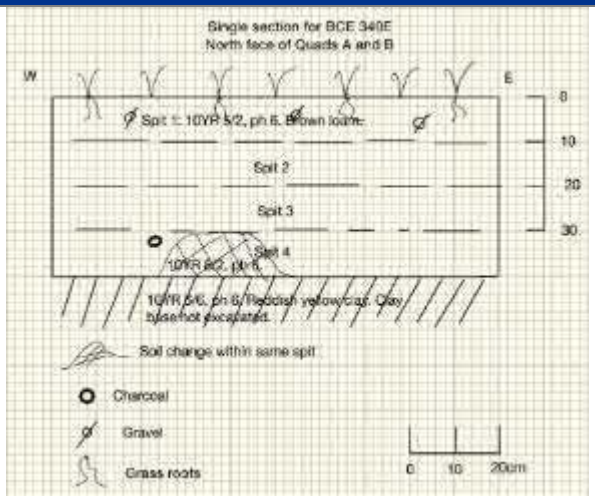
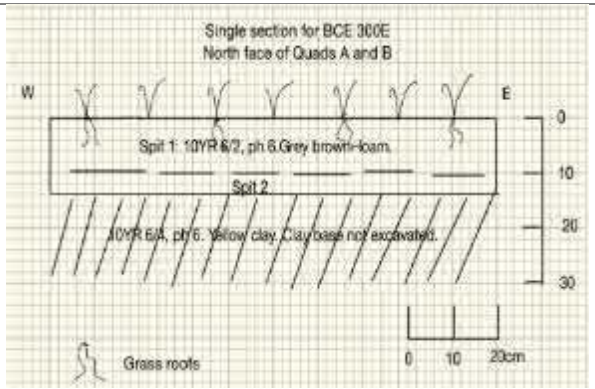
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCW T1 100E (1 m²)			N/A
BCE 700E (1 m²)			N/A

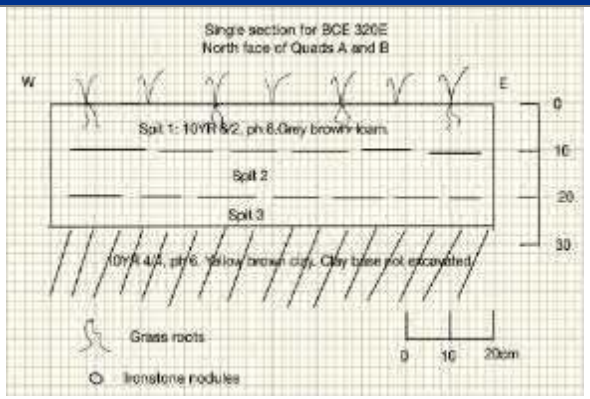
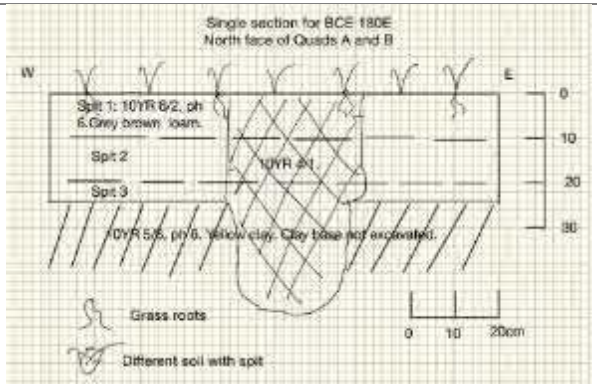
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCE 660E (1 m²)			N/A
BCE 620E (1 m²)			N/A

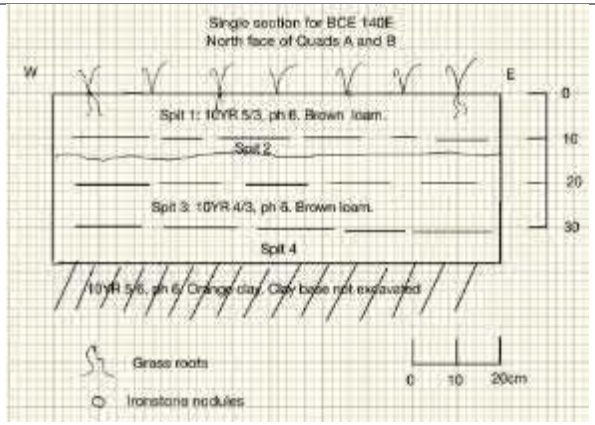
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCE 580E (1 m²)			N/A
BCE 540E (1 m²)			N/A

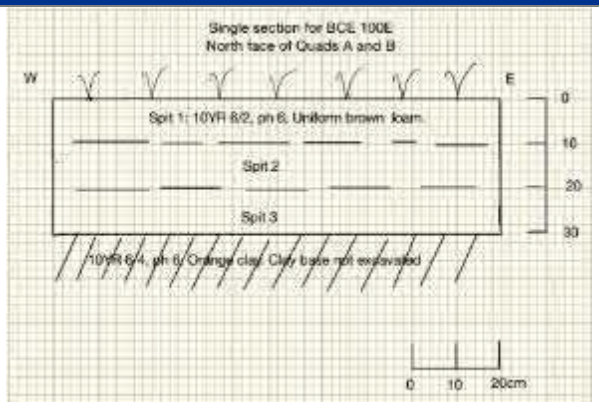
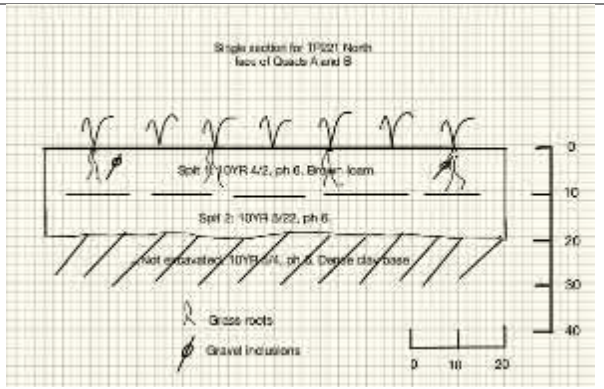
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCE 500E (1 m²)			N/A
BCE 460E (1 m²)			N/A

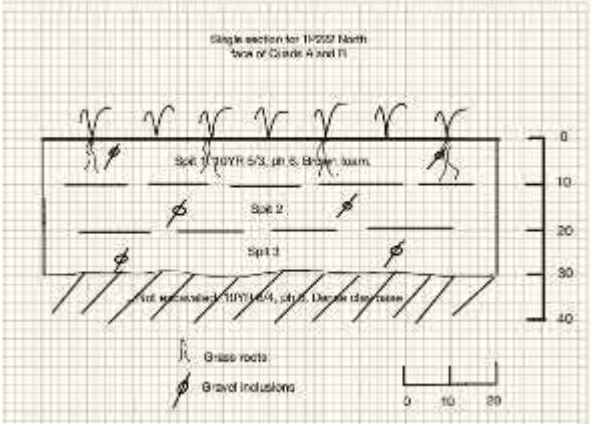
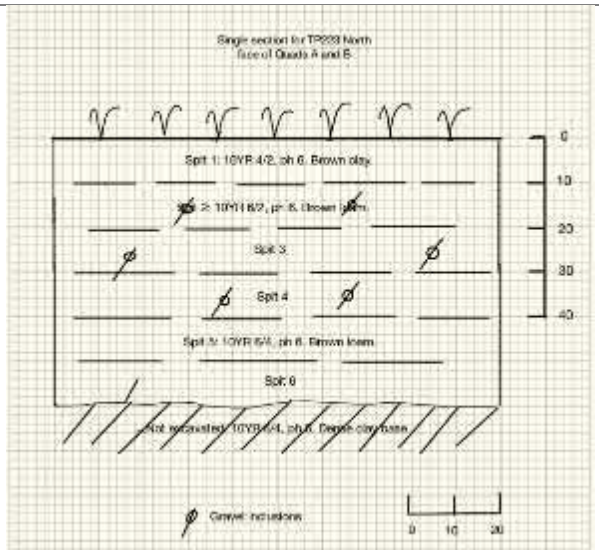
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCE 420E (1 m²)			N/A
BCE 380E (1 m²)			N/A

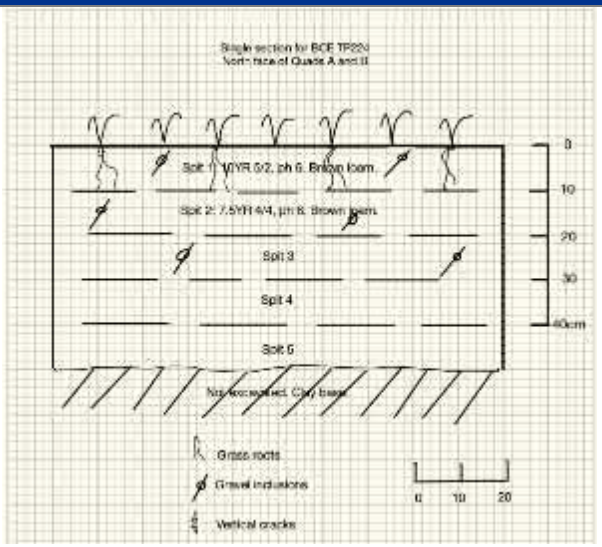
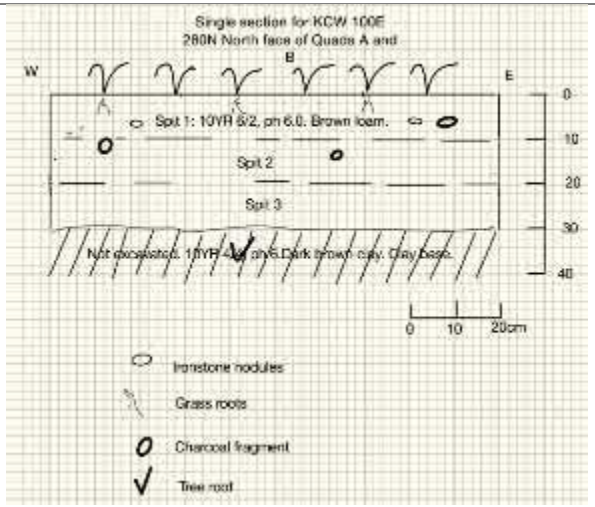
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCE 340E (1 m²)			N/A
BCE 300E (1 m²)			N/A

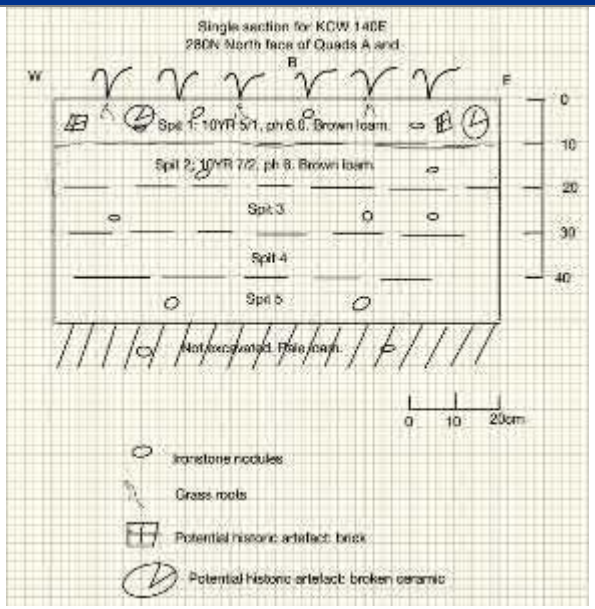
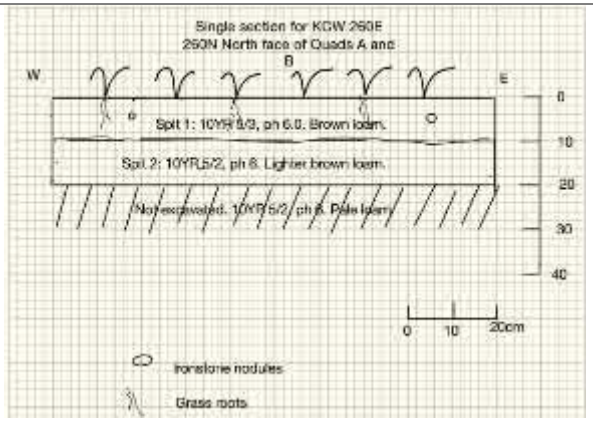
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCE 320E (1 m²)			N/A
BCE 180E (1 m²)			N/A

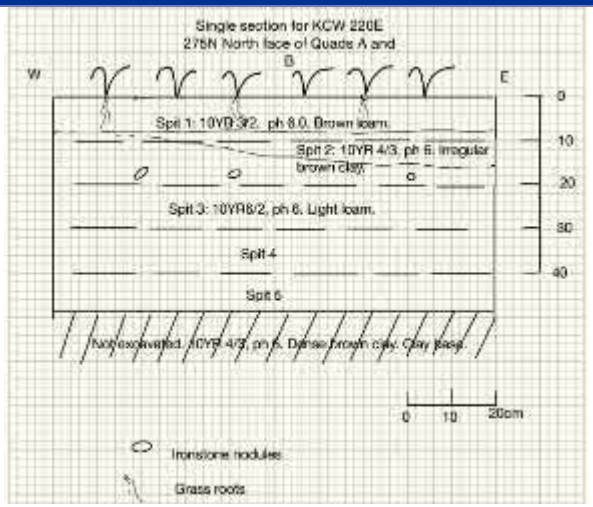
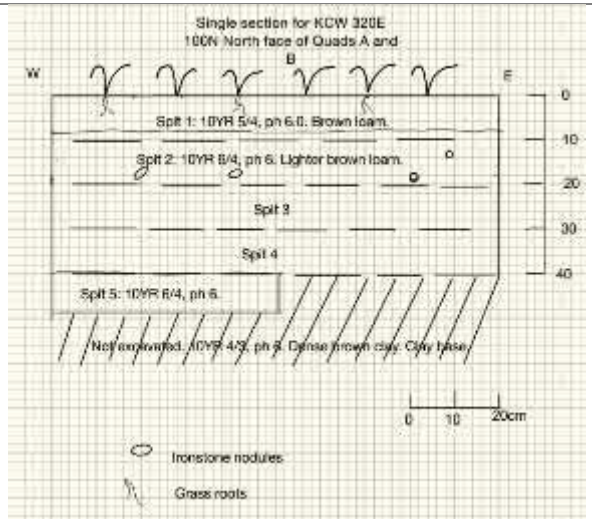
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCE 180E detail		See above.	N/A
BCE 140E (1 m²)			N/A

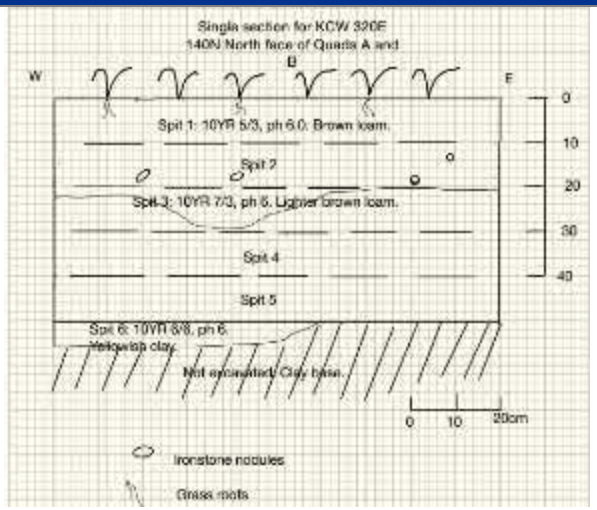
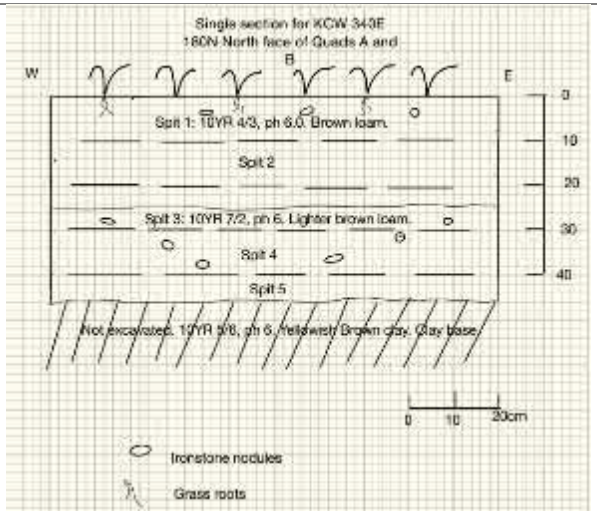
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCE 100E (1 m²)			N/A
BCE TP221 (3 m²)			N/A

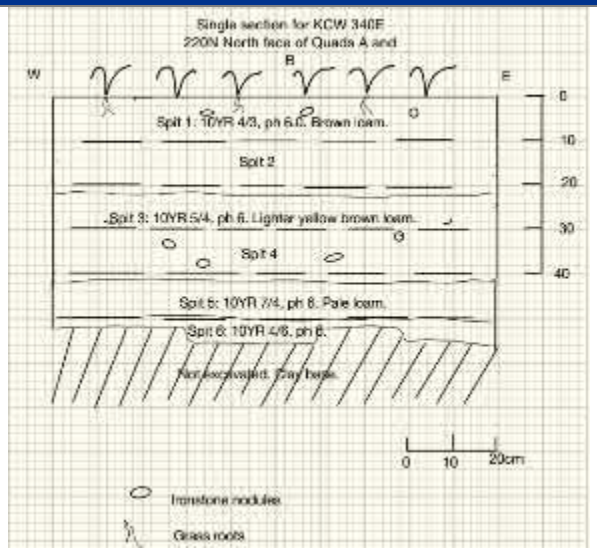
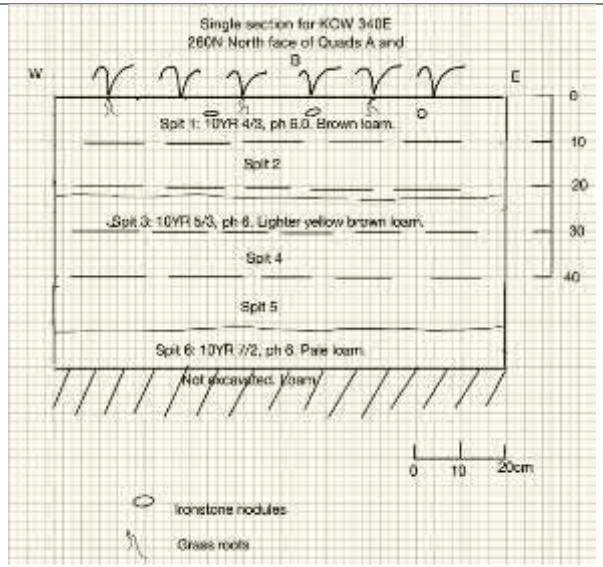
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCE TP222 (3 m²)			N/A
BCE TP223 (3 m²)			N/A

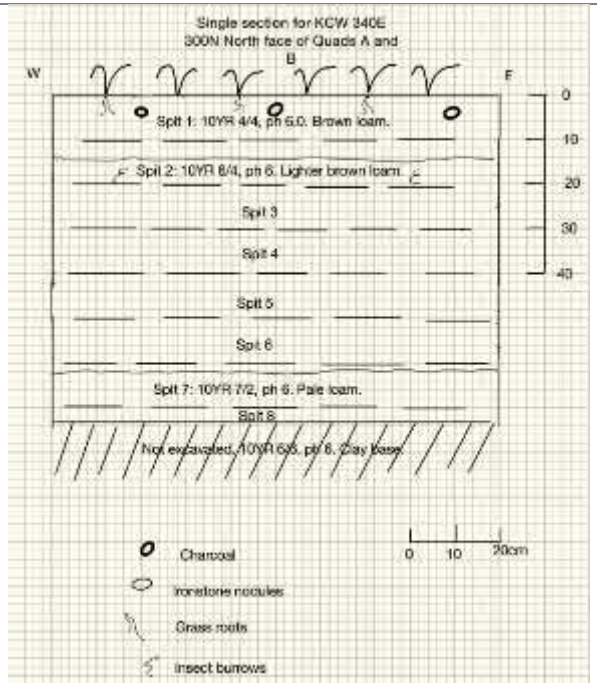
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
BCE TP224 (3 m²)			N/A
KCW 100E280N (1 m²)			N/A

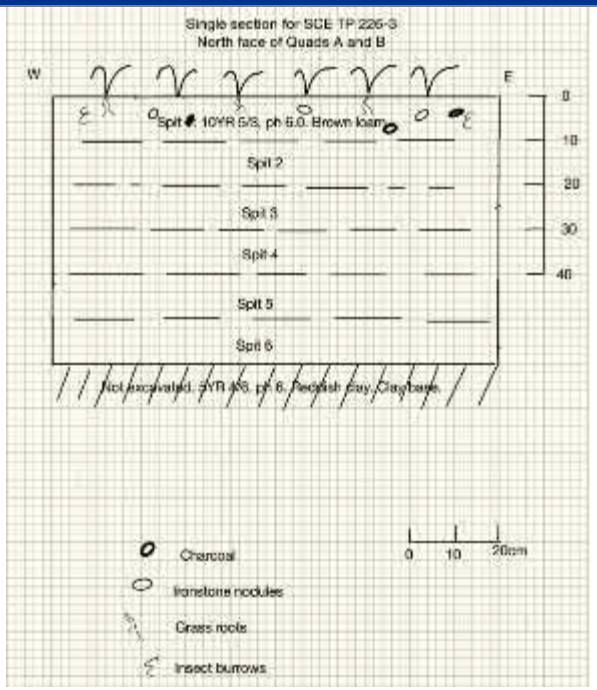
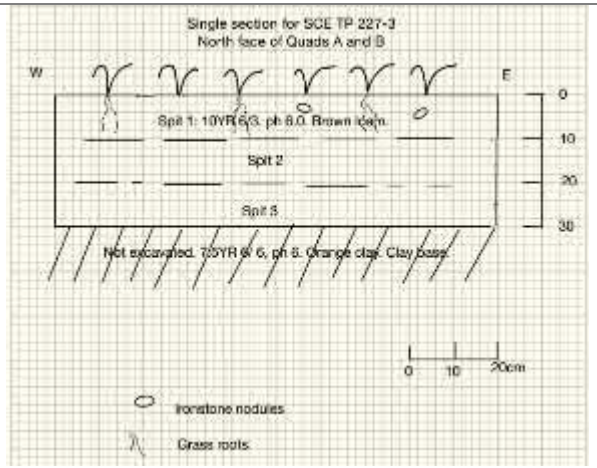
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
KCW 140E280N (1 m²)			N/A
KCW 260E260N (1 m²)			N/A

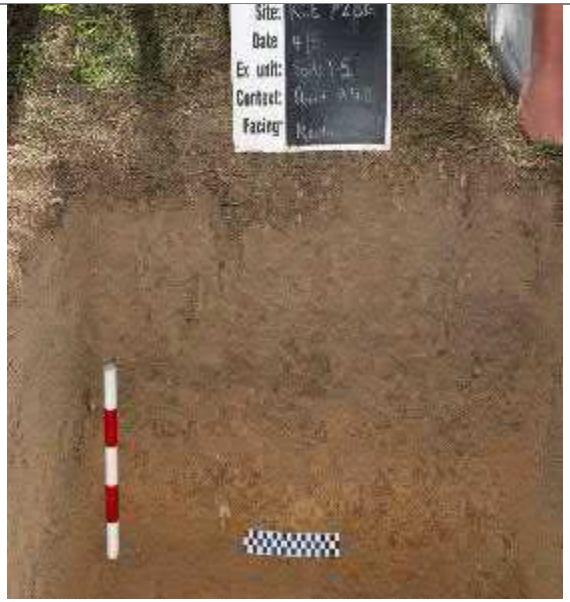
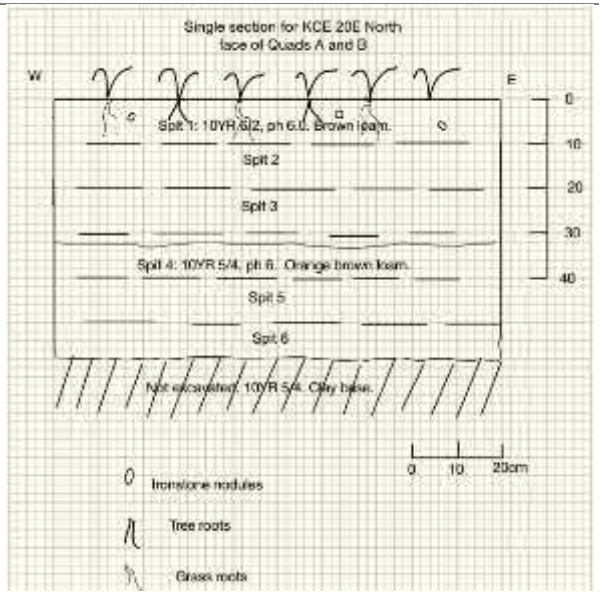
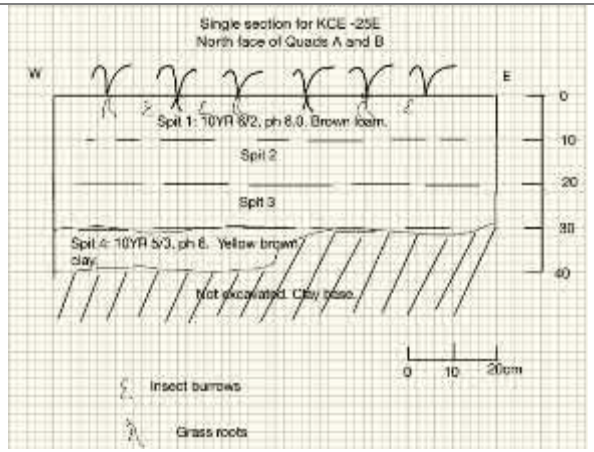
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
KCW 220E275N (1 m²)			N/A
KCW 320E100N (1 m²)			N/A

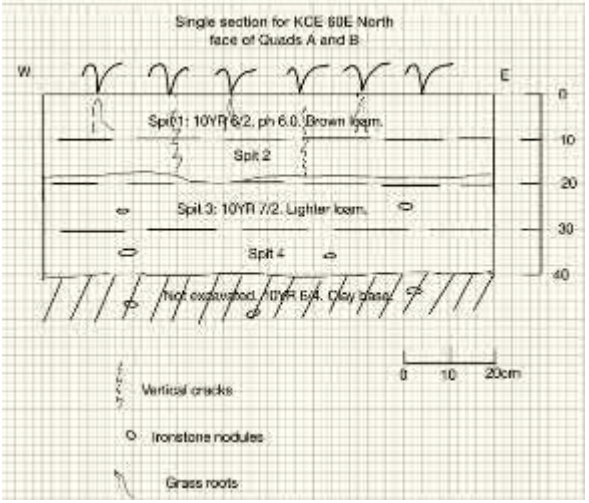
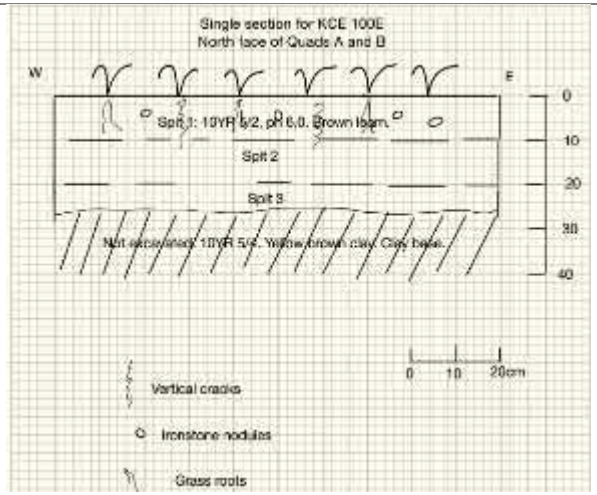
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
KCW 320E140N (1 m²)			N/A
KCW 340E180N (1 m²)			N/A

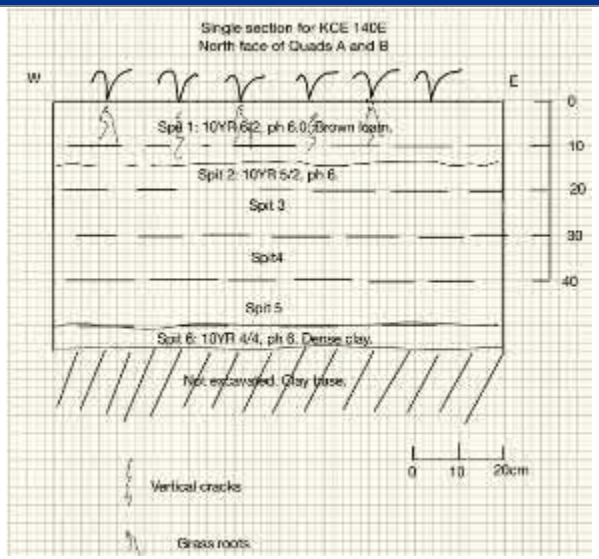
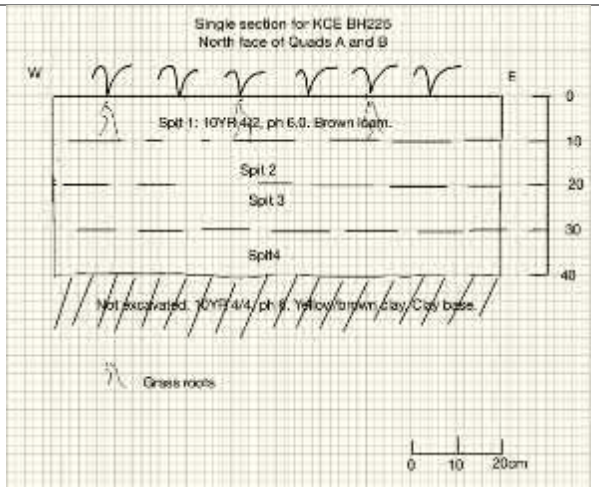
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
KCW 340E220N (1 m²)			N/A
KCW 340E260N (1 m²)			N/A

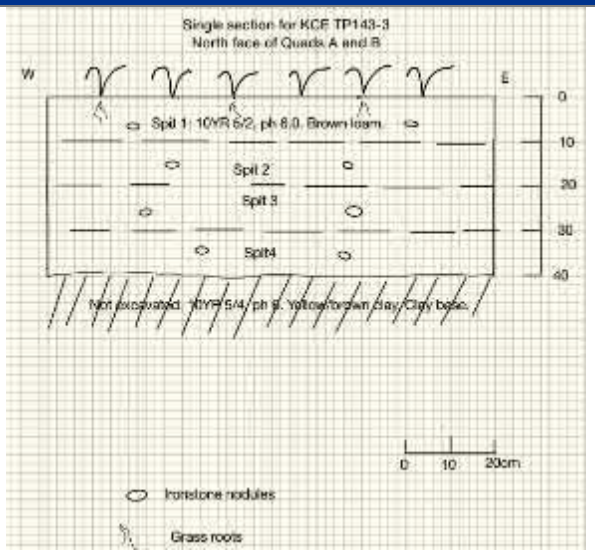
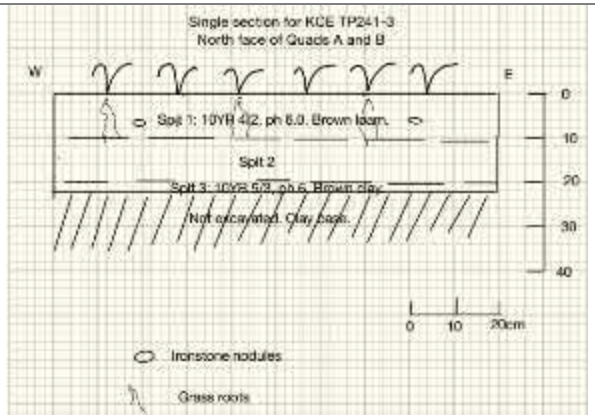
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
KCW 340E300N (1 m²)			N/A

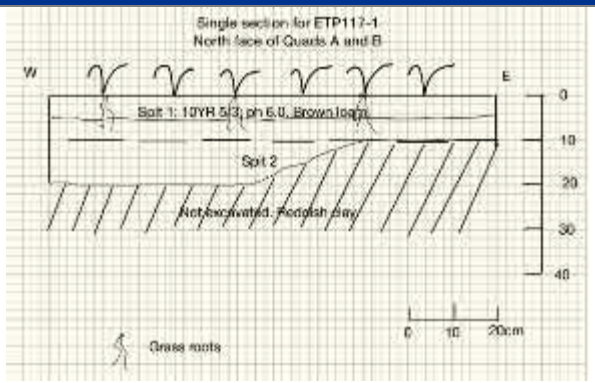
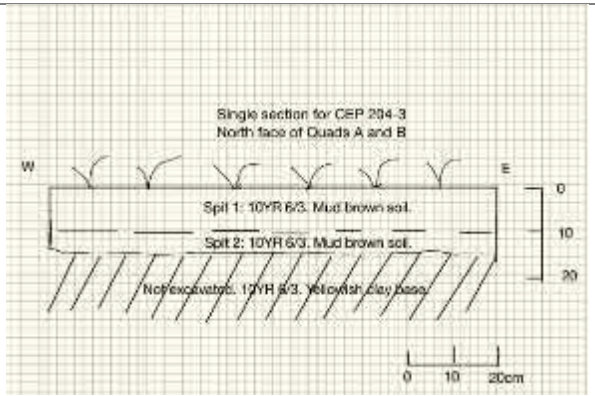
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
SCE TP226 (3 m²)			N/A
SCE TP227 (3 m²)			N/A

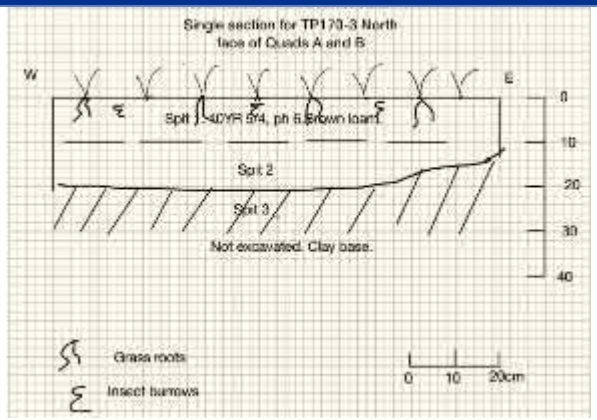
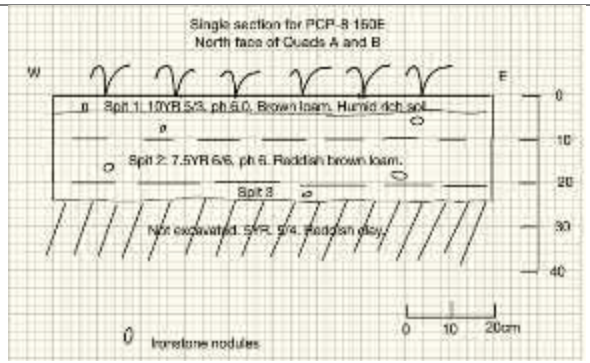
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
KCE 20E (1 m²)			N/A
KCE -25E (1 m²)			N/A

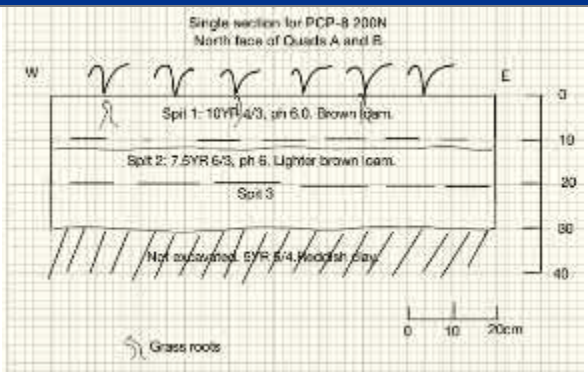
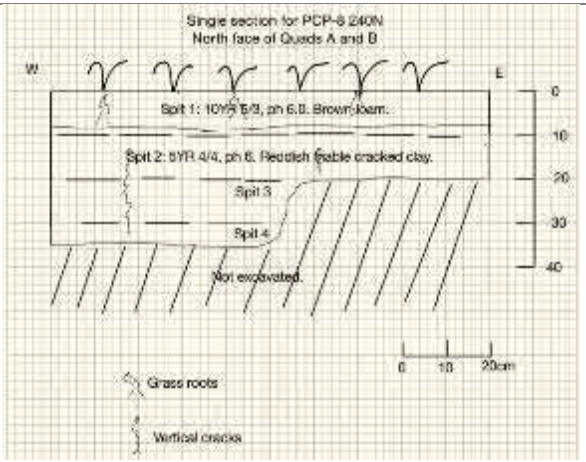
Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
KCE 60E (1 m²)			N/A
KCE 100E (1 m²)	Not available		N/A

Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
KCE 140E (1 m²)			N/A
KCE BH225 (1 m²)			N/A

Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
KCE TP143 (3 m²)			N/A
KCE TP241 (3 m²)			N/A

Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
TP 117			N/A
CCE TP204 (3 m²)			N/A

Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
TP 170			N/A
PCP8 160E (1 m²)			N/A

Site	Stratigraphic photograph	Stratigraphic drawing	Artefacts
PCP8 200N (1 m²)			N/A
PCP8 240N (1 m²)			N/A

Appendix C. Artefact analysis database

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
KNW 100e220n B	2	Quartz	Flake		14	1.1	14	13	5	Plain	Focalised	Feather	
KNW Tp232 2 C	2	Silcrete	Flake		17	0.6	13	12	3	Shattered	Indeterminate	Feather	
KNW Tp232 2 D	3	Silcrete	Retouched flake	Scraper	20	1.5	14	15	5	Shattered	Indeterminate	Feather	End scraper
KNW Tp232 3 A	3	Silcrete	Flaked piece		18	3.7		17	14				
KNW Tp235 2 B	2	Silcrete	Core		21	0.7	21	6	5				grey silcrete long bipolar core
KNW Tp235 2 B	2	IMT	Shatter		22	2.8		16	8				
KNW Tp235 3 A	1	IMT	Proximal flake		19	1.6	14	17	5	Cortex	Wide		
KNW Tp235 3 A	2	Silcrete	Flake		10	0.1	10	6	2	Plain	Focalised	Feather	No Photo
KNW Tp236 1 A	1	Silcrete	Distal flake		32	5.9	27	22	9			Feather	
KNW Tp236 1 D	1	Silcrete	Proximal flake		15	0.5	13	7	5	Plain	Wide		
KNW Tp236 3 B	2	Silcrete	Flaked piece		11	0.2		8	3				
KNW Tp236 3 C	2	Silcrete	Flake		13	0.4	9	10	3	Plain	Wide	Feather	
KNW Tp236 3 D	2	Silcrete	Flaked piece		27	4.8		17	11				
KNW Tp237 1 A	3	Silcrete	Flake		17	0.6	7	8	6	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
KNW Tp237 1 A	3	Quartz	Proximal flake		10	0.2	8	7	3	Plain	Wide		
KNW Tp237 1 B	2	Silcrete	Flake		10	0.1	5	5	2	Multiple scars	Wide	Feather	backing flake
KNW Tp237 1 D	2	Quartz	Proximal flake		9	0.2	7	7	3	Plain	Wide		
KNW Tp237 2 C	3	Silcrete	Distal flake		17	0.4	9	7	5			Feather	
KNW Tp237 2 D	2	Silcrete	Flaked piece		17	0.5		9	4				Potlid ventral
KNW Tp237 3 C	2	IMT	Flaked piece		24	2.1		17	8				
KNW Tp237 3 D	2	IMT	Flake		18	0.9	12	13	4	Plain	Wide	Feather	
PCP8 160n A	2	Silcrete	Distal flake		21	0.7	21	11	4			Feather	Heat affected potlids
PCP8 160n B	2	Silcrete	Flake		14	0.6	15	12	3	Indeterminate	Indeterminate	Feather	
PCP8 160n B	2	Ochre	Pencil		17	1.1		9	9				9mm diameter "crayon" of soft orange ochre
PCP8 160n D	3	Silcrete	Distal flake		15	0.3	8	8	2			Feather	
PCP8 160n D	3	Silcrete	Medial flake		14	0.4	7	7	4	Cortex	Wide	Hinge	
PCP8 240n A	1	Silcrete	Distal flake		24	1.8	24	13	9			Feather	
RRD 1 100e100n B	1	Silcrete	Flake		14	0.3	14	8	2	Multiple scars	Focalised	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
RRD 1 100e100n D	1	Silcrete	Distal flake		11	0.4	12	10	4			Feather	
RRD 1 100e140n B	1	IMT	Conesplit flake		18	0.6	16	8	5	Plain	Wide	Feather	
RRD 1 100e180n C	1	IMT	Flake		17	0.6	16	13	4	Plain	Wide	Feather	
RRD 1 120e140n C	2	IMT	Medial flake		13	0.1	10	5	2				
RRD 1 120e140n C	3	Silcrete	Core		33	11.3							
BCE 1 100e A	3	Silcrete	Flaked piece		16	1.4		10	10				
BCE 1 100e B	1	Silcrete	Distal flake		20	1.8	19	13	7			Feather	
BCE 1 100e B	1	IMT	Distal flake		11	0.2	11	5	2			Feather	
BCE 1 100e B	2	Silcrete	Flake		29	4.8	23	19	9	Cortex	Wide	Feather	
BCE 1 100e B	3	Silcrete	Flake		9	0.2	6	5	3	Plain	Wide	Feather	
BCE 1 100e C	1	Silcrete	Flaked piece		24	2.9		19	6				Flake with ventral removed by potlid scar
BCE 1 100e C	2	Silcrete	Flake		8								
BCE 1 100e C	3	Silcrete	Flake		23	2.3	14	15	7	Plain	Wide	Feather	
BCE 1 100e C	3	Quartz	Flake		17	0.9	10	14	3	Plain	Wide	Feather	
BCE 1 100e D	1	Silcrete	Flaked piece		28	3.2		15	9				Heat shattered
BCE 1 100e D	1	IMT	Flaked piece		11	0.2		7	3				
BCE 1 100e D	2	Silcrete	Flake		11	0.4	9	9	6	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 100e D	2	Silcrete	Flake		17	0.6	17	8	5	Multiple scars	Focalised	Step	
BCE 1 100e D	2	Silcrete	Flaked piece		12	0.3		6	4				
BCE 1 100e D	2	Silcrete	Medial flake		13	0.3	10	9	4				
BCE 1 100e D	2	Silcrete	Flaked piece		15	0.5		10	6				
BCE 1 100e D	3	Silcrete	Proximal flake		16	0.9	11	13	5	Plain	Wide		light grey silcrete
BCE 1 140e B	2	Silcrete	Distal flake		18	0.7	14	12	4			Feather	
BCE 1 140e B	3	Silcrete	Distal flake		17	0.5	13	13	2			Feather	
BCE 1 140e C	1	Silcrete	Flaked piece		18	1.4		14	6				
BCE 1 140e C	1	IMT	Flake		10	0.3	10	10	4	Plain	Wide	Feather	
BCE 1 180e A	2	Silcrete	Flaked piece		14	0.9		10	8				Heat shattered
BCE 1 180e A	2	Silcrete	Flaked piece		15	0.9		11	6				Heat shattered
BCE 1 180e C	2	IMT	Distal flake		20	0.9	11	13	4			Feather	Heat shattered
BCE 1 180e D	2	Silcrete	Retouched flake	Scraper	42	15.4	19	28	11	Multiple scars	Wide	Feather	Flake tool usewear
BCE 1 180e D	2	Silcrete	Flaked piece		21	1.4		9	9				
BCE 1 220e A	1	Quartz	Flaked piece		10	0.5		8	5				
BCE 1 220e A	1	Quartz	Flake		10	0.2	9	9	2	Cortex	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 220e A	2	Silcrete	Flake		20	1.7	20	12	6	Plain	Wide	Feather	Silcrete gravel?
BCE 1 220e A	2	Quartz	Flake		18	1.4	18	11	7	Shattered	Indeterminate	Feather	
BCE 1 220e B	2	IMT	Flaked piece		20	2.5		17	9				Probable gravel
BCE 1 220e C	1	IMT	Distal flake		27	0.8	20	12	3			Feather	Potlid on ventreal
BCE 1 220e C	2	Silcrete	Distal flake		13	0.2	12	8	2			Feather	
BCE 1 220e C	2	Quartz	Flake		7	0.1	7	6	2	Cortex	Wide	Feather	
BCE 1 220e C	2	IMT	Shatter		15	1.1		12	7				Heat shattered
BCE 1 220e D	2	IMT	Flaked piece		11	0.1		7	2				Heat shattered
BCE 1 220e D	3	IMT	Shatter		16	0.6		11	4				
BCE 1 340e D	2	Silcrete	Flake		8	0.2	6	8	3	Plain	Wide	Feather	
BCE 1 380e D	1	Silcrete	Flaked piece		17	0.4		5	4				
BCE 1 540e B	4	Silcrete	Flaked piece		25	4.3		19	12				Silcrete gravel?
BCE 1 540e D	2	Silcrete	Proximal flake		15	0.84	15	10	5	Plain	Focalised		
BCE 1 580e B	3	Quartz	Flake		12	0.6	8	9	4	Cortex	Wide	Feather	Wall clean up
BCE 1 580e C	1	Silcrete	Flaked piece		13	0.6		8	5				
BCE 1 580e D	1	Silcrete	Flaked piece		31	7.6		20	12				Silcrete gravel?
BCE 1 580e D	1	Silcrete	Flaked piece		12	0.8		9	7				Silcrete gravel?

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 580e D	1	Silcrete	Flaked piece		11	0.2		6	5				Silcrete gravel?
BCE 1 580e D	1	IMT	Flake		8	0.1	8	8	1	Plain	Focalised	Feather	
BCE 1 620e A	1	Silcrete	Flaked piece		19	2.5		13	10				Silcrete gravel?
BCE 1 620e C	4	IMT	Flaked piece		21	1		13	7				
BCE 1 660e A	2	IMT	Flaked piece		12	0.2		7	3				
BCE 1 660e C	1	Silcrete	Flaked piece		10	0.5		8	8				
BCE 1 700e A	3	Silcrete	Flaked piece		29	5.6		21	9				Silcrete gravel?
BCE 1 700e C	1	Silcrete	Flaked piece		8	0.1		4	3				***; empties checked, rec'd checked; missing
BCE 1 Tp221 1 A	1	Silcrete	Flake		18	1.1	12	10	6	Plain	Wide	Feather	
BCE 1 Tp221 1 A	1	Silcrete	Distal flake		11	0.1	9	5	2			Feather	
BCE 1 Tp221 1 A	2	Silcrete	Proximal flake		25	2.2	22	11	6	Plain	Wide		
BCE 1 Tp221 1 A	2	IMT	Distal flake		9	0.2		9	4			Feather	
BCE 1 Tp221 1 B	2	Silcrete	Distal flake		9	0.1	8	8	2			Feather	
BCE 1 Tp221 1 B	2	IMT	Flaked piece		19	1.5		13	9				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 Tp221 1 B	2	IMT	Distal flake		13	0.2	13	7	2				
BCE 1 Tp221 1 C	2	Silcrete	Flake		11	0.2	8	7	3	Multiple scars	Focalised	Feather	
BCE 1 Tp221 1 C	2	Silcrete	Flake		12	0.2	10	8	2	Multiple scars	Focalised	Feather	
BCE 1 Tp221 1 C	3	Silcrete	Distal flake		37	3.2	25	17	5			Feather	
BCE 1 Tp221 1 C	3	Silcrete	Flake		13	0.3	11	11	3	Plain	Wide	Feather	
BCE 1 Tp221 1 D	2	Silcrete	Flaked piece		28	3.1		18	10				
BCE 1 Tp221 2 A	1	Silcrete	Distal flake		14	0.3	14	8	3			Feather	
BCE 1 Tp221 2 B	1	Silcrete	Flaked piece		35	5.3		22	6				Heat shattered
BCE 1 Tp221 2 B	1	Silcrete	Distal flake		17	0.6	16	10	5			Feather	
BCE 1 Tp221 2 B	1	Silcrete	Flake		13	0.2	10	7	3	Plain	Wide	Feather	
BCE 1 Tp221 2 B	1	Silcrete	Flaked piece		9	0.2		6	4				
BCE 1 Tp221 2 D	1	IMT	Flaked piece		19	1.5		11	8				Heat shattered
BCE 1 Tp221 3 A	1	Silcrete	Shatter		16	0.9		11	10				Heat shattered
BCE 1 Tp221 3 A	2	Silcrete	Flaked piece		11	0.3		8	3				
BCE 1 Tp221 3 A	2	Silcrete	Flake		8	0.1	8	6	1	Plain	Focalised	Feather	
BCE 1 Tp221 3 A	2	Silcrete	Flake		9	0.1	9	9	1	Plain	Focalised	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 Tp221 3 A	2	Silcrete	Flake		16	0.6	16	12	3	Cortex	Focalised	Feather	
BCE 1 Tp221 3 A	2	Silcrete	Medial flake		11	0.1		6	2	.1			
BCE 1 Tp221 3 A	2	Silcrete	Flake		13	0.3	9	10	3	Plain	Wide	Feather	
BCE 1 Tp221 3 A	2	Silcrete	Flake		16	0.2	15	6	2	Plain	Wide	Feather	
BCE 1 Tp221 3 A	2	Silcrete	Distal flake		22	2.2	18	16	7			Feather	
BCE 1 Tp221 3 A	2	Silcrete	Distal flake		18	1.1	11	11	8			Feather	
BCE 1 Tp221 3 A	2	Silcrete	Distal flake		22	1.2	13	11	6			Feather	
BCE 1 Tp221 3 B	1	Silcrete	Flaked piece		13	0.9		13	5				Silcrete gravel?
BCE 1 Tp221 3 B	2	Silcrete	Flake		11	0.1	10	9	1	Indeterminate	Shattered	Feather	
BCE 1 Tp221 3 B	2	Silcrete	Medial flake		10	0.2	8	8	2				
BCE 1 Tp221 3 B	2	Silcrete	Distal flake		9	0.2		7	3				
BCE 1 Tp221 3 B	2	Silcrete	Distal flake		7	0.1	7	5	1				
BCE 1 Tp221 3 B	2	Silcrete	Flake		11	0.2	7	7	2	Plain	Focalised	Feather	
BCE 1 Tp221 3 B	2	IMT	Proximal flake		27	2.5	17	18	5	Plain	Wide		
BCE 1 Tp221 3 C	1	Silcrete	Medial flake		20	1	7	10	5				
BCE 1 Tp221 3 C	1	Petrified wood	Distal flake		14	0.7	12	12	5			Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 Tp221 3 C	2	Silcrete	Flaked piece		18	2		15	7				Silcrete gravel?
BCE 1 Tp221 3 C	2	Quartz	Flake		18	0.6	16	9	4	Plain	Wide	Feather	
BCE 1 Tp221 3 D	1	IMT	Flaked piece		12	0.4		10	4				
BCE 1 Tp221 3 D	2	Silcrete	Distal flake		36	4.7	30	19	9			Feather	
BCE 1 Tp221 3 D	2	IMT	Distal flake		9	0.1		7	3				
BCE 1 Tp222 1 A	1	Silcrete	Flake		16	0.7	11	10	5	Cortex	Wide	Feather	
BCE 1 Tp222 1 B	2	Silcrete	Retouched flake	Backed artefact	15	0.5	14	8	5				Medial backed artefact fragment
BCE 1 Tp222 1 B	2	Silcrete	Flake		18	0.4	11	12	2	Plain	Wide	Feather	
BCE 1 Tp222 1 B	2	Silcrete	Proximal flake		12	0.2	11	10	2	Plain	Wide		
BCE 1 Tp222 1 B	2	Silcrete	Distal flake		14	0.3	7	7	3			Feather	
BCE 1 Tp222 1 B	2	Silcrete	Distal flake		11	0.2	7	7	3			Feather	
BCE 1 Tp222 1 C	1	Silcrete	Flaked piece		13	0.2		9	1				
BCE 1 Tp222 1 C	1	Silcrete	Flake		21	0.4	18	18	3	Plain	Wide	Feather	***; empties checked, rec'd checked; missing
BCE 1 Tp222 1 C	3	Silcrete	Flaked piece		13	0.6		9	7				
BCE 1 Tp222 1 D	1	Silcrete	Flake		12	0.2	10	9	2	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 Tp222 1 D	1	Silcrete	Distal flake		10	0.1	6	6	2	Plain	Wide	Feather	
BCE 1 Tp222 1 D	2	Silcrete	Distal flake		24	0.2	12	12	7			Feather	
BCE 1 Tp222 1 D	2	Silcrete	Distal flake		11	0.4	10	9	5			Feather	
BCE 1 Tp222 1 D	2	Silcrete	Flake		17	0.4	12	13	2	Plain	Wide	Feather	
BCE 1 Tp222 1 D	2	Silcrete	Distal flake		10	0.1	10	6	1			Feather	
BCE 1 Tp222 1 A	2	Silcrete	Medial flake		14	0.6	9	9	3				
BCE 1 Tp221 2 A	2	Silcrete	Flake		20	1.5	16	16	6	Plain	Wide	Feather	
BCE 1 Tp221 2 A	2	Silcrete	Medial flake		20	2	11	12	7				
BCE 1 Tp221 2 A	2	Silcrete	Retouched flake	Thumbnail scraper	14	0.5	11	12	3				Thumbnail scraper
BCE 1 Tp222 2 A	2	Silcrete	Flake		27	3.1	17	19	6	Cortex	Wide	Feather	
BCE 1 Tp222 2 A	2	Silcrete	Proximal flake		18	0.8	14	14	3	Plain	Wide		
BCE 1 Tp222 2 A	2	Silcrete	Flaked piece		14	0.8		9	7				
BCE 1 Tp222 2 B	1	Silcrete	Retouched flake	Scraper	40	21.1		34	19				Flake tool
BCE 1 Tp222 2 B	1	Silcrete	Distal flake		11	0.1	10	6	1			Feather	
BCE 1 Tp222 2 B	1	Silcrete	Flake		17	1.1	17	9	7	Shattered	Indeterminate	Feather	
BCE 1 Tp222 2 B	1	Quartz	Flake		18	1.5	17	14	5	Shattered	Indeterminate	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 Tp221 2 B	2	IMT	Flake		12	0.3	9	9	3	Shattered	Indeterminate	Feather	
BCE 1 Tp222 2 B	3	Silcrete	Flake		14	0.3	8	8	2	Plain	Wide	Feather	
BCE 1 Tp222 2 B	3	Silcrete	Flake		11	0.2	11	8	2	Plain	Wide	Feather	
BCE 1 Tp222 2 B	3	Silcrete	Distal flake		10	0.1	10	4	2			Feather	
BCE 1 Tp222 2 A	3	Quartz	Flake		11	0.3	7	7	3	Plain	Wide	Feather	
BCE 1 Tp221 2 C	1	Silcrete	Shatter		24	2.7		19	7				Heat shattered
BCE 1 Tp222 2 C	1	Silcrete	Flake		37	16.6	31	34	18	Plain	Wide	Feather	
BCE 1 Tp222 2 C	1	Silcrete	Flake		9	0.2	8	8	2	Plain	Wide	Feather	
BCE 1 Tp222 2 C	1	Silcrete	Shatter		16	0.444		11	2				
BCE 1 Tp222 2 C	2	Silcrete	Flake		27	1.6	26	16	5	Multiple scars	Focalised	Overshot	
BCE 1 Tp222 2 C	2	Silcrete	Flake		6	0.1	6	3	1	Shattered	Indeterminate	Feather	type and length estimate
BCE 1 Tp222 2 C	2	Silcrete	Flaked piece		18	0.9		15	3				Heat shattered
BCE 1 Tp222 2 C	2	Silcrete	Proximal flake		13	0.1	6	6	2	Multiple scars	Focalised		
BCE 1 Tp222 2 C	2	Silcrete	Distal flake		13	0.1	6	6	1			Feather	
BCE 1 Tp222 2 C	2	Silcrete	Flake		23	1	12	13	3	Multiple scars	Focalised	Hinge	
BCE 1 Tp222 2 C	3	Silcrete	Flaked piece		21	2.3		15	7				
BCE 1 Tp222 2 C	3	Silcrete	Flake		18	0.7	16	13	3	Multiple scars	Wide	Feather	
BCE 1 Tp222 2 C	3	Silcrete	Flake		8	0.1	5	6	3	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 Tp222 2 C	3	Silcrete	Proximal flake		13	0.3	10	9	2	Plain	Wide		
BCE 1 Tp222 2 C	3	Silcrete	Shatter		18	0.7		16	2				
BCE 1 Tp222 2 C	3	Silcrete	Flaked piece		9	0.2		7	3				
BCE 1 Tp222 2 D	1	Silcrete	Flake		26	2.2	18	15	6	Plain	Wide	Feather	
BCE 1 Tp221 2 D	2	Silcrete	Flaked piece		17	0.9		11	5				
BCE 1 Tp222 2 D	2	Silcrete	Flake		21	1.8	21	18	5	Multiple scars	Focalised	Feather	
BCE 1 Tp222 2 D	2	Silcrete	Flake		14	0.3	13	9	2	Plain	Wide	Feather	
BCE 1 Tp222 2 D	2	Silcrete	Flake		7	0.1	7	5	1	Plain	Focalised	Feather	
BCE 1 Tp222 2 D	2	Quartz	Flaked piece		15	1.2		12	7				
BCE 1 Tp222 2 D	3	Silcrete	Distal flake		15	0.4	14	10	3			Feather	
BCE 1 Tp222 2 D	3	Silcrete	Distal flake		15	0.7	10	10	4			Feather	
BCE 1 Tp222 3 A	2	Igneous	Manuport		49	33.8		31	21				Pebble fragment, possibly natural
BCE 1 Tp222 3 A	2	Igneous	Manuport		44	18.5		42	15				Pebble fragment, possibly natural
BCE 1 Tp222 3 A	2	Igneous	Manuport		36	7.6		27	10				Pebble fragment, possibly natural

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 Tp222 3 A	2	Silcrete	Proximal flake		13	0.8	12	13	4	Plain	Wide		
BCE 1 Tp222 3 C	1	Silcrete	Flaked piece		19	0.6		9	5				
BCE 1 Tp222 3 C	1	Silcrete	Flake		13	0.2	9	8	2	Plain	Wide	Feather	
BCE 1 Tp222 3 C	1	Silcrete	Flaked piece		14	0.6		10	5				
BCE 1 Tp222 3 C	2	Igneous	Manuport		49	34.4		34	24				Pebble fragment, possibly natural
BCE 1 Tp222 3 C	2	Silcrete	Proximal flake		34	5.3	22	23	6	Plain	Wide		
BCE 1 Tp222 3 D	1	Silcrete	Core		36	23.6		28	20				
BCE 1 Tp222 3 D	1	Silcrete	Flaked piece		18	1.5		14	6				
BCE 1 Tp222 3 D	1	Silcrete	Flaked piece		15	0.7		9	5				
BCE 1 Tp222 3 D	1	Silcrete	Flake		14	0.4	13	10	3	Multiple scars	Wide	Feather	
BCE 1 Tp222 3 D	1	Silcrete	Distal flake		8	0.1	8	6	2			Feather	
BCE 1 Tp222 3 D	2	Silcrete	Flake		14	0.3	9	10	3	Plain	Wide	Feather	
BCE 1 Tp223 3 A	3	Silcrete	Flake		17	0.4	12	10	2	Plain	Wide	Feather	
BCE 1 Tp223 1 A	4	Silcrete	Distal flake		18	0.7	8	8	6			Feather	
BCE 1 Tp223 1 A	4	Silcrete	Distal flake		12	0.1	12	5	1			Feather	
BCE 1 Tp223 3 B	2	Silcrete	Distal flake		13	0.4	10	10	2			Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 Tp223 1 B	4	Silcrete	Flaked piece		17	2.9		14	13				Silcrete gravel? Heat shatter
BCE 1 Tp223 2 A	1	Silcrete	Medial flake		9	0.1	5	5	1				Cleanup A - D 0-15
BCE 1 Tp223 2 A	1	Silcrete	Flake		12	0.4	7	4	4	Plain	Wide	Feather	Cleanup A - D 0-15
BCE 1 Tp223 2 A	3	Silcrete	Retouched flake	Scraper	22	2.1	17	20	5				Usewear scraper
BCE 1 Tp223 3 C	3	Silcrete	Distal flake		9	0.1	9	6	1			Feather	
BCE 1 Tp223 3 C	4	Silcrete	Retouched flake	Backed artefact	11	0.4	12	7	4				Geometric backed artefact
BCE 1 Tp223 3 D	4	Silcrete	Medial flake		10	0.2	6	8	2				
BCE 1 Tp224 1 A	1	Silcrete	Flake		20	1.4	17	13	4	Cortex	Wide	Feather	
BCE 1 Tp224 1 A	1	Silcrete	Flaked piece		17	0.6		10	3				
BCE 1 Tp224 1 A	1	Silcrete	Core		16	0.9		11	5				Bipolar
BCE 1 Tp224 1 A	1	Silcrete	Flaked piece		14	1.1		12	8				
BCE 1 Tp224 1 A	4	IMT	Medial flake		11	0.3	8	8	3				
BCE 1 Tp224 1 A	2	IMT	Distal flake		10	0.2	10	9	3			Feather	
BCE 1 Tp224 1 A	3	Silcrete	Shatter		24	2.2		20	4				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 Tp224 1 A	5	Silcrete	Retouched flake	Backed artefact	17	0.2	17	5	2			Feather	Partially backed blade distal backing only
BCE 1 Tp224 1 A	5	Silcrete	Flake		15	0.4	15	7	3	Cortex	Wide	Feather	
BCE 1 Tp224 1 A	5	Silcrete	Flaked piece		15	0.7		10	5				
BCE 1 Tp224 1 A	5	Silcrete	Distal flake		14	0.4	14	10	4			Feather	
BCE 1 Tp224 1 A	5	Silcrete	Flake		13	0.3	13	9	3	Plain	Focalised	Feather	Unearthed at pointed platform end
BCE 1 Tp224 1 A	5	Silcrete	Gravel		12	0.5		8	5				
BCE 1 Tp224 1 A	5	Silcrete	Distal flake		11	0.2	11	7	3			Feather	
BCE 1 Tp224 1 A	5	Silcrete	Proximal flake		10	0.1	10	6	1	Plain	Focalised		
BCE 1 Tp224 1 A	5	Silcrete	Flaked piece		12	0.2		8	4				
BCE 1 Tp224 1 A	5	Silcrete	Distal flake		11	0.1		7	3				
BCE 1 Tp224 1 A	5	Silcrete	Flaked piece		11	0.2		8	1				
BCE 1 Tp224 1 A	5	Silcrete	Distal flake		9	0.1	4	4	2			Feather	
BCE 1 Tp224 1 A	5	Quartz	Flake		9	0.1	8	5	3	Shattered	Indeterminate	Feather	
BCE 1 Tp224 1 A	5	IMT	Shatter		12	0.4		10	5				Heat shattered

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 Tp224 1 A	5	IMT	Flaked piece		11	0.2		6	6				Heat shattered
BCE 1 Tp224 1 A	5	IMT	Flake		16	0.6	16	14	3	Plain	Focalised	Feather	
BCE 1 Tp224 1 A	5	IMT	Distal flake		14	0.4	7	8	4			Feather	
BCE 1 Tp224 1 A	5	IMT	Distal flake		10	0.1		7	2			Feather	
BCE 1 Tp224 1 B	1	Silcrete	Flake		14	0.4	11	11	2	Plain	Wide	Feather	
BCE 1 Tp224 1 B	1	Silcrete	Gravel		13	1.1		10	7				
BCE 1 Tp224 1 B	1	Silcrete	Distal flake		11	0.2	11	6	2				
BCE 1 Tp224 1 B	4	IMT	Flake		19	0.9	11	12	6	Plain	Wide	Feather	
BCE 1 Tp224 1 C	2	Silcrete	Proximal flake		20	1	14	13	4	Plain	Wide		
BCE 1 Tp224 1 C	2	Silcrete	Flaked piece		16	0.8		10	6				
BCE 1 Tp224 1 C	2	Silcrete	Proximal flake		11	0.2	11	7	2	Plain	Wide	Feather	
BCE 1 Tp224 1 C	2	Silcrete	Flake		7	0.1	7	7	2	Plain	Wide	Feather	
BCE 1 Tp224 1 C	2	Quartz	Distal flake		10	0.2	8	6	2			Feather	
BCE 1 Tp224 1 C	3	IMT	Flaked piece		13	0.2		7	2				Heat shattered
BCE 1 Tp224 1 C	5	Silcrete	Proximal flake		19	1.2	12	12	9	Shattered	Indeterminate		
BCE 1 Tp224 1 D	1	Silcrete	Flake		6	0.1	4	4	1	Indeterminate	Indeterminate	Feather	
BCE 1 Tp224 3 D	4	Silcrete	Flake		11	0.2	9	11	3	Plain	Wide	Feather	
BCE 1 Tp224 1 D	5	Silcrete	Gravel		22	1.5		12	6				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 Tp224 2 A	5	Silcrete	Flake		10	0.1	4	5	3	Indeterminate	Indeterminate	Feather	Backed artefact tip removal flake
BCE 1 Tp224 2 A	5	Quartz	Flaked piece		12	0.5		7	5				Bipolar removal
BCE 1 Tp224 2 A	5	Quartz	Flaked piece		10	0.3		6	3				
BCE 1 Tp224 2 C	2	Silcrete	Flaked piece		15	1		12	7				
BCE 1 Tp224 2 D	1	Silcrete	Flaked piece		22	2.4		16	7				
BCE 1 Tp224 2 D	2	IMT	Flake		12	1	9	13	5	Plain	Wide	Feather	
BCE 1 Tp224 2 D	3	IMT	Flake		21	1	9	13	6	Plain	Wide	Feather	
BCE 1 Tp224 3 A	1	IMT	Flaked piece		16	1.5		14	7				
BCE 1 Tp224 3 A	2	Silcrete	Gravel		16	1		12	7				
BCE 1 Tp224 3 B	1	Silcrete	Flaked piece		18	1.3		16	6				
BCE 1 Tp224 3 C	4	Silcrete	Shatter		26	1.2		10	5				Heat shattered
BCE 1 Tp224 3 C	4	Silcrete	Gravel		18	1.9		14	9				
BCE 1 Tp224 3 D	1	Silcrete	Shatter		16	1		15	5				Heat shattered
BCE 1 Tp224 3 D	3	Silcrete	Flake		7	0.1	6	6	1	Plain	Focalised	Feather	
BCW 1 '-40e 1 B	1	Silcrete	Flaked piece		25	3.9		16	12				
BCW 1 '-40e 1 C	1	Silcrete	Flake		12	0.2	4	6	2	Plain	Wide	Feather	
BCW 1 '-40e 2 B	1	Silcrete	Proximal flake		19	1.2	16	14	4	Multiple scars	Focalised		

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCW 1 '-40e 2 C	1	Silcrete	Distal flake		17	1.2	11	11	5			Feather	
BCW 1 '-40e 3 B	1	Silcrete	Distal flake		19	0.8	18	11	4			Feather	
BCW 1 '-40e 3 C	1	Silcrete	Distal flake		15	0.5	13	8	3			Feather	
BCW 1 '-40e 3 D	1	Silcrete	Core		32	13.3		32	26				
BCW 1 '-40e 3 D	1	Silcrete	Flake		17	1.1	17	12	5	Shattered	Indeterminate	Feather	
BCW 1 0e A	1	Silcrete	Medial flake		18	1.9	14	13	6				
BCW 1 0e A	1	Silcrete	Flake		16	0.5	15	10	4	Shattered	Indeterminate	Feather	
BCW 1 0e A	1	Silcrete	Proximal flake		12	0.4	11	9	3	Multiple scars	Focalised		
BCW 1 0e A	1	Silcrete	Medial flake		12	0.2	9	5	2				
BCW 1 0e A	1	Silcrete	Shatter		12	0.2		8	2				Potlid
BCW 1 0e A	1	Silcrete	Medial flake		8	0.1	6	6	2				
BCW 1 0e A	2	Silcrete	Distal flake		22	0.8	17	13	3			Feather	
BCW 1 0e A	2	Silcrete	Medial flake		12	0.3	7	7	4				
BCW 1 0e A	1	Quartz	Flake		16	1.8	14	13	7	Cortex	Wide	Feather	
BCW 1 0e A	2	IMT	Flake		17	0.4	17	10	4	Multiple scars	Focalised	Feather	
BCW 1 0e B	1	Silcrete	Core		21	3.9		16	14				
BCW 1 0e B	1	Silcrete	Proximal flake		18	1.2	17	10	7	Plain	Focalised		

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCW 1 0e B	1	Silcrete	Distal flake		17	0.7	14	15	4			Feather	
BCW 1 0e B	1	Silcrete	Proximal flake		9	0.2	9	7	3	Plain	Focalised		
BCW 1 0e B	1	Silcrete	Medial flake		9	0.4	8	8	6				
BCW 1 0e B	1	Silcrete	Flake		7	0.1	5	5	2	Plain	Wide	Feather	
BCW 1 0e B	3	Silcrete	Medial flake		13	0.3	13	6	3				
BCW 1 0e C	2	Silcrete	Flaked piece		23	3.1		20	6				
BCW 1 0e C	2	Silcrete	Proximal flake		22	1.5	15	17	5	Plain	Wide		
BCW 1 0e C	2	Silcrete	Flaked piece		12	0.6		9	6				
BCW 1 0e C	2	Silcrete	Flake		11	0.4		7	5				
BCW 1 0e C	2	Silcrete	Flake		12	0.3	10	9	3	Plain	Wide	Feather	
BCW 1 0e C	2	IMT	Distal flake		12	0.1	12	6	1			Feather	
BCW 1 0e C	2	IMT	Flake		18	0.2	18	7	2	Multiple scars	Focalised	Feather	
BCW 1 0e C	2	Petrified wood	Distal flake		17	1.1	15	11	6			Feather	
BCW 1 0e D	1	Silcrete	Distal flake		19	1.5	17	12	5			Feather	
BCW 1 0e D	1	IMT	Flake		14	0.5	13	10	3	Plain	Focalised	Hinge	
BCW 1 120e A	1	Silcrete	Flake		27	5.6	20	20	10	Plain	Wide	Feather	
BCW 1 120e C	1	Silcrete	Medial flake		18	0.7	17	10	4				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCW 1 120e C	1	Quartz	Flake		19	1.1	16	11	6	Shattered	Indeterminate	Feather	
BCW 1 120e C	1	Quartz	Flake		8	0.2	6	6	3	Plain	Wide	Feather	
BCW 1 120e C	1	IMT	Distal flake		23	2.3	22	17	7	Plain	Wide	Feather	
BCW 1 120e C	1	IMT	Flake		15	0.4	8	9	5	Plain	Wide	Feather	
BCW 1 280e A	1	Silcrete	Proximal flake		14								Also ceramic
BCW 1 40e A	1	Petrified wood	Flaked piece		20	1.3		12	6				
BCW 1 40e B	2	Silcrete	Flake		30	3.1	28	18	6	Plain	Wide	Overshot	
BCW 1 80e B	1	Silcrete	Medial flake		17	1.3	15	12	6				
BCW 2 120e0n A	3	Silcrete	Flaked piece		10	0.3		7	5				
BCW 2 120e80n A	3	Silcrete	Distal flake		9								
BWB 1 100e A	2	Silcrete	Flaked piece		15	0.4		9	5				
BWB 1 100e C	2	Silcrete	Shatter		20	2.4		15	9				Silcrete gravel?
BWB 1 100e D	1	Silcrete	Flake		14	0.4	12	10	2	Plain	Focalised	Feather	
BWB 1 140e A	1	Silcrete	Distal flake		13	0.2	7	7	2			Feather	
BWB 1 140e A	2	Silcrete	Medial flake		17	0.9	12	11	5				
BWB 1 140e A	2	Silcrete	Medial flake		10	0.2	7	7	3				
BWB 1 140e B	2	Silcrete	Flake		22	2.5	17	14	6	Plain	Wide	Feather	
BWB 1 140e C	1	Silcrete	Flake		9	0.1	6	6	2	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BWB 1 140e C	1	Silcrete	Flake		10	0.2	6	6	3	Plain	Wide	Step	
BWB 1 140e C	2	Silcrete	Flake		25	0.7	19	8	4	w	Focalised	Feather	Blade
BWB 1 140e C	2	Silcrete	Core		41	10		17	16				Retouched edge
BWB 1 140e C	2	Silcrete	Medial flake		13	0.5	10	9	5				
BWB 1 140e D	2	Silcrete	Flake		16	0.1	16	5	2	Shattered	Indeterminate	Feather	
BWB 1 180e ` C	2	Quartz	Flaked piece		10	0.3		8	3				
BWB 1 180e A	2	Silcrete	Flake		10	0.3	6	6	5	Plain	Focalised	Overshot	Distal tip removal flake from backed artefact
BWB 1 180e A	3	Silcrete	Distal flake		9	0.2	7	7	3			Feather	
BWB 1 180e A	3	Silcrete	Distal flake		22	1.3	9	9	5			Feather	
BWB 1 180e B	2	Silcrete	Flaked piece		29	8.8		22	13				
BWB 1 180e C	1	Silcrete	Flaked piece		14	1.3		13	7				Silcrete gravel?
BWB 1 180e D	3	Silcrete	Proximal flake		9	0.2	7	8	3	Plain	Wide	Feather	
BWB 1 220e A	2	IMT	Flaked piece		10	0.3		7	6				
BWB 1 260e A	2	Silcrete	Distal flake		9	0.1	7	7	2			Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BWB 1 260e B	1	Quartz	Flaked piece		6	0.1		6	5				
BWB 1 340e A	1	Silcrete	Medial flake		14	0.5	12	7	4				
BWB 1 340e A	1	Silcrete	Flake		8	0.1	8	6	2	Plain	Focalised	Feather	
BWB 1 340e B	1	Silcrete	Flake		13	0.4	13	7	5	Plain	Focalised	Feather	
BWB 1 340e B	2	Silcrete	Conesplit flake		14	0.2	14	5	3	Shattered	Indeterminate	Feather	
BWB 1 340e B	2	IMT	Flake		7	0.1	6	6	1	Plain	Focalised	Feather	
BWB 1 340e D	1	Silcrete	Distal flake		13	0.2	13	6	3			Feather	
BWB 1 340e D	4	Silcrete	Flake		12	0.3	11	10	2	Plain	Wide	Feather	
BWB 1 340e D	4	IMT	Flake		19	1.2	15	15	6	Plain	Wide	Feather	
BWB 1 380e A	3	Silcrete	Flaked piece		16	1.2		9	7				Silcrete gravel?
BWB 1 380e A	3	IMT	Flake		8	0.1	7	7	1	Plain	Focalised	Feather	
BWB 1 380e B	2	Quartz	Flaked piece		15	0.5		10	4				
BWB 1 380e C	3	Quartz	Flake		11	0.2	8	8	3	Plain	Wide	Feather	
BWB 1 380e C	4	Silcrete	Flaked piece		16	1.6		12	7				Silcrete gravel?
BWB 1 380e D	2	IMT	Core tool		71	196.7		67	41				Flaked pebble tool; anvil; hammers tone

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BWB 1 420e A	2	Silcrete	Distal flake		10	0.1	9	7	2			Feather	
BWB 1 420e B	2	Silcrete	Distal flake		11	0.2	11	7	2			Feather	
BWB 1 420E B	2	IMT	Flake		49	3.5	48	11	6	Multiple scars	Focalised	Overshot	Ridge straighte ning blade flake
BWB 1 420e B	2	IMT	Flake		24	0.3	24	4	2	Shattered	Indeterminate	Hinge	Blade
BWB 1 420e B	2	IMT	Flake		14	0.3	13	12	2	Plain	Wide	Feather	
BWB 1 420e B	2	IMT	Flake		11	0.1	11	7	1	Plain	Focalised	Feather	
BWB 1 420e B	2	IMT	Distal flake		7	0.1	7	5	1			Feather	
BWB 1 420e B	3	Silcrete	Core		34	16.4		27	17				
BWB 1 420e B	3	Silcrete	Retouched flake	Backed artefact	20	0.8	20	10	4	Multiple scars	Focalised	Feather	Partially backed artefact with tip removed
BWB 1 420e B	3	Silcrete	Flaked piece		13	0.7		10	7				Silcrete gravel?
BWB 1 420e B	3	Silcrete	Flaked piece		9	0.1		5	1				
BWB 1 420e B	3	Silcrete	Distal flake		6	0.1		3	1				Would fall through 5mm sieve
BWB 1 420e B	3	IMT	Flake		24	1.1	22	16	2	Shattered	Indeterminate	Hinge	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BWB 1 420e B	3	IMT	Flake		20	0.3	20	6	2	Shattered	Indeterminate	Feather	
BWB 1 420e B	3	IMT	Flake		17	0.2	17	8	1	Plain	Focalised	Feather	
BWB 1 420e B	3	IMT	Medial flake		15	0.2	14	5	2				
BWB 1 420e B	3	IMT	Flake		12	0.1	9	8	1	Plain	Focalised	Feather	
BWB 1 420e B	3	IMT	Flake		12	0.1	7	8	1	Plain	Wide	Feather	
BWB 1 420e B	3	IMT	Flake		10	0.1	9	9	1	Shattered	Indeterminate	Feather	
BWB 1 420e C	2	IMT	Flake		12	0.1	8	8	2	Plain	Wide	Feather	
BWB 1 420e D	2	Silcrete	Flaked piece		25	9.8		21	18				Possibly silcrete gravel
BWB 1 420e D	2	Silcrete	Flaked piece		21	5.2		20	11				Possibly silcrete gravel
BWB 1 420e D	2	Silcrete	Flaked piece		17	1.1		10	7				Possibly silcrete gravel
BWB 1 420e D	2	IMT	Flake		20	0.2	19	6	1	Shattered	Indeterminate	Feather	
BWB 1 460e C	6	IMT	Distal flake		18	0.4	18	15	3			Feather	
BWB 1 500e D	1	Silcrete	Flaked piece		17	1.9		16	11				Silcrete gravel?
BWB 1 540e D	2	Silcrete	Flaked piece		30	4.1		20	8				
BWB 1 580e B	2	Silcrete	Flaked piece		12	0.3		10	5				
BWB 1 580e C	1	Silcrete	Flake		25	1.9	24	15	4	Plain	Wide	Overshot	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BWB 1 580e C	2	Silcrete	Flake		10	0.2	10	9	3	Plain	Wide	Feather	
BWB 1 580e D	1	Silcrete	Flake		17	0.6	9	9	4	Multiple scars	Wide	Feather	
BWB 1 580e D	2	Silcrete	Flake		15	0.4	14	10	3	Shattered	Indeterminate	Feather	
BWB 1 580e D	2	Silcrete	Distal flake		15	0.2	9	8	2			Feather	
BWB 1 580e D	2	Silcrete	Distal flake		11	0.2	9	8	2				
BWB 1 620e A	2	Silcrete	Flake		13	0.2	10	9	2	Cortex	Wide	Feather	
BWB 1 620e A	2	Silcrete	Proximal flake		17	1.1	14	14	5	Shattered	Indeterminate		
CCE 1 0e A	1	Silcrete	Flaked piece		17	1.7		12	9				
CCE 1 0e B	1	Silcrete	Flake		16	0.4	13	7	5	Plain	Wide	Feather	
CCE 1 0e B	1	Silcrete	Flake		17	0.7	12	10	3	Plain	Wide	Feather	
CCE 1 0e B	1	Silcrete	Medial flake		10	0.3	8	8	3				
CCE 1 0e B	1	Silcrete	Medial flake		11	0.3	9	9	3				
CCE 1 0e C	1	Silcrete	Retouched flake	Backed artefact	15	0.4	13	8	3				Proximal backed artefact Bondi point
CCE 1 0e C	1	Silcrete	Flake		11	0.2	10	8	2	Multiple scars	Wide	Feather	
CCE 1 120e A	2	IMT	Core		40	33.3		34	30				
CCE 1 160e A	3	IMT	Flake		11	0.3	9	7	4	Plain	Wide	Feather	
CCE 1 160e C	3	IMT	Core		36	7		15	15				Iron encruste

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
													d blade core
CCE 1 160e D	2	Silcrete	Medial flake		26	2.7	20	21	4				
CCE 1 200e A	2	Silcrete	Flaked piece		11	0.3		6	3				
CCE 1 200e B	2	IMT	Conesplit flake		16	0.5	14	9	4	Plain	Wide	Feather	
CCE 1 200e C	1	Quartz	Flaked piece		10	0.2		6	3				
CCE 1 200e D	1	Petrified wood	Flaked piece		20	2.7		13	13				
CCE 1 200e D	2	IMT	Medial flake		27	3.9	24	16	9				
CCE 1 240e A	2	IMT	Medial flake		10	0.2	8	8	3				
CCE 1 240e B	2	IMT	Distal flake		18	0.7	10	11	5				
CCE 1 240e C	2	IMT	Flake		8	0.1	8	8	2				No square on bag label; assume 240e
CCE 1 320e D	1	IMT	Flaked piece		22	2		17	7				
CCE 1 400e A	2	Silcrete	Retouched flake	Backed artefact	23	1.4	23	11	7	Plain	Focalised	Feather	Bondi point whole excellent example '

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCE 1 400e A	2	IMT	Medial flake		12	0.2	10	6	3				'
CCE 1 400e C	2	IMT	Proximal flake		8	0.5	8	7	4				Heat shattering; ?Quartz in bag?; '
CCE 1 400e D	1	IMT	Flake		19	0.2	14	8	2	Plain	Focalised	Feather	'
CCE 1 400e D	2	IMT	Flaked piece		13	0.3		8	2				'
CCE 1 40e B	2	Silcrete	Proximal flake		18	1.5	12	16	8	Plain	Wide		
CCE 1 40e C	1	Silcrete	Flake		22	1.2	14	15	4	Plain	Wide	Feather	
CCE 1 40e D	1	Quartz	Core		30	9.8		21	14				
CCE 1 80e A	1	IMT	Shatter		15	0.4		11	3				
CCE 1 80e A	3	IMT	Flake		32	4.8	24	28	6	Cortex	Wide	Feather	
CCE 1 80e C	1	IMT	Conesplit flake		15	0.4	15	8	4	Plain	Wide	Feather	
CCE 1 80e C	2	Silcrete	Distal flake		12	0.4	12	10	3			Feather	
CCE 1 80e C	2	Silcrete	Distal flake		9	0.1	5	5	2			Feather	
CCE 1 80e C	2	Quartz	Flaked piece		8	0.3		8	5				
CCE 1 80e D	2	Silcrete	Core		48	28.8		29	18				
CCE 1 Tp202 120E 1 A	2	Silcrete	Flake		12	0.2	7	7	2	Plain	Wide	Feather	
CCE 1 Tp202 120E 2 D	2	Quartz	Flake		11	0.3	11	9	5	Shattered	Indeterminate	Feather	No sub 1 m square on label

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCE 1 Tp202 120E 3 A	3	Silcrete	Flaked piece		19	1.8		13	9				
CCE 1 Tp202 120E 3 B	1	Silcrete	Flake		17	0.6	14	12	4	Plain	Wide	Feather	
CCE 1 Tp202 120E 3 B	1	Silcrete	Flake		9	0.1	7	7	1	Shattered	Indeterminate	Hinge	
CCE 1 Tp203 1 A	1	Silcrete	Distal flake		28	2.1	28	13	7			Feather	
CCE 1 Tp203 1 A	2	Silcrete	Flaked piece		13	0.5		9	6				
CCE 1 Tp203 1 A	2	IMT	Flake		19	1.2	16	16	5	Shattered	Indeterminate	Feather	
CCE 1 Tp203 1 C	1	Silcrete	Flake		9	0.1	8	4	2	Plain	Focalised	Feather	
CCE 1 Tp203 1 C	1	Chert	Flaked piece		15	0.8		11	7				
CCE 1 Tp203 1 C	2	Silcrete	Gravel		18	1.7		11	10				
CCE 1 Tp203 1 D	2	Quartz	Flake		25	3.4	25	15	11	Plain	Wide	Feather	
CCE 1 Tp203 2 A	1	Silcrete	Medial flake		22	2.3	14	16	8				
CCE 1 Tp203 2 B	1	Quartz	Flaked piece		11	0.2	11	6	3	Shattered	Indeterminate	Feather	
CCE 1 Tp203 2 B	3	Quartz	Distal flake		14	0.5	13	7	5			Feather	'
CCE 1 Tp203 3 C	2	Silcrete	Flaked piece		11	0.3		8	4				'
CCE 1 Tp203 3 D	2	Silcrete	Retouched flake	Backed artefact	17	0.3	7	7	3	Multiple scars	Focalised	Feather	Distal backing retouch '
CCE 2 '-100e20n C	1	Silcrete	Flake		8	0.1	7	7	2	Multiple scars	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCE 2 '-100e20n C	2	Silcrete	Flake		13	0.2	13	5	2	Plain	Wide	Feather	
CCE 2 '-100e20n D	1	Silcrete	Distal flake		11	0.3	8	8	4			Feather	
CCE 2 '-40e A	1	Silcrete	Flaked piece		14	0.8		10	5				
CCE 2 '-40e A	1	Silcrete	Flake		14	0.5	10	11	3	Plain	Wide	Step	
CCE 2 '-40e B	1	Silcrete	Flaked piece		13	0.5		8	4				
CCE 2 '-80e C	1	Silcrete	Distal flake		17	1.5	15	15	7			Feather	
CCE 2 0e A	3	Silcrete	Flaked piece		28	6.7		21	12				Looks like broken natural silcrete gravel
CCE 2 0e C	1	Silcrete	Flaked piece		10	0.1		5	3				
CCE 2 0e C	3	Silcrete	Flaked piece		12	0.2		7	3				
CCE 2 0e C	3	Petrified wood	Medial flake		12	0.3	11	8	2				
CCE 2 0e D	2	Silcrete	Flaked piece		10	0.2		8	3				
CCE 2 120e D	2	Silcrete	Flake		9	0.1	8	8	1	Shattered	Indeterminate	Feather	
CCE 3 1400e B	1	Silcrete	Medial flake		17	1	10	10	4				Broken in 2 in excavation; primary flake

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCE 3 1400e B	1	Silcrete	Flaked piece		15	0.8		10	5				Broken in excavation
CCE 3 1400e B	1	Silcrete	Flaked piece		10	0.4		8	6				Broken in excavation
CCE 3 1440e A	1	Silcrete	Proximal flake		18	1.1	15	14	4	Multiple scars	Focalised		'
CCE 2 200e B	2	Silcrete	Proximal flake		14	0.4	12	10	3	Plain	Focalised		'
CCE 2 Tp404 280e 2 B	3	Quartz	Flaked piece		14	0.8		9	6				'
CCE 2 Tp404 280e 3 B	3	Silcrete	Retouched flake	Backed artefact	25	0.8	25	7	4	Multiple scars	Focalised	Feather	Bondi point whole excellent example '
CCE 2 40e A	1	Silcrete	Distal flake		11	0.2	5	8	3			Feather	'
CCE 2 40e B	2	Silcrete	Flake		12	0.4	12	10	1	Plain	Focalised	Feather	
CCE 2 40e B	3	IMT	Flake		14	0.2	14	11	2	Plain	Focalised	Feather	'
CCE 2 40e C	1	Silcrete	Flake		8	0.1	5	5	1	Shattered	Indeterminate	Feather	
CCE 2 40e C	2	Silcrete	Flaked piece		15	0.6		9	4				'
CCE 2 40e D	2	Silcrete	Flake		11	0.2	11	9	1	Plain	Focalised	Feather	'
CCE 2 40e D	2	IMT	Flaked piece		8	0.1		7	5				'

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCE 3 800e A	2	Silcrete	Retouched flake	Backed artefact	17	1.2	15	12	5				Medial backed artefact fragment ' '
CCE 3 800e A	2	Silcrete	Retouched flake	Backed artefact	10	0.2	10	7	4			Feather	Backed artefact distal; conjoins spit 3 ba proximal '
CCE 3 800e A	3	Silcrete	Retouched flake	Backed artefact	14	0.5	14	8	4	Plain	Focalised		Backed artefact proximal; conjoins spit 2 ba distal '
CCE 2 80e A	1	Silcrete	Flake		10	0.3	8	9	3	Plain	Focalised	Feather	'
CCE 2 80e A	1	IMT	Shatter		12	0.2		10	1				'
CCE 2 80e A	1	Silcrete	Shatter		15	1.1		11	8				'
CCE 2 80e A	1	Silcrete	Medial flake		14	0.4	12	7	3				'
CCE 2 80e B	1	Silcrete	Flake		47	15.5	46	33	10	Plain	Wide	Feather	'
CCE 2 80e B	2	Silcrete	Medial flake		11	0.2	7	7	3				'
CCE 2 80e C	2	Silcrete	Flake		18	0.8	11	13	4	Plain	Wide	Feather	'
CCE 2 80e C	2	Silcrete	Flaked piece		12	0.5		7	4				'
CCE 2 80e C	2	Silcrete	Flaked piece		8	0.3		9	3				'

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCE 2 80e D	1	Silcrete	Distal flake		11	0.2	7	11	2			Feather	'
CCE 2 80e D	2	Silcrete	Flake		10	0.1	9	6	3	Plain	Focalised	Feather	'
CCE 2 840e A	2	Quartz	Distal flake		9	0.2	6	6	3			Feather	'
CCE 2 Tp204 1 B	1	Silcrete	Distal flake		7	0.1	6	5	1			Feather	'
CCE 2 Tp204 1 B	1	Quartz	Flake		9	0.1	9	5	2	Shattered	Shattered	Feather	'
CCE 2 Tp204 1 B	1	Quartz	Flake		12	0.5	10	8	6	Cortex	Wide	Platform	bipolar '
CCE 2 Tp204 1 B	1	Quartz	Flake		13	0.4	13	5	5	Shattered	Indeterminate	Platform	bipolar '
CCE 2 Tp204 1 B	2	IMT	Flake		9	0.1	9	5	3	Plain	Focalised	Hinge	'
CCE 2 Tp204 1 D	2	Quartz	Flake		14	0.5	12	9	4	Plain	Wide	Step	bipolar '
CCE 2 Tp204 1 D	2	IMT	Flaked piece		18	1.1		15	5				'
CCE 2 Tp204 2 A	2	Silcrete	Proximal flake		12	0.5	11	8	5	Plain	Wide		'
CCE 2 Tp204 2 B	2	Silcrete	Retouched flake	Backed artefact	11	0.4	11	7	4				Medial backed artefact '
CCE 2 Tp204 2 B	2	Silcrete	Flaked piece		17	1		9	6				'
CCE 2 Tp204 2 C	1	Quartz	Flaked piece		17	1		9	8				'
CCE 2 Tp204 3 C	1	Silcrete	Flaked piece		23	3.3		14	12				'

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCE 2 Tp204 3 C	2	Quartz	Flake		18	0.9	11	11	5	Plain	Wide	Feather	'
CCE 2 Tp205 1 B	2	Silcrete	Flake		13	0.4	11	9	3	Plain	Focalised	Feather	'
CCE 2 Tp205 1 D	1	IMT	Flaked piece		31	2.8		13	9				'
CCE 2 Tp205 2 B	3	IMT	Distal flake		10	0.09	9	4	2			Feather	'
CCE 2 Tp205 2 D	1	Quartz	Flaked piece		9	0.2		6	3				'
CCE 2 Tp205 3 B	1	Silcrete	Flake		6	0.1	6	5	2	Plain	Wide	Feather	'
CCE 2 Tp205 3 C	1	Silcrete	Flaked piece		18	1.1		13	5				'
CCE 2 Tp205 3 C	3	Silcrete	Flake		16	1	14	15	4	Plain	Wide	Feather	'
CCE 2 Tp205 3 C	3	IMT	Flake		17	1	15	17	4	Plain	Wide	Feather	
CCE 2 Tp205 3 D	2	IMT	Flake		14	0.6	8	13	4	Plain	Wide	Feather	'
CCE 2 Tp206 1 A	2	Silcrete	Retouched flake	Backed artefact	14	0.5	9	8	4			Feather	Distal backed artefact '
CCE 2 Tp206 2 B	1	Silcrete	Medial flake		15	0.8	7	7	5				'
CCE 2 Tp206 2 B	2	Silcrete	Medial flake		14	0.7	10	13	4				'
CCE 2 Tp206 2 C	1	Silcrete	Distal flake		20	1.2	20	10	6			Feather	'
CCE 2 Tp206 2 C	2	Silcrete	Medial flake		29	1.7	13	14	8				'
CCE 2 Tp206 2 C	2	Quartz	Flake		11	0.1	10	4	2	Plain	Focalised	Feather	'
CCE 2 Tp206 2 D	2	Silcrete	Medial flake		9	0.1	7	5	2				'

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCE 2 Tp206 3 A	1	Silcrete	Flaked piece		12	0.3		6	3				'
CCE 2 Tp206 3 A	1	Silcrete	Flake		29	3.4	21	17	8	Plain	Wide	Feather	'
CCE 2 Tp206 3 B	1	Silcrete	Retouched flake	Scraper	23	3.1	20	15	11	Shattered	Indeterminate	Feather	'
CCE 2 Tp206 3 B	2	Silcrete	Distal flake		10	0.3	8	11	4			Feather	'
CCE 2 Tp206 3 B	2	Silcrete	Distal flake		9	0.1	8	6	2			Feather	'
CCE 2 Tp206 3 B	2	IMT	Flake		15	0.2	12	10	1	Plain	Focalised	Feather	'
CCE 2 Tp206 3 C	2	Silcrete	Flake		28	3.5	23	21	6	Plain	Focalised	Feather	'
CCE 2 Tp206 3 C	2	IMT	Flake		12	0.1	9	5	2	Plain	Wide	Feather	'
CCE 2 Tp206 3 C	2	Silcrete	Distal Flake		8	0.2	6	7	2			Feather	'
CCE 2 Tp206 3 C	2	Silcrete	Flaked piece		13	0.4		6	5				'
CCE 2 Tp206 3 C	2	IMT	Flake		12	0.3	12	4	3	Plain	Focalised	Feather	
CCE 2 Tp401 1 C	1	Silcrete	Flaked piece		14	1.4		12	9				'
CCE 2 Tp401 1 C	1	Silcrete	Flake		26	2.5	19	15	7	Plain	Wide	Feather	'
CCE 2 Tp401 2 A	1	Silcrete	Core		37	12		23	11				'
CCE 2 Tp401 2 B	1	Silcrete	Flaked piece		21	1.6		13	8				'
CCE 2 Tp401 2 B	2	IMT	Medial flake		22	0.8	21	9	4				'
CCE 2 Tp401 3 A	1	Silcrete	Flaked piece		13	0.6		12	4				'

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCE 2 Tp401 3 D	1	Silcrete	Proximal flake		18	2.1	16	14	8	Plain	Wide		'
CCW 1 0e A	2	Igneous	Flake		25	1.4	15	16	5	Cortex	Wide	Feather	Unlabelled set of buckets. Label uncertain '
CCW 1 0e B	2	Silcrete	Flake		14	0.3	14	9	2	Plain	Wide	Feather	'
CCW 1 0e B	3	Silcrete	Flake		19	0.3	19	6	3	Plain	Focalised	Feather	'
CCW 1 0e B	3	Silcrete	Flake		10	0.1	10	6	2	Plain	Focalised	Feather	'
CCW 1 0e C	1	Silcrete	Flake		17	0.4	16	11	2	Plain	Focalised	Feather	'
CCW 1 0e D	2	Silcrete	Flake		10	0.2	10	7	3	Plain	Wide	Feather	'
CCW 1 120e B	2	IMT	Shatter		11	0.2		8	2				Potlid '
CCW 1 160e A	2	IMT	Distal flake		30	3.7	28	21	6			Feather	'
CCW 1 160e B	1	Silcrete	Flake		16	0.4	14	11	2	Plain	Focalised	Feather	'
CCW 1 160e C	1	Silcrete	Flake		13	0.4	11	11	3	Plain	Wide	Step	'
CCW 1 160e C	2	Silcrete	Flake		13	0.3	6	8	4	Plain	Wide	Feather	'
CCW 1 160e C	2	Silcrete	Flaked piece		14	0.5		7	5				'
CCW 1 160e D	1	Silcrete	Flake		28	3.2	23	16	7	Plain	Wide	Feather	'
CCW 1 160e D	3	Silcrete	Flake		16	0.5	12	10	4	Plain	Wide	Feather	'
CCW 1 200e B	1	Silcrete	Flake		17								
CCW 1 200e B	1	Silcrete	Medial flake		19								

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCW 1 200e B	1	IMT	Distal flake		7								
CCW 1 200e B	2	Silcrete	Distal flake		14	0.3	8	8	3			Feather	'
CCW 1 200e B	2	Silcrete	Distal flake		11	0.1	10	8	1			Feather	'
CCW 1 200e B	2	Silcrete	Flake		9	0.1	4	7	1	Plain	Focalised	Feather	'
CCW 1 200e B	2	IMT	Medial flake		15	0.4	14	8	4				'
CCW 1 200e C	1	Silcrete	Distal flake		13	0.3	13	7	3			Feather	'
CCW 1 200e C	1	Silcrete	Flake		18	0.6	11	11	4	Plain	Wide	Feather	'
CCW 1 200e C	2	Silcrete	Flake		12	0.3	8	8	4	Plain	Wide	Feather	
CCW 1 200e C	2	Silcrete	Distal flake		16	0.6	14	8	6			Feather	'
CCW 1 200e D	2	Silcrete	Medial flake		8	0.1	8	5	3				'
CCW 1 200e D	3	IMT	Flake		12	0.3	12	9	1	Plain	Focalised	Feather	'
CCW 1 200e D	3	IMT	Distal flake		8	0.1	6	7	2			Feather	'
CCW 1 240e D	3	Silcrete	Core		21	2.4		15	10				'
CCW 1 240e D	3	IMT	Flake		29	5.3	25	24	8	Cortex	Indeterminate	Feather	'
CCW 1 40e A	1	Silcrete	Flake		17	0.8	9	10	5	Plain	Indeterminate	Feather	'
CCW 1 40e A	1	IMT	Flaked piece		13	0.2		10	3				Shatter detachment '

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCW 1 40e A	3	Silcrete	Flaked piece		29	6.1		23	12				'
CCW 1 40e B	1	Silcrete	Flake		17	0.3	14	7	2	Plain	Focalised	Feather	'
CCW 1 40e C	1	IMT	Flake		17	0.6	16	8	3	Plain	Focalised	Hinge	'
CCW 1 40e C	1	IMT	Distal flake		18	0.5	10	9	4			Feather	'
CCW 1 40e C	2	Silcrete	Flake		17	0.7	12	12	4	Plain	Wide	Feather	'
CCW 1 40e C	2	IMT	Distal flake		14	0.3	8	8	4			Feather	'
CCW 1 40e C	2	IMT	Flaked piece		10	0.2		9	2				'
CCW 1 40e C	3	IMT	Shatter		16	0.4		14	2				'
CCW 1 40e C	3	IMT	Shatter		16	0.3		9	2				'
CCW 1 80e B	1	Silcrete	Flake		30	4.1	16	19	7	Plain	Wide	Feather	macro usewear distal '
CCW 1 80e B	1	IMT	Flaked piece		26	3.9		20	10				'
CCW 1 80e B	2	IMT	Core		21	3.7		19	12				'
CCW 1 80e D	1	Silcrete	Flake		30	2.6	24	19	5	Plain	Wide	Feather	'
CCW 1 80e D	1	IMT	Flaked piece		38	3.9		24	4				Shatter detachment '
CCW 1 Tp201 1 A	2	IMT	Flake		14	0.1	8	8	1	Indeterminate	Shattered	Feather	'
CCW 1 Tp201 1 A	3	IMT	Shatter		15	0.2		12	3				Potlid '

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCW 1 Tp201 1 A	3	IMT	Distal flake		19	1	17	14	5			Feather	'
CCW 1 Tp201 1 B	1	Silcrete	Flake		8	0.1	8	6	1	Indeterminate	Shattered	Feather	'
CCW 1 Tp201 1 B	1	Silcrete	Retouched flake	Elouera	25	3.1	23	14	7	Plain	Wide		Proximal backed thick flake '
CCW 1 Tp201 1 B	3	Quartzite	Flaked piece		42	14.3		24	15				'
CCW 1 Tp201 1 C	2	Silcrete	Flake		14	0.3	12	9	3	Plain	Wide	Feather	'
CCW 1 Tp201 1 D	1	Silcrete	Flaked piece		13	0.8		10	6				'
CCW 1 Tp201 1 D	1	Silcrete	Medial flake		9	0.2	8	7	2				'
CCW 1 Tp201 1 D	1	Silcrete	Flake		9	1	8	7	1	Plain	Wide	Feather	'
CCW 1 Tp201 1 D	2	Silcrete	Flake		19	0.6	14	12	3	Plain	Focalised	Feather	'
CCW 1 Tp201 2 A	1	Silcrete	Flake		19	1	15	16	5	Plain	Focalised	Feather	'
CCW 1 Tp201 2 A	2	Silcrete	Flake		14	0.4	12	11	3	Plain	Focalised	Feather	'
CCW 1 Tp201 2 A	2	Silcrete	Flake		13	0.2	8	8	3	Plain	Wide	Feather	'
CCW 1 Tp201 2 A	3	Silcrete	Flake		28	1.8	26	19	3	Plain	Wide	Feather	Broken in excavation '
CCW 1 Tp201 2 A	3	IMT	Flake		33	5.7	27	23	9	Cortex	Wide	Hinge	'

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCW 1 Tp201 2 C	2	Silcrete	Flake		35	4.2	23	19	6	Plain	Wide	Step	'
CCW 1 Tp201 2 D	2	Silcrete	Flake		19	1.3	18	12	6	Plain	Focalised	Feather	'
CCW 1 Tp201 2 D	2	Silcrete	Flake		10	0.1	4	6	2	Plain	Wide	Feather	Retouch flake '
CCW 1 Tp201 3 A	1	IMT	Distal flake		30	2.2	23	13	8			Feather	'
CCW 1 Tp201 3 A	2	Silcrete	Flaked piece		15	0.8		9	7				'
CCW 1 Tp201 3 A	3	Silcrete	Flake		26	1.1	12	12	4	Plain	Focalised	Feather	'
CCW 1 Tp201 3 C	1	Silcrete	Distal flake		12	0.2	8	8	3			Feather	'
CCW 1 Tp201 3 C	2	Silcrete	Flake		14	0.2	6	7	3	Plain	Wide	Feather	'
CCW 1 Tp201 3 C	3	IMT	Flaked piece		26	3.1		14	11				
CHRP 100e100n A	2	Silcrete	Flaked piece		34	4		18	9				
CHRP 100e100n C	3	Silcrete	Flake		19	1.1	19	13	5	Multiple scars	Focalised	Step	
CHRP 100e100n C	3	Silcrete	Distal flake		25	2.3	23	12	8			Overshot	
CHRP 100e120n A	1	Silcrete	Flake		25	1.6	18	12	6	Multiple scars	Focalised	Feather	Light grey silcrete
CHRP 100e120n C	1	Silcrete	Flake		23	1.8	16	18	5	Multiple scars	Wide	Feather	
CHRP 100e120n C	1	Silcrete	Flake		17	0.8	14	11	5	Multiple scars	Focalised	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CHRP 100e120n C	1	IMT	Flaked piece		22	4.1		16	12				
CHRP 100e160n A	1	Silcrete	Core		21	4.3		18	11				blade core
CHRP 100e160n A	1	Silcrete	Flake		14	0.3	10	8	4	Plain	Focalised	Feather	
CHRP 100e160n B	1	Silcrete	Core		30	10.6		27	13				blade core
CHRP 100e160n B	1	Silcrete	Flaked piece		12	0.2		7	3				
CHRP 100e160n C	1	Silcrete	Core		36	10.5		22	13				blade core
CHRP 100e160n C	1	Silcrete	Flake		18	1.4	15	13	6	Plain	Wide	Feather	
CHRP 100e200n C	1	IMT	Flaked piece		16	0.5		8	5				
CHRP 80e100n D	1	Silcrete	Flake		28	2.1	27	12	5	Multiple scars	Wide	Step	
KCE 1 100e A	4	IMT	Flake		16	0.5	13	11	3	Plain	Wide	Feather	
KCE 1 140e A	10	Silcrete	Distal flake		12	0.3	8	10	3	Plain	Wide	Feather	45-50cm
KCE 1 140e C	2	Silcrete	Medial flake		9	0.3	5	7	4				
KCE 1 20e A	3	Silcrete	Flaked piece		20	0.9		10	4				uw one end; 2 small immature shell frags
KCE 1 20e B	4	Silcrete	Flake		28	4.6	20	20	9	Shattered	Indeterminate	Feather	distal edge usewear

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
KCE 1 20e D	3	Petrified wood	Flake		37	7.3	34	18	14	Plain	Wide	Feather	
KCE 1 60e A	5	Silcrete	Flake		10	0.2	7	10	2	Plain	Wide	Feather	small whelk shell likely aquarium introduced species
KCE 1 60e D	4	Silcrete	Conesplit flake		20	1.3	16	10	7	w	p	Feather	Shell fragment ?mussel
KCW 1 320e100n B	2	IMT	Shatter		9	0.1		8	1				Heat shatter
KCW 1 320e140n C	6	IMT	Flaked piece		17	1		12	9				
KCW 1 320e140n D	5	Quartz	Flake		13	0.4	11	10	3	Cortex	Wide	Feather	
KCW 1 320e140n A	2	Silcrete	Retouched flake	Scraper	24	3.7	22	22	7	Plain	Wide	Overshot	End scraper
KCW 1 320e140n A	2	Silcrete	Retouched flake	Thumbnail scraper	11	0.3	10	8	3			Feather	Thumbnail scraper
KCW 1 320e140n A	2	Silcrete	Distal flake		15	0.6	11	11	4			Feather	
KCW 1 320e140n A	4	Silcrete	Shatter		40	13.9		30	15				
KCW 1 320e140n B	1	Silcrete	Retouched flake	Scraper	21	2.8	20	17	7	Plain	Wide	Overshot	End scraper
KCW 1 320e140n B	1	Quartz	Core		49	27.6		29	24				
KCW 1 320e140n B	1	Quartz	Flaked piece		11	0.2		6	4				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
KCW 1 320e140n B	2	Silcrete	Flaked piece		46	18.5		29	15				Rough silcrete ?gravel
KCW 1 320e140n B	2	Quartz	Flake		21	1.3	19	12	6	Shattered	Indeterminate	Feather	
KCW 1 320e140n B	2	Quartz	Flake		17	0.7	17	8	7	Shattered	Indeterminate	Feather	
KCW 1 320e140n C	1	IMT	Core		53	60.4		42	22				AA Blade core
KCW 1 320e140n C	4	Igneous	Flake		25	2.7	18	19	5	Plain	Wide	Step	Porphyry ?
KCW 1 320e140n D	3	Quartzite	Flaked piece		38	8		18	11				Heat shatter
KCW 1 320e140n D	3	IMT	Retouched flake	Backed artefact	40	1.8	40	10	4	Multiple scars	Focalised		Bondi backed artefact tip broken off in excavation
KCW 1 320e140n D	3	IMT	Flake		12	0.4	10	9	5	Plain	Wide	Feather	
KCW 1 340e180n C	2	Silcrete	Proximal flake		9	0.2	9	6	3	Plain	Focalised		
KCW 1 340e180n C	3	Silcrete	Flake		11	0.2	11	11	2	Plain	Focalised	Feather	
KCW 1 340e180n C	3	Silcrete	Flake		15	0.8	15	9	6	Plain	Focalised	Feather	
KCW 1 340e180n C	4	Silcrete	Flake		25	2	21	13	8	Plain	Wide	Overshot	
KCW 1 340e180n D	3	Silcrete	Flake		12	0.5	9	10	5	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
KCW 1 340e180nD	4	Silcrete	Flake		37	5	32	19	7	Multiple scars	Focalised	Overshot	
KCW 1 340e180nD	7	IMT	Flake		15	0.3	14	8	2	Multiple scars	Focalised	Feather	
KCW 1 340e180nD	8	Silcrete	Retouched flake	Backed artefact	18	0.7	15	12	4	Multiple scars	Focalised	Feather	Backed artefact unidirectional geometric
KCW 1 340e180nD	8	Silcrete	Shatter		60	69.3		40	34				
KCW 1 340e180nD	8	Silcrete	Shatter		54	38		32	25				
KCW 1 340e180nD	8	Silcrete	Shatter		27	8.1		26	15				
KCW 1 340e180nD	8	Silcrete	Shatter		31	4.7		25	6				
KCW 1 340e180nD	8	Silcrete	Shatter		28	3.7		15	7				
KCW 1 340e180nD	8	Silcrete	Shatter		22	2.4		17	7				
KCW 1 340e180nD	8	Quartz	Flake		16	0.8	14	10	5	Shattered	Indeterminate	Platform	Bipolar
KCW 1 340e180nD	8	IMT	Flake		29	1.5	18	17	4	Plain	Wide	Feather	
KCW 1 340e220nA	1	Silcrete	Distal flake		17	0.5	16	8	4			Feather	
KCW 1 340e220nA	1	Silcrete	Flake		20	0.7	20	7	6	Shattered	Indeterminate	Feather	
KCW 1 340e220nA	1	IMT	Flake		21	2	21	16	7	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
KCW 1 340e220n A	2	Silcrete	Core		21	4		17	12				
KCW 1 340e220n C	1	Silcrete	Flake		42	10.4	40	19	13	Multiple scars	Focalised	Feather	conjoins #658 excavation damage
KCW 1 340e220n C	1	Silcrete	Flake		12	0.2	9	9	3	Plain	Wide	Feather	conjoins #657 excavation damage
KCW 1 340e220n C	2	IMT	Gravel		9	0.2		6	3				
KCW 1 340e220n D	3	IMT	Flaked piece		18	1		15	5				
KCW 1 340e260n A	2	Silcrete	Flake		13	0.2	13	7	2	Multiple scars	Focalised	Feather	
KCW 1 340e260n A	3	Silcrete	Flake		8	0.2	6	6	4	Shattered	Indeterminate	Feather	
KCW 1 340e260n A	3	Silcrete	Flaked piece		10	0.2		7	4				
KCW 1 340e260n A	6	Silcrete	Flaked piece		12	0.5		7	6				
KCW 1 340e260n B	3	Silcrete	Flake		16	1.2	12	13	7	Plain	Focalised	Feather	
KCW 1 340e260n B	3	Silcrete	Flake		17	0.6	12	8	5	Plain	Wide	Feather	
KCW 1 340e260n B	4	Silcrete	Retouched flake	Backed artefact	24	1.6	24	10	8	Indetermin ate	Indeterminate	Feather	Sparsely backed artefact
KCW 1 340e260n B	2	Silcrete	Distal flake		10	0.2	9	5	4			Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
KCW 1 340e260nC	3	Silcrete	Flake		15	0.7	10	13	4	Plain	Wide	Step	
KCW 1 340e260nC	3	IMT	Flake		19	0.8	16	10	4	Plain	Wide	Feather	
KCW 1 340e260nC	5	Silcrete	Flake		15	0.3	15	6	4	Plain	Focalised	Feather	
KCW 1 340e260nD	2	Silcrete	Distal flake		15	0.3	14	7	3			Feather	
KCW 1 340e260nD	2	Silcrete	Medial flake		9	0.1	5	6	2				
KCW 1 340e300nA	1	Silcrete	Gravel		23	3		17	9				Stoneware sherd
KCW 1 340e300nA	4	Silcrete	Flake		12	0.3	6	6	4	Plain	Wide	Feather	
KCW 1 340e300nC	1	Silcrete	Core		21	2.1		14	7				Bipolar core; wedge-shaped opposed platforms
KCW 1 340e300nC	1	Silcrete	Flake		11	0.1	10	8	1	Plain	Focalised	Feather	Glass fragment
KCW 1 340e300nD	3	Silcrete	Gravel		28	9.1		25	16				
KCW 1 340e300nD	3	Silcrete	Gravel		29	14.1		29	28				
KCW 2 100e300nC	2	Quartz	Flake		16	1.2	16	12	7	Plain	Wide	Feather	record changed from 110e315n

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
KCW 2 140e300n A	1	Quartz	Gravel		29	13.8		25	19				reassessed as introduced gravel based on rounding
KCW 2 140e300n A	2	IMT	Gravel		30	2.5		11	8				Gravel
KCW 2 140e300n C	1	Silcrete	Retouched flake	Scraper	32	10.1	29	26	10	Cortex	Wide		End scraper
KCW 2 140e300n C	3	Quartzite	Flake		14	0.4	13	9	6	Shattered	Indeterminate	Overshot	Gravel?
KCW 2 140e300n D	4	Igneous	Gravel		26	9.1		23	15				Green igneous gravel with sand cement
KCW 2 260e260n D	2	IMT	Shatter		16	0.5		11	4				Heat shatter
KCW 2 320e100n A	5	Silcrete	Flake		16	0.3	11	11	2	Shattered	Indeterminate	Step	
KNW 100n B	1	IMT	Flake		30	10.1	25	25	13	Plain	Wide	Feather	
KNW 100n D	1	Quartz	Flake		16	0.6	15	10	4	Shattered	Indeterminate	Feather	
KNW 140n A	3	IMT	Flake		26	2.2	26	11	8	Indeterminate	Indeterminate	Feather	Dorsal shows UW retouched edge
KNW 140n C	1	IMT	Conesplit flake		16	0.4	10	9	5	Plain	Wide	Feather	Conesplit
KNW 140n C	4	IMT	Flake		29	2.4	29	19	6	Plain	Focalised	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
KNW 140n D	3	IMT	Flake		34	4.3	18	24	8	Plain	Wide	Feather	
KNW 180n A	1	IMT	Flake		18	0.8	13	9	7	Plain	Wide	Feather	
KNW 220n C	2	IMT	Flaked piece		34	5.8		20	9				
KNW 260n A	1	Silcrete	Flake		15	0.5	12	10	4	Plain	Wide	Feather	
KNW 260n A	3	Silcrete	Flake		18	0.6	10	11	3	Plain	Wide	Feather	
KNW 260n B	2	Silcrete	Core		37	21.2		29	16				blade core
KNW 260n C	2	Silcrete	Flake		20	0.5	13	14	2	Plain	Focalised	Feather	
KNW 260n D	3	Silcrete	Conesplit flake		36	5.2	31	22	8	Plain	Wide	Feather	
KNW 260n D	3	Silcrete	Conesplit flake		33	7.7	28	25	13	Plain	Wide	Feather	
KNW 260n D	3	Silcrete	Retouched flake	Thumbnail scraper	22	2.2	19	16	6	Plain	Wide	Feather	Large thumbnail scraper
KNW 260n D	3	Silcrete	Conesplit flake		14	0.2	10	6	3	Plain	Wide	Feather	
KNW 260n D	3	Quartz	Flake		22	3.3	17	16	8	Cortex	Wide	Feather	
KNW 260n D	3	IMT	Conesplit flake		11	0.1	11	8	1	Plain	Wide	Feather	***empties checked, rec'd checked; not in bag of several artefacts
KNW 300n A	2	Silcrete	Distal flake		21	0.7	22	8	6			Hinge	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
KNW 300n A	3	Silcrete	Flaked piece		19	0.7		9	4				
KNW 300n C	3	IMT	Shatter		21	0.7		9	5				Potlid
KNW 300n D	3	Silcrete	Flaked piece		29	6.2		29	7				Very rough fabric
KNW 420n B	2	Silcrete	Flake		34	10.6	31	27	11	Plain	Wide	Feather	Thick flake of ?Marulan grey silcrete
KNW 420n D	2	Quartz	Flake		9	0.2	9	7	3	Shattered	Indeterminate	Feather	
KNW 500n C	3	IMT	Flake		38	11.1	25	30	11	Plain	Wide	Hinge	
KNW Bh129 C	1	Silcrete	Medial flake		15	0.6	12	10	5				
KNW Tp233 1 B	1	Silcrete	Flake		7	0.1	6	5	1	Plain	Focalised	Feather	
KNW Tp233 1 C	1	IMT	Medial flake		12	0.2	12	9	2				
KNW Tp233 2 B	3	IMT	Shatter		14	0.4		13	2				potlid
KNW Tp233 3 C	1	Quartz	Flake		15	1	13	11	6	Shattered	Shattered	Platform	
KNW Tp233 3 C	2	IMT	Shatter		14	0.3		11	2				Potlid
KNW Tp309 1 B	2	Silcrete	Flake		12	0.3	7	8	4	Shattered	Indeterminate	Feather	
KNW 100e140n B	3	Quartz	Flake		15	0.7	9	10	6	Plain	Wide	Feather	
RRD 1 120e140n D	3	Quartz	Flake		10	0.3	9	7	3	Indeterminate	Indeterminate	Feather	
RRD 1 140e140n C	1	IMT	Flaked piece		20	0.7		10	3				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
RRD 1 140e140n D	1	Quartz	Flake		18	1.9	11	12	9	Cortex	Wide	Feather	
RRD 1 80e140n B	2	Quartz	Manuport		29	13.6		26	15				Pebble
SCE 1 100e A	1	Silcrete	Medial flake		32	10.9	16	24	17				
SCE 1 100e A	1	IMT	Medial flake		9	0.1		6	2				
SCE 1 100e A	2	Silcrete	Flake		22	1.8	17	18	6	Plain	Wide	Feather	
SCE 1 100e A	2	Silcrete	Flake		19	1.1	11	13	6	Plain	Wide	Feather	
SCE 1 100e A	2	Silcrete	Flake		17	0.6	15	12	3	Plain	Wide	Feather	
SCE 1 100e A	2	Silcrete	Flake		15	0.5	13	8	3	Plain	Wide	Feather	
SCE 1 100e A	2	Silcrete	Flake		16	0.2	13	8	2	Shattered	Indeterminate	Feather	
SCE 1 100e A	2	Silcrete	Flake		15	0.5	10	12	3	Plain	Wide	Feather	
SCE 1 100e A	2	Silcrete	Flake		14	0.7	13	12	6	Cortex	Indeterminate	Feather	
SCE 1 100e A	2	Silcrete	Flake		18	1	14	14	3	Plain	Wide	Feather	
SCE 1 100e A	2	Silcrete	Flake		12	0.2	12	8	2	Shattered	Indeterminate	Feather	
SCE 1 100e A	2	Silcrete	Flake		12	0.1	12	9	1	Shattered	Indeterminate	Feather	
SCE 1 100e A	2	Silcrete	Flake		12	0.2	9	9	2	Plain	Focalised	Feather	
SCE 1 100e A	2	Silcrete	Flake		14	0.3	14	8	3	Shattered	Indeterminate	Feather	
SCE 1 100e A	2	Silcrete	Flake		12	0.2	10	9	2	Plain	Focalised	Feather	
SCE 1 100e A	2	Silcrete	Medial flake		11	0.1	7	9	2				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 100e A	2	Silcrete	Core		30	7.9		20	14				Classic flake body asymmetric alternating core
SCE 1 100e A	2	Silcrete	Flaked piece		25	3.4		17	9				
SCE 1 100e A	2	Silcrete	Flake		18	1.7	15	14	8	Plain	Wide	Feather	
SCE 1 100e A	2	Silcrete	Proximal flake		18	1.4	12	13	6	Plain	Wide		
SCE 1 100e A	2	Silcrete	Proximal flake		20	2.7	20	18	8	Plain	Wide		
SCE 1 100e A	2	Silcrete	Proximal flake		15	0.5	12	11	3	Plain	Focalised		
SCE 1 100e A	2	Silcrete	Distal flake		28	3.8	25	21	6			Feather	
SCE 1 100e A	2	Silcrete	Flaked piece		29	5		21	7				
SCE 1 100e A	2	Silcrete	Distal flake		16	0.6	10	10	3			Feather	
SCE 1 100e A	2	Silcrete	Distal flake		10	0.3	8	9	3			Hinge	
SCE 1 100e A	2	Silcrete	Distal flake		10	0.2	9	6	4			Feather	
SCE 1 100e A	2	Silcrete	Medial flake		15	0.5	7	10	3				
SCE 1 100e A	2	Silcrete	Flaked piece		37	11.9		17	16				Heat shatter
SCE 1 100e A	2	Silcrete	Flaked piece		31	6.2		18	14				Heat shatter

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 100e A	2	Silcrete	Flaked piece		19	1.6		12	10				Heat shatter
SCE 1 100e A	2	Silcrete	Flaked piece		22	2.3		18	6				Heat shatter
SCE 1 100e A	2	Silcrete	Flaked piece		19	1.7		15	8				Heat shatter
SCE 1 100e A	2	Silcrete	Flaked piece		21	1.5		12	7				
SCE 1 100e A	2	Silcrete	Flaked piece		15	0.7		9	7				Heat shatter
SCE 1 100e A	2	Silcrete	Shatter		15	0.4		9	3				Heat shatter
SCE 1 100e A	2	Silcrete	Flaked piece		13	0.3		9	2				Heat shatter
SCE 1 100e A	2	Silcrete	Shatter		13	0.6		11	4				Heat shatter
SCE 1 100e A	2	Silcrete	Flaked piece		8	0.2		8	5				
SCE 1 100e A	2	Petrified wood	Flaked piece		20	2.1		11	10				
SCE 1 100e A	2	IMT	Flake		20	0.9	18	13	4	Plain	Wide	Feather	
SCE 1 100e A	2	IMT	Distal flake		25	1.1	22	18	3			Feather	
SCE 1 100e A	2	IMT	Flaked piece		30	2.7		16	6				
SCE 1 100e A	3	Silcrete	Flake		24	3	22	19	9	Cortex	Wide	Feather	
SCE 1 100e B	1	Silcrete	Flake		28	2.7	15	17	5	Cortex	Wide	Feather	
SCE 1 100e B	1	Silcrete	Flaked piece		14	0.7		13	5				
SCE 1 100e B	1	Silcrete	Distal flake		11	0.3	10	9	3			Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 100e B	2	Silcrete	Shatter		37	5.6		23	9				Heat shatter
SCE 1 100e B	2	Silcrete	Shatter		25	2.3		22	6				Heat shatter
SCE 1 100e B	2	Silcrete	Core		34	13		27	18				
SCE 1 100e B	2	Silcrete	Core		28	10.3		22	16				
SCE 1 100e B	2	Silcrete	Flaked piece		31	9.1		21	20				
SCE 1 100e B	2	Silcrete	Flake		26	3	22	23	6	Plain	Wide	Feather	
SCE 1 100e B	2	Silcrete	Shatter		21	0.9		14	3				Heat shatter
SCE 1 100e B	2	Silcrete	Shatter		24	1.1		11	5				Heat shatter
SCE 1 100e B	2	Silcrete	Shatter		22	1.2		13	4				Heat shatter
SCE 1 100e B	2	Silcrete	Shatter		22	0.9		14	4				Heat shatter
SCE 1 100e B	2	Silcrete	Shatter		22	1		9	5				Heat shatter
SCE 1 100e B	2	Silcrete	Flake		23	1	22	9	6	Multiple scars	Focalised	Feather	Ridge correction/ redirecting flake
SCE 1 100e B	2	Silcrete	Shatter		19	1.5		14	6				Heat shatter
SCE 1 100e B	2	Silcrete	Shatter		20	0.7		15	3				Heat shatter
SCE 1 100e B	2	Silcrete	Flake		15	0.2	15	7	2	Shattered	Indeterminate	Feather	
SCE 1 100e B	2	Silcrete	Flake		20	1	12	12	8	Plain	Wide	Feather	
SCE 1 100e B	2	Silcrete	Flake		12	0.3	10	9	3	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 100e B	2	Silcrete	Flake		10	0.2	8	8	2	Plain	Wide	Feather	
SCE 1 100e B	2	Silcrete	Flake		10	0.2	5	8	3	Plain	Wide	Feather	
SCE 1 100e B	2	Silcrete	Flake		19	0.5	6	9	4	Plain	Wide	Feather	
SCE 1 100e B	2	Silcrete	Flake		11	0.1	10	5	3	Plain	Focalised	Feather	
SCE 1 100e B	2	Silcrete	Distal flake		11	0.1	7	7	1			Feather	
SCE 1 100e B	2	Silcrete	Flake		11	0.2	9	7	3	Shattered	Indeterminate	Feather	
SCE 1 100e B	2	Silcrete	Flaked piece		22	1.5		13	7				Heat shatter
SCE 1 100e B	2	Silcrete	Shatter		14	0.3		11	3				Heat shatter
SCE 1 100e B	2	Silcrete	Shatter		17	1.1		16	4				Heat shatter
SCE 1 100e B	2	Silcrete	Shatter		12	0.3		7	3				Heat shatter
SCE 1 100e B	2	Silcrete	Shatter		11	0.1		6	2				
SCE 1 100e B	2	Silcrete	Flaked piece		12	0.4		7	5				
SCE 1 100e B	2	Silcrete	Shatter		14	0.3		8	3				
SCE 1 100e B	2	Silcrete	Shatter		11	0.1		7	2				
SCE 1 100e B	2	Silcrete	Flaked piece		12	0.3		7	4				
SCE 1 100e B	2	Silcrete	Shatter		12	0.4		11	3				
SCE 1 100e B	2	Silcrete	Distal flake		12	0.2	9	8	3			Feather	
SCE 1 100e B	2	Silcrete	Distal flake		14	0.2	8	7	3			Feather	
SCE 1 100e B	2	Silcrete	Shatter		11	0.2		10	2				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 100e B	2	Silcrete	Distal flake		11	0.2		6	2				
SCE 1 100e B	2	Quartz	Flake		16	1.2	17	12	7	Shattered	Indeterminate	Feather	
SCE 1 100e B	2	Quartz	Flake		18	0.9	18	8	6	Shattered	Indeterminate	Feather	
SCE 1 100e B	2	Quartz	Proximal flake		8	0.1	6	7	1				
SCE 1 100e B	2	IMT	Shatter		12	0.1		10	1				
SCE 1 100e B	2	IMT	Flake		10	0.1	9	8	2	Plain	Focalised	Hinge	
SCE 1 100e B	2	IMT	Flaked piece		14	0.2		9	2				
SCE 1 100e B	2	IMT	Distal flake		16	0.4	9	11	4			Feather	
SCE 1 100e B	2	IMT	Shatter		10	0.2		6	2				
SCE 1 100e B	2	IMT	Shatter		11	0.4		9	6				
SCE 1 100e B	3	Silcrete	Flaked piece		24	2.4		13	10				
SCE 1 100e B	3	Silcrete	Flake		19	0.5	15	8	7	Plain	Wide	Feather	
SCE 1 100e C	2	Silcrete	Core		25	7.5		24	16				
SCE 1 100e C	2	Silcrete	Core		31	10.7		23	16				
SCE 1 100e C	2	Silcrete	Core		36	5.9		18	13				
SCE 1 100e C	2	Silcrete	Retouched flake	Backed artefact	15	0.4	15	8	3	Multiple scars	Focalised		Backed artefact proximal
SCE 1 100e C	2	Silcrete	Flake		28	4.1	23	16	10	Plain	Wide	Feather	
SCE 1 100e C	2	Silcrete	Flaked piece		21	4		20	16				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 100e C	2	Silcrete	Flaked piece		15	0.7		12	7				
SCE 1 100e C	2	Silcrete	Core		43	12.7		26	12				flake body blade core
SCE 1 100e C	2	Silcrete	Flake		43	10.4	37	31	11	Plain	Focalised	Feather	
SCE 1 100e C	2	Silcrete	Core		24	2.6		17	7				
SCE 1 100e C	2	Silcrete	Flake		22	2	21	15	7	Multiple scars	Focalised	Feather	
SCE 1 100e C	2	Silcrete	Core		21	2.6		15	8				
SCE 1 100e C	2	Silcrete	Flake		26	1.8	23	18	4	Plain	Focalised	Step	
SCE 1 100e C	2	Silcrete	Flake		22	2.5	20	16	9	Plain	Wide	Overshot	
SCE 1 100e C	2	Silcrete	Flake		14	0.3	9	9	3	Shattered	Indeterminate	Overshot	
SCE 1 100e C	2	Silcrete	Flake		14	0.4	13	10	3	Plain	Focalised	Step	
SCE 1 100e C	2	Silcrete	Flake		15	0.3	13	12	2	Plain	Focalised	Hinge	
SCE 1 100e C	2	Silcrete	Flake		14	0.4	12	8	3	Cortex	Wide	Feather	
SCE 1 100e C	2	Silcrete	Flake		15	0.5	15	8	4	Cortex	Wide	Feather	
SCE 1 100e C	2	Silcrete	Retouched flake		21	2.7	14	15	8	Plain	Wide		end retouch; not a tool?
SCE 1 100e C	2	Silcrete	Flake		19	0.5	10	11	3	Cortex	Wide	Feather	
SCE 1 100e C	2	Silcrete	Flake		11	0.2	9	11	2	Shattered	Indeterminate	Feather	
SCE 1 100e C	2	Silcrete	Flake		17	0.4	16	12	2	Plain	Focalised	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 100e C	2	Silcrete	Flake		11	0.2	8	8	3			Feather	
SCE 1 100e C	2	Silcrete	Flake		14	0.5	14	11	3	Plain	Focalised	Feather	
SCE 1 100e C	2	Silcrete	Flake		12	0.2	10	10	2	Plain	Focalised	Feather	
SCE 1 100e C	2	Silcrete	Flake		12	0.2	12	9	2	Multiple scars	Focalised	Feather	
SCE 1 100e C	2	Silcrete	Flake		11	0.3	6	8	3	Plain	Wide	Feather	
SCE 1 100e C	2	Silcrete	Flake		9	0.2	8	7	2	Plain	Wide	Feather	
SCE 1 100e C	2	Silcrete	Distal flake		17	0.5	8	10	4			Feather	
SCE 1 100e C	2	Silcrete	Distal flake		17	0.6		17	8			Feather	
SCE 1 100e C	2	Silcrete	Distal flake		24	3.9	22	21	10			Feather	
SCE 1 100e C	2	Silcrete	Proximal flake		12	10	10	9	5	Multiple scars	Focalised		
SCE 1 100e C	2	Silcrete	Distal flake		11	0.3	10	7	3			Feather	
SCE 1 100e C	2	Silcrete	Distal flake		15	1		15	5			Feather	
SCE 1 100e C	2	Silcrete	Distal flake		10	0.1	9	7	2			Feather	
SCE 1 100e C	2	Silcrete	Distal flake		15	0.4	15	11	3			Feather	
SCE 1 100e C	2	Silcrete	Distal flake		13	0.3	12	7	4			Feather	
SCE 1 100e C	2	Silcrete	Distal flake		10	0.2	10	6	3			Feather	
SCE 1 100e C	2	Silcrete	Distal flake		9	0.1	5	5	4			Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 100e C	2	Silcrete	Shatter		27	1.7		12	6				Heat shatter
SCE 1 100e C	2	Silcrete	Shatter		41	5.9		26	6				
SCE 1 100e C	2	Silcrete	Shatter		22	1.7		20	4				
SCE 1 100e C	2	Silcrete	Shatter		25	1.4		15	5				
SCE 1 100e C	2	Silcrete	Shatter		19	0.9		12	5				
SCE 1 100e C	2	Silcrete	Shatter		18	0.6		11	4				
SCE 1 100e C	2	Silcrete	Shatter		14	0.4		12	3				
SCE 1 100e C	2	Silcrete	Shatter		13	0.2		7	3				
SCE 1 100e C	2	Silcrete	Shatter		18	1		12	6				
SCE 1 100e C	2	Silcrete	Shatter		15	0.5		12	3				
SCE 1 100e C	2	Silcrete	Flake		10	0.2	9	7	3	Plain	Wide	Feather	
SCE 1 100e C	2	Silcrete	Shatter		13	0.5		10	4				
SCE 1 100e C	2	Silcrete	Shatter		11	0.2		8	2				
SCE 1 100e C	2	Silcrete	Shatter		12	0.3		11	2				
SCE 1 100e C	2	IMT	Medial flake		9	0.2	7	8	2				
SCE 1 100e C	2	IMT	Shatter		16	0.4		12	2				
SCE 1 100e C	3	Silcrete	Distal flake		19	1.2	8	11	8			Feather	
SCE 1 100e C	3	IMT	Flake		11	0.4	8	10	4	Plain	Wide	Feather	
SCE 1 100e D	2	Silcrete	Core		54	34.8		30	18				
SCE 1 100e D	2	Silcrete	Flaked piece		41	18.2		26	18				
SCE 1 100e D	2	Silcrete	Flaked piece		34	8.1		27	13				
SCE 1 100e D	2	Silcrete	Flake		29	1.4	25	11	5	Plain	Wide	Feather	
SCE 1 100e D	2	Silcrete	Proximal flake		21	0.6	20	8	3	Plain	Focalised		
SCE 1 100e D	2	Silcrete	Flake		17	1.3	13	13	8	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 100e D	2	Silcrete	Flake		22	1.3	21	13	6	Shattered	Indeterminate	Feather	
SCE 1 100e D	2	Silcrete	Flake		27	3.7	17	17	10	Shattered	Indeterminate	Feather	
SCE 1 100e D	2	Silcrete	Flake		27	3.1	12	19	8	Plain	Wide	Feather	
SCE 1 100e D	2	Silcrete	Flake		17	0.3	14	8	4	Plain	Wide	Feather	
SCE 1 100e D	2	Silcrete	Flake		25	1.8	11	12	8	Plain	Wide	Feather	
SCE 1 100e D	2	Silcrete	Flake		12	0.2	9	8	3	Plain	Wide	Feather	
SCE 1 100e D	2	Silcrete	Shatter		18	0.7		12	3				
SCE 1 100e D	2	Silcrete	Flake		7	0.1	7	6	1	Shattered	Indeterminate	Feather	
SCE 1 100e D	2	Silcrete	Flake		14	0.3	13	7	2	Shattered	Indeterminate	Feather	
SCE 1 100e D	2	Silcrete	Flake		34	2.4	34	15	5	Plain	Focalised	Feather	
SCE 1 100e D	2	Silcrete	Shatter		28	6		25	7				
SCE 1 100e D	2	Silcrete	Shatter		25	5.8		22	11				
SCE 1 100e D	2	Silcrete	Shatter		30	9.2		24	13				
SCE 1 100e D	2	Silcrete	Shatter		22	1.7		11	9				
SCE 1 100e D	2	Silcrete	Shatter		27	5.4		18	12				
SCE 1 100e D	2	Silcrete	Shatter		19	3		15	12				
SCE 1 100e D	2	Silcrete	Shatter		22	1.2		14	4				
SCE 1 100e D	2	Silcrete	Shatter		21	1.2		16	4				
SCE 1 100e D	2	Silcrete	Shatter		18	1.8		15	7				
SCE 1 100e D	2	Silcrete	Shatter		17	0.7		13	4				
SCE 1 100e D	2	Silcrete	Shatter		14	0.4		10	3				
SCE 1 100e D	2	Silcrete	Shatter		11	0.2		8	3				
SCE 1 100e D	2	Silcrete	Shatter		10	0.2		5	5				
SCE 1 100e D	2	Silcrete	Shatter		13	0.2		5	3				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 100e D	2	Silcrete	Shatter		12	0.2		9	2				
SCE 1 100e D	2	Silcrete	Shatter		13	0.2		8	3				
SCE 1 100e D	2	Silcrete	Flaked piece		11	0.5		9	9				
SCE 1 100e D	2	Silcrete	Medial flake		22	2.4	13	15	8				
SCE 1 100e D	2	Silcrete	Flaked piece		16	1.8		12	10				
SCE 1 100e D	2	Silcrete	Distal flake		13	0.3	13	6	4			Feather	
SCE 1 100e D	2	Silcrete	Distal flake		13	0.3	10	8	5			Feather	
SCE 1 100e D	2	Silcrete	Flake		9	0.1	9	3	1	Shattered	Indeterminate	Feather	
SCE 1 100e D	2	Silcrete	Distal flake		12	9	12	6	4			Feather	
SCE 1 100e D	2	Silcrete	Flaked piece		11	0.6		11	7				
SCE 1 100e D	2	Silcrete	Flaked piece		12	0.3		8	4				
SCE 1 100e D	2	Silcrete	Flaked piece		15	0.4		6	6				
SCE 1 100e D	2	Silcrete	Retouched flake	Backed artefact	12	0.3	13	5	5				Distal backed artefact tip
SCE 1 100e D	2	Silcrete	Retouched flake	Backed artefact	14	0.4	14	7	4	Plain	Focalised		Proximal backed artefact fragment

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 100e D	2	Quartz	Flaked piece		11	0.4		9	5				
SCE 1 100e D	2	Quartz	Flaked piece		8	0.2		6	3				
SCE 1 100e D	3	Silcrete	Flake		13	0.3	13	8	2	Plain	Wide	Feather	
SCE 1 100e D	3	Silcrete	Flake		12	0.5	12	9	3	Plain	Focalised	Step	
SCE 1 100e D	3	Silcrete	Flake		18	0.8	12	11	6	Plain	Wide	Feather	
SCE 1 100e D	3	Silcrete	Flake		8	0.1	7	8	2	Plain	Wide	Feather	
SCE 1 100e D	3	IMT	Flake		16	0.7	12	14	3	Plain	Wide	Feather	
SCE 1 120e A	1	Silcrete	Proximal flake		15	0.4	13	10	2	Multiple scars	Focalised		
SCE 1 120e A	2	Silcrete	Distal flake		19	0.7	18	9	3	Plain	Wide	Feather	
SCE 1 120e A	3	Silcrete	Flaked piece		24	5.7		17	16				
SCE 1 120e A	3	Silcrete	Flaked piece		19	1.7		10	8				
SCE 1 120e A	3	Silcrete	Flaked piece		20	1.2		10	8				
SCE 1 120e A	3	Silcrete	Flake		17	0.9	17	13	5	Shattered	Indeterminate	Feather	
SCE 1 120e A	3	Silcrete	Distal flake		17	1	13	12	5			Feather	
SCE 1 120e B	2	Silcrete	Proximal flake		25	3.9	17	18	7	Plain	Wide		
SCE 1 120e B	2	Silcrete	Flake		16	0.5	11	11	4	Plain	Wide	Feather	
SCE 1 120e B	2	Silcrete	Flake		16	0.7	12	11	5	Plain	Wide	Feather	
SCE 1 120e B	2	Silcrete	Flake		13	0.3	9	8	3	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 120e B	2	Silcrete	Flaked piece		10	0.4		10	8				
SCE 1 120e B	2	Silcrete	Flaked piece		10	0.3		7	5				
SCE 1 120e B	2	Quartz	Flake		9	0.1	6	5	2	Shattered	Indeterminate	Feather	
SCE 1 120e C	1	Silcrete	Medial flake		13	0.6	12	9	6				
SCE 1 120e C	1	Silcrete	Medial flake		11	0.5	11	9	4				
SCE 1 120e C	1	IMT	Flaked piece		11	0.2		7	2				
SCE 1 120e C	2	Silcrete	Proximal flake		25	1.6	24	13	5	Plain	Wide		
SCE 1 120e C	2	Silcrete	Proximal flake		24	1.5	24	13	5	Shattered	Indeterminate		
SCE 1 120e C	2	Silcrete	Retouched flake	Scraper	30	4.6	19	18	10	Indeterminate	Indeterminate	Feather	Distal retouch
SCE 1 120e C	2	Silcrete	Proximal flake		16	2.9		15	6				
SCE 1 120e C	2	Silcrete	Distal flake		12	0.4	12	9	3			Feather	
SCE 1 120e C	2	Silcrete	Flaked piece		25	1.3		14	8				
SCE 1 120e C	2	Silcrete	Flaked piece		17	0.6		7	5				
SCE 1 120e C	2	IMT	Shatter		12	0.2		9	1				Potlid
SCE 1 120e D	1	Silcrete	Proximal flake		30	7.9	22	27	9	Multiple scars	Wide		Broken in excavation 3 fragments

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 120e D	2	Silcrete	Flake		21	0.8	16	9	4	Plain	Wide	Feather	
SCE 1 120e D	2	Silcrete	Flake		21	2.1	16	14	8	Plain	Wide	Step	
SCE 1 120e D	2	Silcrete	Flake		29	3.7	16	15	7	Multiple scars	Wide	Feather	
SCE 1 120e D	2	Silcrete	Flake		19	0.9	10	13	5	Plain	Wide	Feather	
SCE 1 120e D	2	IMT	Flake		9	0.2	8	7	4	Plain	Focalised	Feather	
SCE 1 120e D	2	Silcrete	Core		31	8.6		25	14				
SCE 1 120e D	2	IMT	Flake		20	1.4	9	13	5	Plain	Wide	Feather	
SCE 1 120e D	2	Silcrete	Distal flake		13	0.2	8	7	1			Hinge	
SCE 1 120e D	2	Silcrete	Distal flake		11	0.3		9	4				
SCE 1 120e D	2	Silcrete	Shatter		16	0.8		9	5				
SCE 1 120e D	2	Silcrete	Flaked piece		19	1.8		11	9				
SCE 1 120e D	2	Quartz	Flake		17	0.8	17	11	4	Shattered	Indeterminate	Platform	bipolar
SCE 1 120e D	2	Silcrete	Flaked piece		16	0.9		13	6				
SCE 1 120e D	3	Silcrete	Flaked piece		22	3.8		19	9				
SCE 1 120e D	3	Silcrete	Core		24	5.5		16	12				
SCE 1 140e A	2	IMT	Flake		15	0.2	8	8	2	Plain	Focalised	Feather	
SCE 1 140e B	1	Silcrete	Flake		20	1.9	14	17	6	Multiple scars	Wide	Step	
SCE 1 140e B	1	IMT	Flaked piece		24	2.1		19	6				
SCE 1 140e B	2	Silcrete	Flake		16	1	13	13	4	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 140e B	2	IMT	Flake		15	0.3	4	9	4	Plain	Wide	Feather	Backing error flake
SCE 1 140e B	2	IMT	Flake		16	0.3	6	9	3	Plain	Wide	Feather	
SCE 1 140e C	1	Silcrete	Shatter		12	0.4		9	3				Heat shatter
SCE 1 140e C	1	Silcrete	Flake		9	0.2		8	3				
SCE 1 140e C	2	Silcrete	Flake		21	2.8	18	19	9	Shattered	Indeterminate	Platform	
SCE 1 140e C	2	IMT	Distal flake		9	0.1		7	2			Feather	
SCE 1 140e C	2	IMT	Distal flake		12	0.1		6	2			Feather	
SCE 1 140e C	3	Silcrete	Flake		15	0.2	15	6	2	Shattered	Indeterminate	Feather	
SCE 1 140e C	3	Silcrete	Flake		14	0.4	13	10	2	Plain	Focalised	Feather	
SCE 1 140e D	1	Silcrete	Medial flake		10	0.2	9	8	2				
SCE 1 140e D	2	Silcrete	Flake		25	1.1	19	14	4	Plain	Wide	Feather	
SCE 1 140e D	2	Silcrete	Flake		22	1.4	14	11	8	Plain	Wide	Feather	
SCE 1 140e D	4	Silcrete	Distal flake		10	0.1	9	7	1			Feather	
SCE 1 140e D	4	IMT	Flake		23	1.5	21	18	4	Plain	Wide	Hinge	Broken in 2 in excavation
SCE 1 180e A	1	Silcrete	Medial flake		10	0.1	6	6	1				
SCE 1 180e A	1	Silcrete	Flaked piece		10	0.1		7	2				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 180e A	3	Silcrete	Retouched flake	Scraper	44	16.4	40	27	12	Plain	Wide	Feather	end scraper
SCE 1 180e A	3	Silcrete	Flaked piece		28	5.2		21	11				
SCE 1 180e A	3	Silcrete	Flaked piece		25	1.2		14	4				
SCE 1 180e A	3	Silcrete	Flaked piece		23	2.2		14	8				
SCE 1 180e A	4	Silcrete	Flake		35	8.4	27	21	16	Cortex	Wide	Feather	
SCE 1 180e A	4	Silcrete	Flake		10	0.2	8	9	3	Plain	Focalised	Feather	
SCE 1 180e B	2	Silcrete	Flake		27	1.7	5	11	7	Plain	Wide	Feather	Retouched tool rejuvenation flake
SCE 1 180e B	2	Silcrete	Flake		10	0.1	10	7	1	Shattered	Indeterminate	Feather	
SCE 1 180e B	2	Silcrete	Flaked piece		18	3.1		16	15				
SCE 1 180e B	2	Silcrete	Flake		16	0.7	16	12	4	Shattered	Indeterminate	Feather	
SCE 1 180e B	2	Silcrete	Flaked piece		16	0.7		10	5				
SCE 1 180e B	2	Silcrete	Distal flake		12	0.3	8	8	4			Feather	
SCE 1 180e C	2	Silcrete	Distal flake		20	0.4	6	6	3			Feather	
SCE 1 220e A	2	Silcrete	Retouched flake	Scraper	29	7.6	21	21	11	Multiple scars	Wide		side scraper
SCE 1 220e A	2	Silcrete	Flaked piece		19	2.8		18	13				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 220e A	3	Silcrete	Flaked piece		29	10.8		27	17				
SCE 1 220e A	3	Silcrete	Flaked piece		14	1.1		11	8				
SCE 1 220e A	3	Silcrete	Distal flake		17	0.7	10	11	5			Feather	conjoins 1010 at natural flaw
SCE 1 220e A	3	Silcrete	Flake		16	0.4	12	8	3	Plain	Wide	Feather	
SCE 1 220e A	3	Silcrete	Distal flake		18	0.7	11	11	4			Feather	
SCE 1 220e A	3	Silcrete	Proximal flake		19	0.6	6	8	5	Plain	Wide		conjoins 1007 at natural flaw
SCE 1 220e B	1	Silcrete	Medial flake		14	0.7	12	11	3				
SCE 1 220e B	1	Silcrete	Flake		8	0.1	7	7	1	Plain	Focalised	Feather	
SCE 1 220e C	3	Silcrete	Conesplit flake		14	0.2	12	7	2	Cortex	Wide	Feather	
SCE 1 220e D	3	Silcrete	Flake		12	0.2	12	8	2	Plain	Wide	Feather	***; empties checked, rec'd checked; missing
SCE 1 220e D	3	Silcrete	Flake		28	6.2	19	26	10	Plain	Wide	Feather	
SCE 1 220e D	3	Silcrete	Flake		20	1.1	20	11	4	Plain	Wide	Hinge	
SCE 1 220e D	3	IMT	Distal flake		15	0.2	5	5	2			Feather	***; empties checked, rec'd

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
													checked; missing
SCE 1 260e A	1	Petrified wood	Distal flake		22	3.1	17	15	8			Feather	
SCE 1 260e A	2	Silcrete	Flaked piece		17	1.1		11	6				
SCE 1 260e B	2	Quartz	Flake		9	0.2	8	9	4	Shattered	Indeterminate	Feather	
SCE 1 260e B	2	IMT	Shatter		10	0.2		10	2				
SCE 1 260e C	2	Silcrete	Flake		29	3.8	27	13	13	Plain	Focalised	Feather	
SCE 1 260e C	3	IMT	Medial flake		13	0.2	10	7	2				
SCE 1 260e C	3	IMT	Flaked piece		8	0.1		5	4				
SCE 1 260e D	3	Silcrete	Medial flake		20	1.4	11	14	4				
SCE 1 260e D	3	Quartz	Flake		22	3.8	19	19	12	Plain	Focalised	Feather	
SCE 1 300e D	3	IMT	Flake		15	0.2	15	6	3	Cortex	Wide	Feather	
SCE 1 340e A	2	Silcrete	Flake		19	1.2	16	11	5	Plain	Wide	Feather	
SCE 1 340e A	2	IMT	Flaked piece		24	3.7		12	10				3 fragments broken in excavation
SCE 1 140e B	2	IMT	Flake		14	0.2	12	8	2	Plain	Focalised	Step	usewear distal

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
CCW 1 Tp201 3 C	1	Silcrete	Distal flake		10	0.2	8	8	2			Feather	
SCE 1 340e A	3	Silcrete	Medial flake		21	1.6	17	15	4				
SCE 1 340e A	3	Silcrete	Proximal flake		15	8	14	11	4	Multiple scars	Focalised	Hinge	
SCE 1 340e C	2	Silcrete	Gravel		19	3.5		17	15				
SCE 1 340e C	2	Silcrete	Flake		9	0.2	7	7	3	Plain	Wide	Feather	
SCE 1 340e C	2	Silcrete	Proximal flake		10	0.1	7	7	2	Multiple scars	Focalised		
SCE 1 340e D	2	Silcrete	Flake		15	1.1	12	12	7	Plain	Focalised	Feather	
SCE 1 340e D	2	Silcrete	Flake		15	0.7	13	8	4	Plain	Wide	Feather	
SCE 1 340e D	2	IMT	Flake		12	0.3	5	8	2	Plain	Wide	Feather	
SCE 1 340e D	3	Silcrete	Medial flake		14	0.5	14	10	3				
SCE 1 380e B	2	IMT	Distal flake		28	2.1	25	21	6			Feather	
SCE 1 380e C	2	IMT	Proximal flake		13	0.4	10	10	4	Plain	Wide		
SCE 1 380e C	2	Quartz	Distal flake		31	4.5	25	23	8			Feather	
SCE 1 380e D	2	IMT	Flake		28	1.6	27	14	5	Plain	Wide	Feather	
SCE 1 420e C	2	Silcrete	Distal flake		10	0.2	7	6	4			Feather	White exotic silcrete
SCE 1 420e C	2	IMT	Distal flake		26	1.5	15	17	5			Hinge	
SCE 1 460e A	3	Silcrete	Flake		9	0.1	6	6	2	Plain	Wide	Feather	
SCE 1 460e C	2	Quartz	Flake		15	0.2	14	6	2	Shattered	Indeterminate	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 460e C	2	IMT	Flake		14	0.5	4	7	4	Plain	Wide	Feather	
SCE 1 460e D	1	Silcrete	Flaked piece		13	0.8		9	7				
SCE 1 460e D	1	Silcrete	Flaked piece		13	0.6		10	6				
SCE 1 460e D	1	Silcrete	Flaked piece		8	0.2		7	4				
SCE 1 Tp226 1 B	3	Silcrete	Flake		10	0.3	4	7	4	Shattered	Indeterminate	Feather	
SCE 1 Tp226 1 B	3	Silcrete	Flaked piece		17	1.2	15	15	5	Plain	Wide	Feather	
SCE 1 Tp226 1 B	3	Silcrete	Flaked piece		35	8.1		20	14				
SCE 1 Tp226 1 B	3	IMT	Flake		17	0.7	17	15	5	Shattered	Indeterminate	Hinge	
SCE 1 Tp226 1 B	4	Silcrete	Flake		13	0.2	12	9	2	Plain	Wide	Feather	
SCE 1 Tp226 1 B	4	Silcrete	Distal flake		11	0.2	9	9	2			Feather	
SCE 1 Tp226 1 B	5	IMT	Flaked piece		13	0.2		9	2				
SCE 1 Tp226 1 C	1	Silcrete	Distal flake		24	1.8	21	13	7			Feather	
SCE 1 Tp226 1 C	4	IMT	Flaked piece		14	0.3		9	3				
SCE 1 Tp226 1 D	4	Quartz	Flake		11	0.2	7	6	3	Plain	Wide	Feather	
SCE 1 Tp226 1 D	4	IMT	Flake		10	0.1	7	8	2	Plain	Wide	Feather	Also a large rock lump 82mm this unit

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 Tp226 1 D	2	IMT	Distal flake		34	3.8	22	24	6			Feather	
SCE 1 Tp226 1 D	3	IMT	Distal flake		10	0.1	10	8	2			Hinge	
SCE 1 Tp226 1 D	5	Silcrete	Distal flake		17	0.9	11	13	6			Feather	
SCE 1 Tp226 2 A	3	IMT	Flake		15	0.4	13	10	3	Plain	Wide	Feather	
SCE 1 Tp226 2 B	4	Quartz	Flake		18	1	18	10	6	Shattered	Indeterminate	Platform	bipolar
SCE 1 Tp226 3 A	1	Silcrete	Distal flake		13	0.2	7	7	2			Feather	
SCE 1 Tp226 3 A	1	IMT	Flake		29	3	26	17	7	Plain	Wide	Feather	
SCE 1 Tp226 3 B	3	IMT	Flake		13	0.2	9	9	2	Plain	Wide	Hinge	
SCE 1 Tp226 3 C	1	IMT	Distal flake		24	1.9	13	13	5			Hinge	
SCE 1 Tp226 3 D	2	Silcrete	Flake		11	0.2	10	9	1	Plain	Focalised	Feather	
SCE 1 Tp226 3 D	4	IMT	Flake		30	2.1	27	18	6	Plain	Wide	Feather	
SCE 1 Tp226 3 D	6	IMT	Flaked piece		22	0.7		8	5				
SCE 1 Tp227 1 A	1	Silcrete	Medial flake		15	0.8	13	8	7				
SCE 1 Tp227 1 A	3	Silcrete	Flake		12	0.3	9	9	2	Plain	Wide	Feather	
SCE 1 Tp227 1 B	2	Quartzite	Flake		38	8.7	29	26	9	Multiple scars	Wide	Feather	Rough black quartzite or burnt silcrete
SCE 1 Tp227 1 B	2	Quartzite	Medial flake		24	1.9	12	12	5				Rough black quartzite

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
													or burnt silcrete
SCE 1 Tp227 1 B	2	Silcrete	Core		32	15.2		28	20				
SCE 1 Tp227 1 B	3	IMT	Medial flake		12	0.5	9	11	3				
SCE 1 Tp227 1 C	1	Silcrete	Medial flake		9	0.2	6	7	3				
SCE 1 Tp227 1 C	1	Silcrete	Medial flake		12	0.4	7	7	4				
SCE 1 Tp227 1 C	1	Silcrete	Flaked piece		18	1.3		12	8				
SCE 1 Tp227 1 C	2	Silcrete	Gravel		29	10		25	16				Rounded
SCE 1 Tp227 1 C	3	Silcrete	Distal flake		15	0.6	14	12	3			Feather	
SCE 1 Tp227 1 C	3	Silcrete	Retouched flake	Backed artefact	11	0.2	11	5	3				Unidirectionally backed artefact Geometric
SCE 1 Tp227 1 D	3	Silcrete	Flaked piece		46	51.5		36	32				Lump of silcrete with fracture surface but no initiation; small quartz pebble10
SCE 1 Tp227 2 A	3	Silcrete	Core		34	7.9		19	13				
SCE 1 Tp227 2 A	3	Silcrete	Flake		13	0.4	7	9	4	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 Tp227 2 A	3	Silcrete	Flake		13	0.2	13	6	3	Plain	Focalised	Feather	
SCE 1 Tp227 2 B	1	Igneous	Hammerstone/Anvil		97	300.5		70	37				Broken pebble with anvil pitting and end pitting
SCE 1 Tp227 2 B	2	Silcrete	Flaked piece		27	4.1		17	10				
SCE 1 Tp227 2 B	2	Quartz	Flake		27	6.1	26	21	9	Shattered	Indeterminate	Platform	Bipolar split pebble
SCE 1 Tp227 2 B	3	Silcrete	Flaked piece		49	45.2		36	24				Broken in excavation 3 fragments
SCE 1 Tp227 2 B	3	Silcrete	Flake		24	3.1	19	19	7	Plain	Wide	Feather	
SCE 1 Tp227 2 B	3	Silcrete	Conesplit flake		18	0.7	10	13	5	Plain	Wide	Feather	
SCE 1 Tp227 2 B	3	Silcrete	Flaked piece		16	0.6		11	3				
SCE 1 Tp227 2 C	2	Silcrete	Flaked piece		20	3.1		16	10				
SCE 1 Tp227 2 C	2	IMT	Flaked piece		14	0.6		10	5				
SCE 1 Tp227 2 D	2	Quartzite	Gravel		13	0.4		7	4				Rough black quartzite or burnt silcrete
SCE 1 Tp227 2 D	2	IMT	Flaked piece		10	0.2		9	2				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCE 1 Tp227 2 D	3	Silcrete	Proximal flake		14	0.6	7	9	6	Plain	Wide		
SCE 1 Tp227 3 A	2	Petrified wood	Distal flake		17	0.6	13	11	4			Feather	
SCE 1 Tp227 3 A	2	Petrified wood	Flake		20	1.5	14	16	6	Plain	Wide	Feather	
SCE 1 Tp227 3 C	2	Silcrete	Flake		12	0.2	6	6	2	Plain	Wide	Feather	
SCE 1 Tp227 3 C	2	Petrified wood	Flake		20	0.6	14	10	5	Plain	Focalised	Feather	
SCE 1 Tp227 3 C	2	Shale	Gravel		9	0.1		7	2				
SCE 1 Tp227 3 C	2	IMT	Distal flake		8	0.1	5	6	3			Feather	
SCE 1 Tp227 3 C	2	Silcrete	Flake		11	0.1	10	8	2	Plain	Focalised	Feather	
SCE 1 Tp227 3 D	1	Silcrete	Flaked piece		30	6		20	11				Rough
SCE 1 Tp227 3 D	2	Silcrete	Flaked piece		22	1.4		12	6				
SCE 1 Tp227 3 D	2	Silcrete	Medial flake		11	0.4	7	8	3				
SCE 1 Tp227 3 D	2	Petrified wood	Medial flake		21	0.8	7	7	5				
SCE 1 Tp227 3 D	3	IMT	Flake		10	0.1	6	6	3	Plain	Focalised	Hinge	
SCE 1 Tp227 3 D	3	IMT	Flake		10	0.1	8	9	1	Plain	Focalised	Feather	
SCW 1 100e A	1	Silcrete	Flaked piece		23	4.6		20	10				
SCW 1 100e A	1	Silcrete	Flaked piece		12	0.3		7	3				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 1 100e A	1	Silcrete	Flaked piece		15	0.7		12	5				
SCW 1 100e A	1	Silcrete	Flake		11	0.2	7	7	2	Plain	Focalised	Feather	
SCW 1 100e A	1	Silcrete	Flake		13	0.2	8	9	1	Plain	Focalised	Feather	
SCW 1 100e A	1	Silcrete	Flaked piece		12	0.4		8	6				
SCW 1 100e A	1	Silcrete	Distal flake		10	0.1	8	8	2			Feather	
SCW 1 100e A	1	Silcrete	Flake		11	0.3	11	8	2	Shattered	Indeterminate	Feather	
SCW 1 100e A	1	Quartz	Distal flake		13	0.4	11	11	3	Shattered	Indeterminate		
SCW 1 100e B	1	Silcrete	Proximal flake		9	0.1	8	7	2	Plain	Wide		
SCW 1 100e B	2	Silcrete	Flake		10	0.2	6	6	3	Plain	Focalised	Hinge	
SCW 1 100e C	1	IMT	Flake		14	0.4	7	9	3	Plain	Wide	Feather	
SCW 1 100e D	1	Silcrete	Flake		22	1.1	18	11	6	Plain	Focalised	Feather	
SCW 1 100e D	1	Silcrete	Distal flake		17	0.8	16	11	4			Feather	White exotic silcrete
SCW 1 100e D	1	Silcrete	Distal flake		16	0.3	16	6	3			Feather	
SCW 1 100e D	1	Silcrete	Flake		11	0.3	8	10	3	Plain	Wide	Feather	
SCW 1 100E D	1	Silcrete	Flake		10	0.2	10	7	2	Shattered	Indeterminate	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 1 100e D	1	IMT	Retouched flake	Backed artefact	12	0.1	13	5	3			Feather	Distal Bondi point backed artefact
SCW 1 140e C	2	Silcrete	Flake		11	0.1	11	6	1	Plain	Focalised	Feather	
SCW 1 140e D	1	Silcrete	Medial flake		9	0.1	7	7	2				
SCW 1 180e A	2	Silcrete	Retouched flake	Thumbnail scraper	14	0.3	12	8	2				Thumbnail scraper
SCW 1 180e A	2	IMT	Proximal flake		15	0.4	14	8	3	Plain	Wide		
SCW 1 180e A	4	Silcrete	Distal flake		26	3.3	20	26	6			Feather	
SCW 1 180e A	4	Petrified wood	Flake		37	15.7		27	16				Broken in two in excavation
SCW 1 180e A	4	IMT	Flake		29	4.4	24	18	8	Plain	Wide	Feather	
SCW 1 180e B	2	Silcrete	Distal flake		12	0.2	7	7	2			Feather	
SCW 1 180e B	3	Silcrete	Flaked piece		25	5.6		18	14				
SCW 1 180e B	4	Silcrete	Flaked piece		25	8.5		23	18				
SCW 1 180e B	4	Silcrete	Flake		14	0.7	13	9	5	Plain	Wide	Feather	
SCW 1 180e C	2	Silcrete	Flaked piece		11	0.1		5	3				
SCW 1 180e C	2	Silcrete	Medial flake		12	0.2	7	7	2				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 1 180e C	2	Silcrete	Flake		11	0.3	6	7	4	Plain	Wide	Feather	
SCW 1 180e C	3	Silcrete	Flake		17	0.5	14	8	3	Plain	Wide	Feather	
SCW 1 180e C	3	Silcrete	Shatter		17	0.6		15	2				Heat shatter
SCW 1 180e C	3	Silcrete	Medial flake		14	0.3	6	6	4				
SCW 1 180e C	3	Silcrete	Flake		15	0.5	11	10	3	Multiple scars	Wide	Feather	
SCW 1 180e C	4	Silcrete	Flake		20	1.8	14	15	6	Cortex	Wide	Feather	
SCW 1 180e D	1	Silcrete	Distal flake		13	0.3	11	7	5			Feather	
SCW 1 180e D	2	IMT	Flake		14	0.5	11	12	3	Plain	Wide	Feather	
SCW 1 180e D	3	Silcrete	Medial flake		15	0.5	11	12	3				
SCW 1 180e D	3	Silcrete	Flaked piece		25	2.3		11	10				
SCW 1 180e D	3	Silcrete	Flake		12	0.2	7	7	2	Plain	Focalised	Feather	
SCW 1 180e D	4	Silcrete	Flake		27	3.1	14	16	8	Plain	Wide	Feather	
SCW 1 180e D	4	Silcrete	Proximal flake		28	2.3	27	13	6	Shattered	Indeterminate		
SCW 1 180e D	4	Silcrete	Flaked piece		17	2.4		14	10				
SCW 1 180e D	4	IMT	Flaked piece		16	0.4		7	4				
SCW 1 180e D	5	IMT	Core		34	22.7		32	20				
SCW 1 180e D	5	IMT	Distal flake		9	0.1	8	9	2			Feather	
SCW 1 220e C	1	Silcrete	Flake		15	0.3	7	8	3	Plain	Focalised	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 1 260e A	2	Silcrete	Flaked piece		18	1		10	2				***; not in bag of artefacts
SCW 1 260e A	2	Quartz	Flake		10	0.3	9	8	4	Cortex	Wide	Feather	
SCW 1 260e B	3	Quartzite	Flake		53	19.4	33	33	14	Cortex	Wide	Hinge	
SCW 1 260e C	2	Quartz	Flake		17	0.9	16	7	4	Shattered	Indeterminate	Feather	***
SCW 1 260e C	3	Silcrete	Medial flake		9	0.2	8	6	5				
SCW 1 260e C	4	IMT	Distal flake		14	0.3	12	10	2			Hinge	
SCW 1 260e D	3	Silcrete	Flaked piece		13	0.5		7	7				
SCW 1 300e A	3	Silcrete	Flake		9	0.2	8	8	2	Plain	Wide	Feather	
SCW 1 300e A	3	Silcrete	Medial flake		8	0.2	6	7	2				
SCW 1 300e B	3	IMT	Flake		25	6.1	18	24	12	Plain	Wide	Feather	
SCW 1 300e C	3	Silcrete	Flake		24	2.4	21	16	7	Plain	Wide	Feather	
SCW 1 300e C	5	Silcrete	Flaked piece		8	0.2		6	5				
SCW 1 300e D	3	Silcrete	Flaked piece		30	6.4		22	14				
SCW 1 340e A	3	Silcrete	Medial flake		11	0.2	7	7	3				
SCW 1 340e C	3	Igneous	Core		35	20.8		30	22				Porphyry
SCW 1 380e A	1	Silcrete	Distal flake		21	1.1	12	12	3			Feather	Broken in two in excavation
SCW 1 380e B	1	IMT	Flaked piece		18	0.7		11	4				Heat shattered

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 1 500e A	2	Silcrete	Core		24	8.1		22	17				
SCW 1 500e A	2	Silcrete	Proximal flake		14	0.3	14	10	2	Shattered	Indeterminate		
SCW 1 500e A	2	Silcrete	Flake		11	0.3	11	10	3	Shattered	Indeterminate	Feather	
SCW 1 500e A	3	Silcrete	Flake		29	1.3	27	8	6	Plain	Focalised	Feather	Ridge straighte ning flake
SCW 1 500e A	3	Silcrete	Flake		32	10.8	26	26	19	Plain	Wide	Feather	
SCW 1 500e A	3	Silcrete	Flake		29	1.9	28	18	4	Plain	Focalised	Feather	
SCW 1 500e A	3	Silcrete	Core		30	6.6		23	10				
SCW 1 500e A	3	Silcrete	Flake		25	1.2	23	11	4	Plain	Wide	Feather	
SCW 1 500e A	3	Silcrete	Flake		15	0.8	9	10	6	Plain	Wide	Feather	
SCW 1 500e A	3	Silcrete	Core		21	4.1		17	13				
SCW 1 500e A	3	Silcrete	Flake		11	0.2	9	9	2	Plain	Focalised	Feather	
SCW 1 500e A	3	Silcrete	Flake		10	0.2	8	8	3	Plain	Focalised	Feather	
SCW 1 500e A	3	Silcrete	Distal flake		10	0.1	7	7	2			Feather	
SCW 1 500e A	3	Silcrete	Distal flake		13	0.2	10	7	3			Feather	
SCW 1 500e A	3	Silcrete	Shatter		14	0.4		11	4				
SCW 1 500e A	3	Silcrete	Flake		14	0.3	13	8	2	Multiple scars	Focalised	Step	
SCW 1 500e A	3	Silcrete	Distal flake		12	0.5	10	10	5			Feather	
SCW 1 500e A	3	Silcrete	Distal flake		13	0.5	10	10	4			Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 1 500e A	3	Silcrete	Flaked piece		13	0.6		9	6				
SCW 1 500e A	4	Silcrete	Flake		22	1.4	22	14	5	Plain	Focalised	Feather	
SCW 1 500e A	4	Silcrete	Flake		11	0.2	9	9	2	Plain	Focalised	Feather	
SCW 1 500e A	4	Silcrete	Flake		11	0.2	9	8	3	Plain	Wide	Hinge	
SCW 1 500e A	4	Silcrete	Medial flake		13	0.3	7	9	3				
SCW 1 500e B	2	Silcrete	Flaked piece		22	4.7		20	14				
SCW 1 500e B	3	Silcrete	Flake		23	2.2	22	17	9	Plain	Wide	Feather	
SCW 1 500e B	3	Silcrete	Flake		14	0.4	14	14	2	Plain	Focalised	Feather	
SCW 1 500e B	3	Silcrete	Flake		14	0.3	8	8	3	Multiple scars	Focalised	Feather	
SCW 1 500e B	3	Silcrete	Proximal flake		15	0.3	8	8	3	Plain	Focalised		
SCW 1 500e B	3	Silcrete	Flake		23	2.3	20	16	8	Cortex	Wide	Feather	
SCW 1 500e B	3	Silcrete	Distal flake		15	0.2	9	8	2			Feather	
SCW 1 500e B	3	Silcrete	Distal flake		15	0.3	14	10	2			Feather	
SCW 1 500e B	3	Silcrete	Flaked piece		12	0.5		9	5				
SCW 1 500e B	4	Silcrete	Flaked piece		21	1.2		11	6				
SCW 1 500e B	4	Silcrete	Flake		16	0.4	12	7	4	Plain	Wide	Feather	
SCW 1 500e B	4	Silcrete	Distal flake		11	0.1	11	5	2			Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 1 500e C	3	IMT	Distal flake		28	2.6	23	12	7			Overshot	
SCW 1 500e C	4	Silcrete	Flake		21	2.5	17	15	8	Plain	Focalised	Feather	
SCW 1 500e C	4	Silcrete	Distal flake		22	1.4	22	11	6			Feather	
SCW 1 500e C	4	Silcrete	Flake		19	1	15	10	6	Plain	Wide	Feather	
SCW 1 500e C	4	Silcrete	Flake		19	0.6	12	12	2	Multiple scars	Focalised	Step	
SCW 1 500e C	4	Silcrete	Flake		14	0.5	9	11	4	Plain	Wide	Feather	
SCW 1 500e C	4	Silcrete	Flake		8	0.1	7	6	1	Shattered	Indeterminate	Feather	
SCW 1 500e C	4	Silcrete	Distal flake		9	0.2	8	8	3			Feather	
SCW 1 500e C	4	Silcrete	Distal flake		22	0.8	22	8	5			Feather	Broken in 2 in excavation
SCW 1 500e D	3	Silcrete	Flake		12	0.3	7	7	3	Plain	Focalised	Feather	
SCW 1 500e D	3	Silcrete	Flake		12	0.2	10	8	2	Plain	Focalised	Feather	
SCW 1 500e D	3	Silcrete	Flake		12	0.3	11	10	3	Multiple scars	Focalised	Feather	
SCW 1 500e D	3	Silcrete	Flake		10	0.2	9	9	3	Multiple scars	Focalised	Feather	
SCW 1 500e D	3	Silcrete	Flake		13	0.3	13	9	2	Plain	Focalised	Feather	
SCW 1 500e D	3	Silcrete	Flake		13	0.3	7	8	4	Plain	Wide	Feather	
SCW 1 500e D	3	Silcrete	Distal flake		14	0.6	14	10	4			Step	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 1 500e D	3	Silcrete	Flaked piece		21	1.3		11	7				
SCW 1 500e D	3	Silcrete	Distal flake		20	1.1	10	11	6			Feather	
SCW 1 500e D	3	Silcrete	Flaked piece		21	2.2		16	9				
SCW 1 500e D	3	Silcrete	Flaked piece		24	1.9		11	8				
SCW 1 500e D	4	Silcrete	Flake		14	0.3	9	11	2	Plain	Wide	Feather	
SCW 1 500e D	5	Silcrete	Flake		28	1.6	22	11	5	Multiple scars	Wide	Feather	
SCW 1 500e D	5	Silcrete	Proximal flake		16	0.7	14	10	5	Multiple scars	Focalised		
SCW 1 580e D	1	Silcrete	Flake		10								
SCW 1 580e D	1	Silcrete	Flake		8								
SCW 1 580e D	1	Silcrete	Flake		11								
SCW 1 580e D	1	Silcrete	Flake		13								
SCW 1 Tp225 1 C	1	Silcrete	Medial flake		10	0.4	9	10	3				
SCW 1 Tp225 2 C	1	Silcrete	Flaked piece		28	5.7		19	12				
SCW 1 Tp225 3 A	1	IMT	Flake		19	1.6	17	17	5	Plain	Wide	Feather	Broken in excavation
SCW 1 Tp225 3 C	1	Silcrete	Flaked piece		8	0.2		6	5				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e120n A	1	Silcrete	Proximal flake		9	0.2	8	7	2	Plain	Focalised		From unlabelled buckets generally from this square or nearby attributed by sievers to Spit 1
SCW 2 100e120n A	1	Silcrete	Flaked piece		17	1.2		13	8				From unlabelled buckets generally from this square or nearby attributed by sievers to Spit 1
SCW 2 100e120n A	1	Silcrete	Flaked piece		15	0.1		11	8				From unlabelled buckets generally from this square or nearby attributed by sievers to Spit 1
SCW 2 100e120n A	1	Quartz	Flake		13	0.9	12	12	6	Shattered	Indeterminate	Platform	bipolar
SCW 2 100e120n A	1	Quartz	Flake		12	0.5	10	7	4	Shattered	Indeterminate	Platform	bipolar

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e120n A	1	IMT	Flake		19	0.7	7	7	7	Shattered	Focalised	Feather	From unlabelled buckets generally from this square or nearby attributed by sievers to Spit 1
SCW 2 100e120n A	1	IMT	Flake		12	0.3	10	10	2	Plain	Wide	Feather	From unlabelled buckets generally from this square or nearby attributed by sievers to Spit 1
SCW 2 100e120n B	1	Silcrete	Flake		14	0.3	14	8	3	Multiple scars	Focalised	Feather	
SCW 2 100e120n B	1	Silcrete	Gravel		19	2.1		18	13				
SCW 2 100e120n B	3	IMT	Proximal flake		16	0.2	9	11	2	Plain	Wide		Heat shattered
SCW 2 100e120n C	1	Silcrete	Flake		21	2.9	11	13	11	Plain	Focalised	Feather	
SCW 2 100e120n C	1	Silcrete	Flaked piece		24	1.9		11	10				
SCW 2 100e120n C	1	Silcrete	Medial flake		12	0.3	11	8	3				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e120nD	1	Silcrete	Distal flake		13	0.3	8	8	3			Feather	
SCW 2 100e160nA	2	Silcrete	Proximal flake		22	1.8	20	12	7	Multiple scars	Focalised	Step	
SCW 2 100e160nA	2	Silcrete	Flake		16	0.6	15	10	3	Plain	Focalised	Hinge	
SCW 2 100e160nA	2	Silcrete	Flake		22	1.4	15	16	6	Multiple scars	Focalised	Feather	
SCW 2 100e160nA	2	Silcrete	Flake		13	0.9	11	12	7	Plain	Focalised	Feather	
SCW 2 100e160nA	2	Silcrete	Flake		11	0.2	7	7	4	Shattered	Indeterminate	Feather	
SCW 2 100e160nA	2	Silcrete	Proximal flake		12	0.5	8	9	5	Plain	Wide		
SCW 2 100e160nA	2	IMT	Shatter		21	1		18	4				Heat shattered
SCW 2 100e160nB	1	Silcrete	Core		23	4.5		18	12				
SCW 2 100e160nB	1	Silcrete	Core		26	4.5		22	10				
SCW 2 100e160nB	1	Silcrete	Retouched flake		13	0.8	13	11	5				Geometric backed artefact
SCW 2 100e160nB	2	Silcrete	Gravel		14	0.7		11	5				
SCW 2 100e160nB	2	Silcrete	Flake		19	1.3	12	12	7	Plain	Wide	Feather	
SCW 2 100e160nB	2	Silcrete	Core		31	8		29	20				
SCW 2 100e160nB	2	Silcrete	Distal flake		16	0.8	16	14	5			Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e160n B	2	Silcrete	Distal flake		8	0.1	6	6	2			Feather	
SCW 2 100e160n B	2	Quartz	Flake		15	0.3	15	5	4	Shattered	Indeterminate	Feather	
SCW 2 100e160n B	2	IMT	Shatter		18	0.6		15	3				Potlid
SCW 2 100e160n B	2	IMT	Flake		12	0.2	12	8	2	Plain	Wide	Feather	***empties checked, rec'd checked; not in bag of several artefacts
SCW 2 100e160n B	3	Silcrete	Core		42	42.4		42	30				Clean thin shiny cortex unlike others with rough thicker cortex
SCW 2 100e160n B	3	IMT	Flaked piece		12	0.3		7	5				
SCW 2 100e160n C	1	Petrified wood	Medial flake		15	0.4	9	10	2				
SCW 2 100e160n D	1	IMT	Flake		29	2.5	24	19	5	Plain	Wide	Feather	
SCW 2 100e160n D	1	IMT	Medial flake		13	0.2	5	5	2				
SCW 2 100e160n D	1	IMT	Flake		10	0.2	9	9	2	Plain	Focalised	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e160nD	2	Silcrete	Distal flake		19	0.9	19	14	4			Feather	
SCW 2 100e160nD	2	Silcrete	Core		33	17		28	22				
SCW 2 100e160nD	2	Quartz	Distal flake		21	1.3	21	10	6	Indeterminate	Indeterminate	Platform	bipolar
SCW 2 100e160nD	2	IMT	Flake		28	4.2	24	17	13	Plain	Focalised	Feather	
SCW 2 100e200nA	1	Silcrete	Flaked piece		35	8.8		22	10				
SCW 2 100e200nA	1	Silcrete	Flake		23	2.6	18	16	9	Plain	Focalised	Feather	
SCW 2 100e200nA	1	Silcrete	Medial flake		12	0.4	11	7	5				
SCW 2 100e200nA	1	Silcrete	Flake		14	0.6	9	10	4	Plain	Wide	Feather	
SCW 2 100e200nA	1	Silcrete	Flake		16	0.7	13	10	5	Plain	Wide	Feather	
SCW 2 100e200nA	1	Silcrete	Gravel		17	0.8		10	8				
SCW 2 100e200nA	1	IMT	Flake		35	6.3	25	27	6	Plain	Wide	Hinge	
SCW 2 100e200nA	2	Silcrete	Flake		40	11.6	30	26	12	Cortex	Wide	Feather	
SCW 2 100e200nA	2	Silcrete	Distal flake		32	1.9	30	11	6			Feather	Broken in excavation
SCW 2 100e200nA	2	IMT	Flake		11	0.3	9	11	4	Plain	Wide	Feather	
SCW 2 100e200nA	3	Silcrete	Flake		16	0.7	15	10	4	Shattered	Focalised	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e200n A	3	IMT	Distal flake		13	0.2	12	9	2			Hinge	
SCW 2 100e200n B	1	Silcrete	Proximal flake		32	6.9	25	24	9	Plain	Wide		
SCW 2 100e200n B	2	IMT	Flake		12	0.2	9	9	2	Plain	Wide	Feather	
SCW 2 100e200n B	3	Silcrete	Distal flake		10	0.2	8	9	2			Feather	
SCW 2 100e200n C	1	Silcrete	Distal flake		33	4.1	28	23	5			Feather	Broken in two in excavation
SCW 2 100e200n C	1	Silcrete	Flaked piece		24	3.3		17	10				
SCW 2 100e200n C	1	IMT	Flake		24	3	24	16	7	Plain	Focalised	Feather	
SCW 2 100e200n C	2	Silcrete	Flake		18	0.9	15	16	4	Plain	Wide	Feather	
SCW 2 100e200n C	2	IMT	Proximal flake		14	0.5	12	9	4	Shattered	Focalised	Feather	
SCW 2 100e200n C	3	IMT	Distal flake		16	0.4	8	8	3			Feather	
SCW 2 100e200n D	1	IMT	Flake		33	10.7	27	33	16	Plain	Wide	Feather	Broken in two in excavation
SCW 2 100e200n D	2	Silcrete	Flake		41	15	22	25	16	Cortex	Wide	Feather	
SCW 2 100e200n D	2	IMT	Flake		14	0.2	14	11	2	Plain	Focalised	Feather	
SCW 2 100e200n D	3	IMT	Flake		23	0.5	9	11	3	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e200nD	3	IMT	Flake		14	0.3	14	9	2	Plain	Wide	Feather	
SCW 2 100e200nD	3	IMT	Flaked piece		24	3.8		16	9				Broken in three in excavation
SCW 2 100e240nA	1	Quartzite	Flaked piece		15	0.9		9	4				
SCW 2 100e240nA	1	Silcrete	Flaked piece		32	5.1		18	10				
SCW 2 100e240nA	1	Silcrete	Distal flake		29	2.5	14	17	8			Feather	
SCW 2 100e240nA	1	Silcrete	Flaked piece		8	0.3		8	6				
SCW 2 100e240nA	2	Silcrete	Flaked piece		17	1.5		11	8				
SCW 2 100e240nB	1	Silcrete	Core		28	8		25	12				
SCW 2 100e240nB	1	Silcrete	Distal flake		16	0.3	16	7	5			Feather	
SCW 2 100e240nB	3	Silcrete	Distal flake		12	0.3	10	9	3				
SCW 2 100e240nB	4	Silcrete	Flaked piece		35	6.9		19	11				
SCW 2 100e240nC	1	Silcrete	Flaked piece		15	0.7		13	5				
SCW 2 100e240nC	1	Silcrete	Medial flake		23	2	13	14	7				
SCW 2 100e240nC	2	Silcrete	Flake		10	0.1	5	5	3	Plain	Focalised	Feather	Backed artefact tip

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
													removal flake
SCW 2 100e240n C	2	Silcrete	Distal flake		23	1.3	20	11	7			Overshot	
SCW 2 100e240n C	2	Silcrete	Medial flake		25	2.2	15	15	6				
SCW 2 100e240n C	2	IMT	Proximal flake		14	0.5	9	11	5	Cortex	Wide		
SCW 2 100e240n C	3	Silcrete	Flaked piece		17	1.2		13	8				
SCW 2 100e240n C	3	Silcrete	Flaked piece		14	0.4		6	5				
SCW 2 100e240n D	2	Silcrete	Flake		15	0.6	13	11	5	Shattered	Focalised	Feather	
SCW 2 100e240n D	2	Silcrete	Flake		19	1	13	13	4	Plain	Wide	Feather	
SCW 2 100e240n D	2	Silcrete	Flaked piece		15	1.2		15	9				
SCW 2 100e280n B	1	Silcrete	Core		23	5.6		18	14				
SCW 2 100e280n B	1	Silcrete	Flaked piece		22	2.4		14	7				
SCW 2 100e280n B	1	Silcrete	Flaked piece		29	5.8		19	15				
SCW 2 100e280n B	1	Silcrete	Flaked piece		25	3.3		16	9				
SCW 2 100e280n B	1	Silcrete	Flaked piece		12	0.5		8	6				
SCW 2 100e280n B	2	Silcrete	Distal flake		12	0.1	12	7	2			Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e280n B	3	IMT	Flake		9	0.1	9	7	3	Plain	Wide	Feather	
SCW 2 100e280n C	1	Silcrete	Distal flake		14	0.4	6	8	3			Feather	
SCW 2 100e280n D	1	Silcrete	Flake		8	0.1	7	6	1	Plain	Focalised	Feather	
SCW 2 100e280n D	4	Silcrete	Flake		13	0.2	9	8	2	Plain	Focalised	Feather	
SCW 2 100e320n A	1	Silcrete	Retouched flake	Scraper	18	0.6	17	8	4			Feather	distal end UWR
SCW 2 100e320n B	2	Silcrete	Flake		15	0.5	10	9	3	Plain	Focalised	Feather	
SCW 2 100e320n C	4	Silcrete	Flake		12	0.2	8	8	1	Plain	Focalised	Feather	
SCW 2 100e320n D	4	Silcrete	Flake		14	0.2	14	8	2	Plain	Focalised	Feather	
SCW 2 100e320n D	4	Silcrete	Flaked piece		11	0.5	8	9	5	Plain	Wide	Feather	
SCW 2 100e320n D	4	IMT	Flake		23	2	12	14	8	Plain	Wide	Feather	
SCW 2 100e40n A	2	Silcrete	Retouched flake	Backed artefact	11	0.3	10	9	3			Feather	distal fragment of geometric backed artefact
SCW 2 100e40n A	2	Quartz	Flake		14	0.5	14	7	4	Shattered	Focalised	Platform	
SCW 2 100e40n B	1	Silcrete	Flake		15	0.6	15	9	5	Plain	Focalised	Feather	
SCW 2 100e40n B	1	Silcrete	Flake		17	0.8	17	10	5	Plain	Focalised	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e40n B	1	Quartz	Flaked piece		13	1		9	8				
SCW 2 100e40n B	1	IMT	Flake		16	1.1	15	11	8	Plain	Wide	Feather	
SCW 2 100e40n B	2	Silcrete	Retouched flake	Scraper	24	2.7	20	17	9	Plain	Focalised	Feather	Unidirectional RU one edge
SCW 2 100e40n B	3	IMT	Flake		22	1.3	20	13	5	Plain	Wide	Feather	
SCW 2 100e40n C	1	Quartz	Flake		17	0.8	15	10	6	Plain	Wide	Feather	
SCW 2 100e40n D	2	Silcrete	Retouched flake	Backed artefact	21	1.1	21	13	4			Feather	Geometric backed artefact broken back
SCW 2 100e40n D	2	Silcrete	Distal flake		13	0.4	9	10	5			Feather	
SCW 2 100e40n D	2	Quartz	Flaked piece		14	0.7		11	5				
SCW 2 100e40n D	2	Quartz	Flake		14	0.7	14	8	7	Shattered	Indeterminate	Platform	bipolar
SCW 2 100e40n D	2	Quartz	Flaked piece		9	0.3		7	5				
SCW 2 100e40n D	2	IMT	Flake		6	0.1	6	6	2	Cortex	Focalised	Feather	
SCW 2 100e80n A	1	Silcrete	Retouched flake	Scraper	28	4.2	25	17	9			Feather	distal retouched flake
SCW 2 100e80n A	1	Silcrete	Core		36	20.9		28	20				
SCW 2 100e80n A	1	Silcrete	Gravel		46	29.3		31	26				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e80n A	1	Silcrete	Flake		10	0.1	8	9	2	Plain	Wide	Feather	
SCW 2 100e80n A	2	Silcrete	Flake		10	0.4	9	8	4	Multiple scars	Wide	Feather	
SCW 2 100e80n A	2	Silcrete	Flake		19	1.3	19	12	6	Multiple scars	Focalised	Feather	UW
SCW 2 100e80n A	2	Silcrete	Retouched flake	Backed artefact	8	0.2	6	5	4				Backed artefact tip
SCW 2 100e80n A	2	IMT	Flaked piece		21	0.8		10	3				Heat shattered
SCW 2 100e80n A	3	Silcrete	Shatter		15	0.5		12	3				Potlid
SCW 2 100e80n A	3	Silcrete	Retouched flake	Backed artefact	13	0.2	13	8	2			Feather	Backed artefact whole
SCW 2 100e80n A	3	Silcrete	Flake		8	0.1	8	8	1	Plain	Focalised	Feather	
SCW 2 100e80n B	1	Silcrete	Retouched flake	Backed artefact	14	0.5	14	8	3	Multiple scars	Focalised	Feather	Backed artefact butt
SCW 2 100e80n B	1	Silcrete	Flake		13	0.5	12	11	4	Plain	Wide	Feather	
SCW 2 100e80n B	1	Silcrete	Core		41	27.9		34	25				
SCW 2 100e80n B	2	Silcrete	Flake		16	0.4	16	8	2	Plain	Focalised	Feather	
SCW 2 100e80n B	2	Silcrete	Distal flake		12	0.3	10	7	3			Feather	
SCW 2 100e80n B	2	IMT	Shatter		20	0.7		8	8				Heat shattered
SCW 2 100e80n B	2	IMT	Flaked piece		16	0.6		10	4				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e80n B	3	Silcrete	Flaked piece		18	1.9		16	8				
SCW 2 100e80n B	3	Quartz	Flaked piece		11	0.2		6	4				
SCW 2 100e80n C	1	Silcrete	Flake		27	2.9	21	16	11	Plain	Wide	Feather	Dark from heat alteration
SCW 2 100e80n C	1	Silcrete	Core		29	5.3		18	8				blade core
SCW 2 100e80n C	1	Silcrete	Core		31	5.7		19	14				Flake body
SCW 2 100e80n A	2	Silcrete	Core		29	8.1		22	15				
SCW 2 100e80n C	1	IMT	Flaked piece		19	2.3		16	8				
SCW 2 100e80n C	2	Silcrete	Core		25	7.2		20	17				
SCW 2 100e80n C	2	Silcrete	Core		31	9		24	12				
SCW 2 100e80n C	2	Silcrete	Flake		17	1.2	17	11	6	Plain	Wide	Platform	bipolar
SCW 2 100e80n C	2	Silcrete	Flake		17	0.8	10	11	5	Plain	Wide	Feather	
SCW 2 100e80n C	2	Silcrete	Distal flake		12	0.4	9	10	4			Feather	
SCW 2 100e80n C	2	Silcrete	Distal flake		8	0.2	7	7	3			Feather	
SCW 2 100e80n C	3	Silcrete	Flake		18	0.5	17	12	3	Plain	Wide	Feather	
SCW 2 100e80n C	3	IMT	Flake		20	0.2	20	3	2	Plain	Focalised	Hinge	Dorsal is a retouched edge

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e80n D	1	Silcrete	Flake		33	3.3	24	15	7	Plain	Wide	Feather	
SCW 2 100e80n D	1	Silcrete	Flaked piece		26	5.4		17	12				
SCW 2 100e80n D	1	Silcrete	Flaked piece		22	2.7		20	7				
SCW 2 100e80n D	1	Silcrete	Flaked piece		22	1.9		14	10				
SCW 2 100e80n D	1	Silcrete	Flake		22	2	21	15	7	Plain	Focalised	Feather	
SCW 2 100e80n D	1	IMT	Flake		27	7	24	21	16	Plain	Wide	Feather	
SCW 2 100e80n D	2	Quartzite	Retouched flake	Graver	29	2.4	27	20	8	Shattered	Indeterminate		Distal retouch usewear graver
SCW 2 100e80n D	2	Silcrete	Flake		61	34.9	55	29	20	Plain	Wide	Feather	
SCW 2 100e80n D	2	Silcrete	Core		41	13.9		26	16				
SCW 2 100e80n D	2	Silcrete	Core		38	15.4		28	17				
SCW 2 100e80n D	2	Silcrete	Core		40	8.6		16	10				Flake body
SCW 2 100e80n D	2	Silcrete	Core		28	6.2		21	11				
SCW 2 100e80n D	2	Silcrete	Flaked piece		19	1		12	4				
SCW 2 100e80n D	2	Silcrete	Flaked piece		19	2.1		16	7				
SCW 2 100e80n D	2	Silcrete	Retouched flake	Scraper	27	4.7		15	11				Usewear

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e80n D	2	Silcrete	Medial flake		12	0.3	12	7	2				
SCW 2 100e80n D	2	Silcrete	Flake		20	2	17	15	9	Plain	Wide	Feather	
SCW 2 100e80n D	2	Silcrete	Flake		21	2.2	15	16	7	Plain	Wide	Feather	
SCW 2 100e80n D	2	Silcrete	Flake		16	0.2	16	5	4	Plain	Wide	Feather	Redirecting flake
SCW 2 100e80n D	2	Silcrete	Flake		17	0.3	17	9	2	Shattered	Focalised	Feather	
SCW 2 100e80n D	2	Silcrete	Flaked piece		21	0.6		12	2				
SCW 2 100e80n D	2	Silcrete	Flake		15	0.6	13	11	4	Plain	Wide	Feather	
SCW 2 100e80n D	2	Silcrete	Proximal flake		16	0.3	13	8	2	Cortex	Wide		
SCW 2 100e80n D	2	Silcrete	Flake		15	0.4	15	10	3	Cortex	Wide	Feather	
SCW 2 100e80n D	2	Silcrete	Flaked piece		19	1.5		13	6				
SCW 2 100e80n D	2	Silcrete	Flaked piece		15	0.4		8	4				
SCW 2 100e80n D	2	Silcrete	Flake		15	0.3	12	5	3	Multiple scars	Focalised	Feather	
SCW 2 100e80n D	2	Silcrete	Flaked piece		19								
SCW 2 100e80n D	2	Silcrete	Flaked piece		21	1.5		13	9				Heat shattered
SCW 2 100e80n D	2	Silcrete	Core		18	2.3		14	10				
SCW 2 100e80n D	2	Silcrete	Flake		20	0.5	16	11	2	Plain	Wide	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e80nD	2	Silcrete	Distal flake		17	1.2	12	14	6			Feather	
SCW 2 100e80nD	2	Silcrete	Gravel		14	0.8		10	10				
SCW 2 100e80nD	2	Silcrete	Flake		13	0.4	11	12	3	Plain	Focalised	Step	
SCW 2 100e80nD	2	Silcrete	Flake		13	0.3	8	8	3	Plain	Wide	Feather	
SCW 2 100e80nD	2	Silcrete	Flaked piece		13	0.5		10	3				
SCW 2 100e80nD	2	Silcrete	Flake		14	0.7	14	12	5	Plain	Focalised	Step	
SCW 2 100e80nD	2	Silcrete	Gravel		10	0.4		8	4				
SCW 2 100e80nD	2	Silcrete	Flake		15	0.5	14	9	4	Plain	Focalised	Feather	
SCW 2 100e80nD	2	Silcrete	Retouched flake		13	0.2	12	7	2	Indeterminate	Indeterminate	Feather	usewear or retouch
SCW 2 100e80nD	2	Silcrete	Flake		11	0.2	11	7	3	Plain	Wide	Feather	
SCW 2 100e80nD	2	Silcrete	Flake		13	0.4	11	10	5	Plain	Wide	Feather	
SCW 2 100e80nD	2	Silcrete	Distal flake		10	0.2	8	7	2			Hinge	
SCW 2 100e80nD	2	Silcrete	Flaked piece		15	0.8		9	6				
SCW 2 100e80nD	2	Silcrete	Distal flake		8	0.1	5	5	2			Feather	
SCW 2 100e80nD	2	Silcrete	Flake		12	0.4	11	9	4	Plain	Focalised	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e80nD	2	Silcrete	Flake		11	0.1	11	7	1	Plain	Wide	Feather	
SCW 2 100e80nD	2	Silcrete	Flaked piece		11	0.2		5	3				
SCW 2 100e80nD	2	Silcrete	Flake		10	0.1	5	5	1	Plain	Focalised	Feather	
SCW 2 100e80nD	2	Silcrete	Distal flake		9	0.2	7	9	2				
SCW 2 100e80nD	2	Silcrete	Flake		11	0.2	7	7	4	Plain	Wide	Feather	
SCW 2 100e80nD	2	Silcrete	Proximal flake		10	0.1	8	8	1	Shattered	Indeterminate		
SCW 2 100e80nD	2	Silcrete	Distal flake		9	0.2	9	8	2			Feather	
SCW 2 100e80nD	2	Silcrete	Flake		10	0.1	8	6	2	Plain	Wide	Feather	
SCW 2 100e80nD	2	Silcrete	Flake		10	0.3	8	4	4	Plain	Focalised	Feather	
SCW 2 100e80nD	2	Silcrete	Flake		5	0.1	5	3	1	Plain	Focalised	Feather	
SCW 2 100e80nD	2	Quartz	Flaked piece		12	0.2		4	4				
SCW 2 100e80nD	2	IMT	Proximal flake		32	11.1	17	22	15	Cortex	Wide		Conjoins to 1460
SCW 2 100e80nD	2	IMT	Proximal flake		28	5.4	14	16	11	Cortex	Wide		Heat shattered; conjoins to 1459
SCW 2 100e80nD	2	IMT	Distal flake		31	3.1	21	26	5			Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 100e80nD	2	IMT	Flake		20	0.4	20	6	3	Multiple scars	Focalised	Feather	Classic blade
SCW 2 100e80nD	2	IMT	Medial flake		8	0.1	6	6	1				
SCW 2 120e120nB	2	Silcrete	Medial flake		8	0.2	7	6	4				
SCW 2 120e120nB	2	Quartz	Core		15	1.4		12	8				Bipolar
SCW 2 120e120nB	2	IMT	Flake		16	0.7	13	13	6	Plain	Focalised	Feather	
SCW 2 120e120nB	2	IMT	Shatter		12	0.2		10	2				
SCW 2 120e120nC	1	Silcrete	Flake		15	0.4	14	8	3	Plain	Focalised	Feather	Exotic grey white silcrete
SCW 2 120e120nC	1	Silcrete	Proximal flake		14	0.6	11	10	4	Plain	Wide		conjoins 1470
SCW 2 120e120nC	1	Silcrete	Distal flake		12	0.3	9	9	4			Feather	conjoins 1469
SCW 2 120e120nC	1	Chert	Flaked piece		15	0.8		12	5				
SCW 2 120e120nD	1	Quartz	Flake		13	0.3	11	7	4	Shattered	Indeterminate	Platform	Bipolar flake
SCW 2 120e120nD	2	Quartz	Flake		13	0.3	12	7	4	Shattered	Indeterminate	Feather	
SCW 2 120e120nD	2	IMT	Distal flake		22	0.9	21	8	6			Feather	
SCW 2 120e120nD	2	IMT	Proximal flake		13	0.5	10	12	4	Cortex	Focalised		

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 120e40n A	1	Silcrete	Flaked piece		20	2.7		17	11				Light grey silcrete
SCW 2 120e40n A	1	Silcrete	Distal flake		11	0.3	9	8	3			Feather	retouch/usewear distal
SCW 2 120e40n B	1	Silcrete	Medial flake		19	1.1	18	12	4				
SCW 2 120e40n B	1	Silcrete	Flaked piece		15	1.1		13	7				
SCW 2 120e40n B	1	IMT	Flaked piece		18	0.9		12	5				
SCW 2 120e40n B	1	IMT	Shatter		30	5.7		27	7				Heat shatter
SCW 2 120e40n C	1	Silcrete	Medial flake		14	0.3		7	3				
SCW 2 120e40n C	1	Silcrete	Retouched flake		10	0.3	9	6	4				Medial backed artefact fragment
SCW 2 120e40n C	1	Silcrete	Medial flake		16	0.1	11	11	5				
SCW 2 120e40n C	1	IMT	Proximal flake		12	0.5	9	9	4	Plain	Focalised		
SCW 2 120e40n C	2	Silcrete	Flaked piece		22	4.1		18	11				grey white silcrete
SCW 2 120e40n C	2	Silcrete	Distal flake		14	0.2	14	7	3			Feather	
SCW 2 120e40n D	1	Silcrete	Flake		12	0.2	6	6	3	Plain	Wide	Feather	
SCW 2 120e40n D	1	Quartz	Distal flake		9	0.2	8	8	3			Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
SCW 2 120e80n A	1	IMT	Distal flake		9	0.1	6	6	1			Feather	
SCW 2 120e80n A	2	Silcrete	Shatter		33	3		18	4				
SCW 2 120e80n A	2	Silcrete	Flaked piece		14	0.3		9	3				
SCW 2 120e80n A	2	Silcrete	Flake		14	0.4	11	8	3	Plain	Wide	Feather	
SCW 2 120e80n B	2	Silcrete	Medial flake		17	0.5	12	12	2				
SCW 2 120e80n C	1	Silcrete	Proximal flake		13	0.6	8	11	4	Plain	Wide		
SCW 2 120e80n C	1	Silcrete	Medial flake		12	0.3	6	8	3				
SCW 2 120e80n C	2	Silcrete	Flake		10	0.1	6	7	2	Plain	Wide	Feather	
SCW 2 120e80n C	2	Silcrete	Flake		11	0.2	10	7	3	Shattered	Indeterminate	Feather	
SCW 2 120e80n D	1	Silcrete	Medial flake		26	3	18	15	7				
SCW 2 120e80n D	1	Silcrete	Proximal flake		13	0.4	8	8	5	Plain	Wide		
SCW 2 120e80n D	1	IMT	Distal flake		24	1.4	19	10	5			Hinge	
SCW 2 120e80n D	1	Quartz	Flake		17	1.1	16	10	6	Plain	Wide	Feather	
SCW 2 120e80n D	1	Quartz	Medial flake		7	0.1	7	5	2				
SCW 2 120e80n D	1	IMT	Distal flake		16	0.8	9	11	6				
CCE 2 -120e C	1	Silcrete	Flake		8	0.1	8	5	3	Cortex	Focalised	Feather	

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 100e C	2	Silcrete	Flake		8	0.1	7	7	2	Multiple scars	Focalised	Feather	
CCE 2 Tp404 1 D	1	Quartz	Flake		7	0.1	6	6	2	Shattered	Indeterminate	Platform	bipolar flake
CCE 2 400e C	1	IMT	Proximal flake		21	1.4	21	12	5	Multiple scars	Focalised		heat shatter damage
CCE 2 Tp404 2 B	2	Silcrete	Retouched flake	Backed artefact	24	0.6	24	7	4	Shattered	Indeterminate	Feather	Bondi Point
SCW 1 100e240w A	3	Silcrete	Distal flake		15	0.2	14	10	2			Feather	
KNW 1 300n C	2	Silcrete	Distal flake		10	0.1	4	4	1			Feather	
KNW 1 100e140n D	1	Quartz	Flake		10	0.1	7	7	3	Cortex	Wide	Feather	
KNW 1 Tp233 3 A	2	Silcrete	Retouched flake	Backed artefact	12	0.2	8	6	2			Feather	distal bondi point fragment
BCE 1 Tp224 2 D	2	IMT	Flake		12	0.3	11	11	2	Plain	Wide	Hinge	
CCW 1 160E B	3	IMT	Flaked piece		17	0.5		10	4				
CHRP 1 80e100n B	2	IMT	Flaked piece		17	0.3		10	2				
KCW 1 320e100n D	1	Silcrete	Shatter		19	0.9		14	4				
BCE 1 Tp222 3 B	2	Silcrete	Distal flake		14	0.2	12	8	3			Feather	
BCE 1 Tp222 3 B	2	Silcrete	Medial flake		10	0.1	7	8	2				

Provenance	Spit	RM	Type	Implement	Length	Weight	Oriented length	Width	Thickness	Platform surface	Platform type	Termination	Notes
BCE 1 Tp222 3 A	1	Silcrete	Flake		14	0.5	8	12	4	Plain	Wide	Feather	UW on platform edge = edge rejuvenation flake
SCW 1 100e240n A	2	Silcrete	Medial flake		11	0.3	6	6	3				
SCE 1 100e D	1	Silcrete	Flaked piece		13	0.5		10	7				
SCE 1 100e D	1	Silcrete	Shatter		11	0.2		9	2				
SCE 1 100e D	1	Silcrete	Distal flake		10	0.1		7	2				
SCE 1 100e D	1	Silcrete	Medial flake		8	0.1	7	7	2				
SCW 1 300e0n A	2	Silcrete	Flaked piece		18	2.9		15	11				
SCW 1 120e120n C	2	Quartz	Core		17	2		17	11				Bipolar
SCW 1 140e C	1	Silcrete	Flake		9	0.2	9	7	4	Plain	Focalised	Feather	
SCW 1 120e80n A	2	Silcrete	Distal flake		24	1.1	22	9	5			Feather	
BCE 1 580e C	1	Silcrete	Flaked piece		28	7.1		20	17				Possible silcrete gravel
BCE 1 580e C	1	Silcrete	Flaked piece		25	4.8		18	13				Possible silcrete gravel
BCE 1 580e D	4	IMT	Flake		18	0.4	4	7	4	Plain	Wide	Feather	

Appendix D. Geomorphological report

Geomorphological Assessment of Aboriginal Archaeological Test Excavations Along the Designated Route of the M12 Motorway, New South Wales.

Report to Baker Archaeology

4th September 2018

Sam Player

Geomorphologist

Geoarchaeology & Prospection

ABN 35 112 653 167

12 Hughes Avenue

Lawson, 2783

Email: samplayer@geoprospection.com.au

1 Introduction and Aims

Geoarchaeology & Prospection was commissioned by Baker Archaeology to assess and report on the origin and history of regolith profiles exposed by Aboriginal archaeological testing excavations conducted along the designated route of the M12 motorway. Confirmation of the mode of formation of each site was used to provide interpretative implications for the history of recovered Aboriginal objects.

2 Geomorphology, Geology and Soils

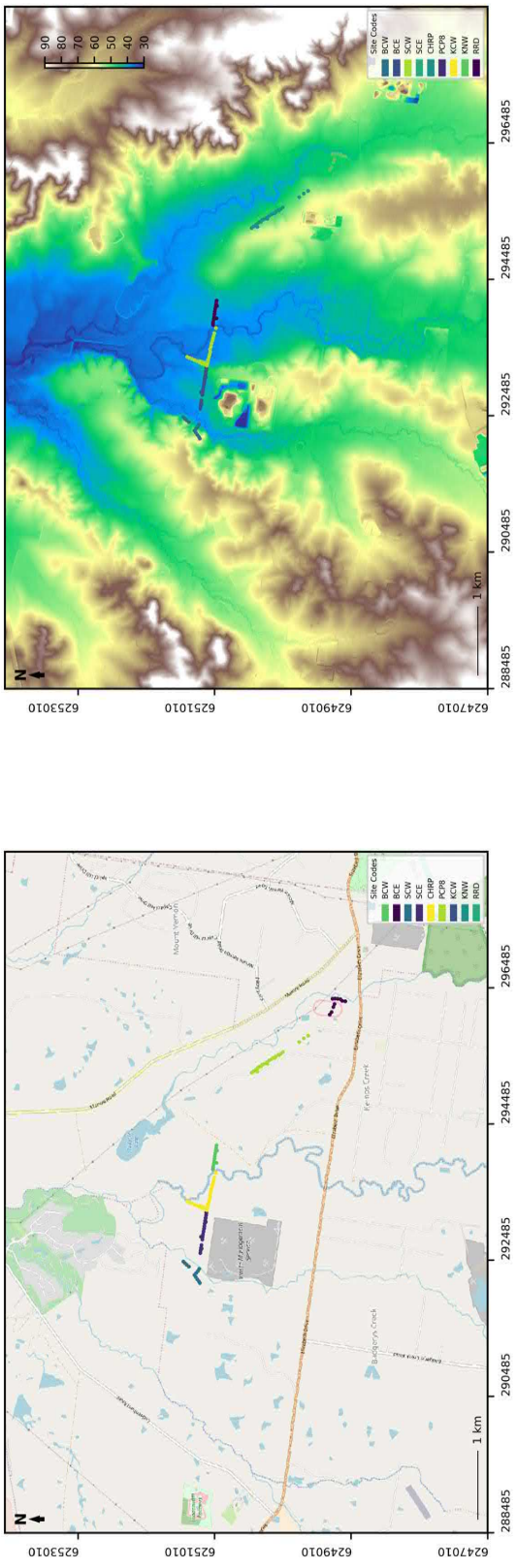
The study area is located within the Cumberland Lowland physiographic region, characterised by undulating to low hilly country situated predominantly on shale (Pain et al., 2011). Excavations were dispersed over a wide range of landforms ranging from level-flat, floodplains and terraces, slopes and crests (Figure 1b).

To the north of the study area published outcrops of the St Marys formation occur, including along the ridge immediately east of South Creek. The formation is composed variously of "silcrete, siliceous sandstone, shale, and transported ironstone clasts, all variably cemented by limonite within a sandy, mottled clay matrix" (D. C. Jones and N. R. Clark, 1987). Shale and sandstone fragments are angular and derived from the Wianamatta Group. Rounded ironstone pisolites and large, subangular silcrete boulders, also occur. It is unlikely that all occurring outcrops are accounted for in the published map and it can be expected that others would occur, particularly to the west of South Creek.

The geological substrate of the slopes and crests around the study area is composed of Bringelly Shale, composed variously of shale, carbonaceous claystone, claystone, laminate, fine to medium-grained lithic sandstone, rare coal and tuff. The major drainage lines are composed of Quaternary sediments composed variously of Fine-grained sand, silt and clay (N. Clark and D. Jones, 1991).

Soils described in the area largely conform to surface morphology and include the Blacktown, Luddenham, Picton, and South Creek soil landscapes. Table 1 describes the general geomorphology, soil characteristics, and integrity of each soil landscape. Each of the Blacktown, Luddenham and Picton soil landscapes are residual (e.g. no deposition of sediments is currently active), whereas the South Creek soil landscape is depositional and potentially preserve stratified archaeological deposits.

D. C. Jones and N. R. Clark (1987) describes the South Creek terraces as comprising up to 8 m of reddish brown clay with interbedded fine sand. Perversely for archaeologists, the clay material is visually indistinguishable from subsoil clays weathered from residual Ashfield and/or Bringelly Shale, although D. C. Jones and N. R. Clark state that laterisation is less well developed. At residual locations, the subsoil clay boundary is commonly taken as the level at which excavation of Aboriginal archaeological objects is stopped. The geological reasoning is such that given the residual character of the substrate, no surface addition of sediments occurs, and so Aboriginal objects can only enter the substrate by initial emplacement on the ground surface followed by biological turbation processes. The turbation processes are predominantly active in the "topsoil" and so further downward movement of Aboriginal objects rarely occurs into the underlying clay-rich "subsoil". In contrast, on the South Creek alluvium, the comparable subsoil clay may in fact be part of a stratum that overlays other archaeological-bearing units. Furthermore, the theoretical basis by which Aboriginal archaeological excavations are stopped at the presence of subsoil clay does not apply to subsoil clay on the South Creek Alluvium, which is depositional rather than residual. The presence of Aboriginal objects within the South Creek Alluvium subsoil clay is entirely feasible, but it is unclear to what extant that has ever been tested.



(a) Location (OpenStreetMap contributors, 2018).

(b) Elevation (Geoscience Australia and Australian Stratigraphy Commission, 2017).

(c) Geology (N. Clark and D. Jones, 1991).

(d) Soil (Bannerman and Hazelton, 1990).

Figure 1: Location, elevation, geology and soil maps relative to the testing sites.

Table 1: Summary of soil landscapes after Bannerman and Hazelton (1990) and Bannerman and Hazelton (1990)

Soil Landscape	*Geomorphology*	*Soil*	*Integrity*
Blacktown	Gently undulating rises on Wianamatta Group shales.	Shallow to moderately deep (<100 cm) hard-setting mottled texture contrast soils, red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines.	No appreciable erosion occurs. Minor sheet and gully erosion may be found where surface vegetation is not maintained.
Luddenham	Undulating to rolling low hills on Wianamatta Group shales.	Shallow <100 cm) dark podzolic soils or massive earthy clays on crests moderately deep red podzolic soils on upper slopes moderately deep (<150 cm) yellow podzolic soils and prairie soils on lower slopes and drainage lines.	High to very high erosion at concentrated flows moderate to very high elsewhere.
Picton	Steep sideslopes on Wianamatta Group shales and colluvial material, usually with a southerly aspect.	Shallow to deep (50–200 cm) red and brown podzolic soils on upper slopes. Brown and yellow podzolic soils on colluvial material. Yellow podzolic soils on lower slopes and in drainage lines.	Slumps and sheet erosion occur throughout. Small discontinuous gullies occur where subsoils are more plastic.
South Creek	Floodplains valley flats and drainage depressions of the channels on the Cumberland Plain. Usually flat with incised channels.	Often deep layered sediments over bedrock or relict soils. Where pedogenesis has occurred structured plastic clays or structured loams in and immediately adjacent to drainage lines red and yellow podzolic soils are most common on terraces with small areas of structured grey clays leached clay and yellow solodic soils.	Dynamic soil landscape with many areas of naturally occurring erosion and deposition. Streambank erosion and sheet erosion of floodplains are common. In depositional phases streams may be partially or completely blocked by sedimentation or vegetated bars.

3 Methods

Desktop terrain analyses were conducted through production of location, elevation, geology and soil maps using in-house scripting tools including geopandas, rasterio and cartopy. Data sources for

each map respectively include OpenStreetMap (OpenStreetMap contributors, 2018), 5 m resolution LiDar-derived DEM (Digital Elevation Model) from Geoscience Australia (Geoscience Australia and Australian Stratigraphy Commission, 2017), geological datasets from the Geological Survey of NSW (N. Clark and D. Jones, 1991), and soil datasets from the NSW Office of Environment and Heritage (OEH) (Bannerman and Hazelton, 1990).

Field inspections were conducted on 4^{th} and 27^{th} April, and the 26^{th} June 2018. Typically at each site the entire range of pits would be observed and representatives of particular profile types described. However, because of the danger of horses and livestock being injured by open test pits, each pit was generally infilled immediately after excavation, making selection of representative profile types problematic. Instead, selection of test pits was made based on topographic variability and/or specific question raised by the filed archaeologists.

At each site surface morphology was observed by pedestrian survey and discussions made with the field archaeologists regarding the physical characteristics of the test pits, and a decision made regarding which pits to describe. Where required, the filled spoil of the pit was removed. The physical characteristics of the profile was documented by photographic record and described using the nomenclature of The National Committee on Soil and Terrain (2009).

4 Results and Discussion

Reporting and discussion of the results from each site is made from west to east.

5 BCW

BCW was located west of the coarse of Badgerys Creek approximately 1.75 km north of Elizabeth Drive. The site spanned two hillcrests flanking and aligned parallel to Badgerys Creek; and the left-bank floodplain of Badgerys Creek. The two hillcrests had been bisected by an erosive second-order ephemeral stream that drained the slopes to the west. The upslope first-order tributaries were branched in a manner that isolated the hillcrests from the dominant rise to the west.

Test pits along the hillcrests were filled but described as being very shallow to a basal clay, consistent with their landscape position on a hillcrest and the mapped substrate of Bringelly Shale and the Blacktown soil landscape. Skeletal and residual regolith profiles such as these would be archaeologically non-stratigraphic and so no formal descriptions were made.

The only contrast to the skeletal soil observed on the hillcrest was Test Pit 0E, which included a relatively thick topsoil composed of sandy loam and gravel. The gravels were subrounded to rounded suggesting water transport and it is likely that the location was a former stream channel. Given the location on a prominant point of the hillcrest, the material is certainly older than the colonisation of Australia and therefore archaeologically residual. Test Pit 0E was therefore non-stratigraphic.

6 BCE

BCE was located across two low rises west of the coarse of Badgerys Creek and approximately 1.75 km north of Elizabeth Drive. Terrain analysis found that the low rises were bisected by an open depression that drained to the north, into South Creek. The substrate of the eastern low rise was mapped as Bringelly Shale and Blacktown soil landscape suggesting that landform was residual. No break of slope could be detected in the upslope topography towards the south; given that the upslope landform was certainly residual, the uninterrupted slope to the eastern low rise at BCE supports the

mapped interpretation. To the north of the eastern low rise, a break of slope was observed where the low rise descends towards the floodplain of South Creek.

The substrate of the western low rise was mapped as Quaternary sediments and South Creek soil landscape suggesting the rise was an alluvial terrace. Terrain analysis found that a potential break of slope with the rises to the south was obscured by landfill operations, however, there was neither a clear break of slope to the north. Instead the low rise continued towards South Creek and abutted it. No trace of the rise could be observed beyond the right-bank of South Creek confirming that the feature was an alluvial terrace.

A range of test pits remained open for observation and selection for formal description was based on questions posed by the field archaeologists. In particular, the short-range change of character of test pits on the eastern rise was of interest.

Test Pit 660E was located on the eastern low rise at BCE. A field description, photographic record and schematic are presented in Figure 2. The profile was composed of brown silt loam (Unit I) overlying red medium clay (Unit II). The properties of units I and II were consistent with the units bt1 and bt2 of the Blacktown soil landscape (Bannerman and Hazelton, 1990). The occurrence of fine nodules in Unit II was not typical but could be explained by proximity to a former floodplain, the alternating wetting/drying process favouring the formation of redoximorphic nodules (Fiedler and Sommer, 2004).

Test Pit 580E was located downslope of Test Pit 660E. A field description, photographic record and schematic are presented in Figure 3. The profile was composed of brown silt loam (Unit I) overlying red medium clay (Unit II); fine nodules were noted to be prolific in the profile. It was likely that the presence of the nodules had caused the materials to become loose; a thickness of 30 cm had been dug into Unit II in comparison to only 10 cm of the corresponding unit of Test Pit 660E. The properties of units I and II were consistent with the units bt1 and bt2 of the Blacktown soil landscape (Bannerman and Hazelton, 1990). The occurrence of fine nodules in Unit II is again not typical; the interpretation made for Test Pit 660E, that the nodules are caused by proximity to the former floodplain, is reinforced given that the quantity of nodules in Test Pit 580E was greater and closer to the former floodplain.

Test Pit 540E was located downslope of Test Pit 660E. A field description, photographic record and schematic are presented in Figure 4. The profile was composed of brown silt loam (Unit I) overlying pale grey silt loam (Unit II) overlying yellow silty clay (Unit III) overlying yellow medium clay (Unit IV); fine nodules were observed in Units I, II and III. The properties could not be definitively matched with units of the South Creek soil landscape, however, the divergence was not significant and should be expected in an alluvial landscape. A reduction of colouring agents was notable towards greys and yellow, in contrast to red colours upslope. The contrast was attributable to an increase in average moisture saturation because of proximity to the former floodplain.

Test Pit 460E was located in the centre of the open-depression bisecting the two low rises, downslope of Test Pit 540E. A field description,photographic record and schematic are presented in Figure 5. The profile was composed of pale grey clay loam (Unit I) overlying pale grey silty clay (Unit II) overlying yellow silty clay loam (Unit III) and yellow silty clay (Unit IV). The properties of units I, II, and III are comparable to sc2 of the South Creek soil landscape, whereas Unit IV is comparable to sc3. Further greying and yellowing of the profile is evident at the lowest and most likely moister position of the topographic profile.

Test pits located on the western low rise that were available for observation were remarkably similar to those already described. At the time of field inspection the similarity of regolith characteristics between the two low rises leant interpretation towards the western low rise also being residual; it was decided therefore not to formally record test pits there given that the site was already well characterised. Subsequent terrain analysis found that interpretation to be incorrect. The eastern

low rise was residual and stratified Aboriginal objects are unlikely to occur. The western low rise, inclusive of the bisecting open-depression was depositional and may preserve stratified Aboriginal objects.

7 SCW

SCW was located on a low rise and a level-flat, approximately 1.65 km north of Elizabeth Drive. The low rise was the northern tip of the same low rise described at site BCW. Here, the landform descended to a faint break of slope at the active floodplain of South Creek. The substrate was mapped as Bringelly Shale and Blacktown soil landscape supporting that the landform was residual. The field archaeologists suspected that a change in geological substrate occurred between the southern and northern part of the low rise. Two test pits were described that were said to show a change in regolith characteristics.

On the level-flat, selection of test pits for formal description was based on capturing the range of observable regolith characteristics in those that remained exposed. On the low rise, selection was based on an apparent change of characteristics between the upslope and downslope test pit. The field archaeologists reported that fine silcrete gravel and ironstone were recovered from test pits excavated within the low rise. Silcrete boulders were also observed laying on the right-bank of South Creek at the eastern end of the site. Each of those materials may be associated with the St Marys formation and would indicate its occurrence nearby. The question was posed as to whether the low rise was the source of St Marys-derived materials.

Test Pit 120N was located on the low rise. A field description, photographic record and schematic is presented in Figure 6. The profile was composed of brown silty clay loam (Unit I) overlying red light medium clay (Unit II) overlying red medium clay (Unit III). Units I and II were comparable to sc2 and sc3 of the Blacktown soil landscape.

Test Pit 160N was located downslope of Test Pit 120N, beyond a faint break of slope. A field description, photographic record and schematic is presented in Figure 7. The profile was composed of brown silty clay loam (Unit I) overlying brown medium clay (Unit II). Units I and II were comparable to sc2 and sc3 of the Blacktown soil landscape.

The regolith characteristics of the downslope test pit diverged from the upslope predominantly by subsoil colour; downslope subsoil colour was brown in contrast to the upslope red. The downslope profile also had slightly thicker topsoil. The simplest explanation is that the downslope test pit has been impacted by floodwaters, reducing its colour from red to brown, and adding minor sediments to its surface. The space between test pits 120N and 160N likely represents the absolute edge of the active South Creek floodplain, rather than a substrate change from St Marys formation.

The observed regolith characteristics on the low rise cannot confirm the presence of St Marys formation as the substrate, although nor can it refute it. The presence of St Marys-derived materials including silcrete and ironstone, exhumed from the test pits, is indicative that the formation occurs in the area, and the occurrence of silcrete boulders at the nearby creek bank is arguably definitive. It should also be noted that test pits described on the same low rise at site BCE reported the presence of fine nodules, or pisoliths, also a feature of the St Marys Formation. However, pisoliths occurring in the St Marys Formation have been interpreted to have been transported there because of the presence of cross-bedding structures (D. C. Jones and N. R. Clark, 1987). If derived from the St Marys Formation, the pisoliths at BCE should therefore also occur in the subsoil, yet they do not and are are discounted as such. Based on the range of evidence, the problem of whether the low rise at SCW, or a location upslope, is composed of St Marys Formation is an archaeological one, given that it must be shown that the silcrete recovered from the test pits are not simply artefacts and/or manuports.

The level-flat was the active left-bank floodplain of South Creek. The substrate was mapped as Quaternary sediments and South Creek soil landscape, supporting the landform as depositional. Variation of regolith characteristics between available test pits on the broader floodplain was not pronounced. However, some difference was noted at the bank of South Creek. To document the variation, formal descriptions were made at one test pit on the floodplain, and one at the bank.

Test Pit 580E was located on the broader and active South Creek floodplain. A field description, photographic record and schematic is presented in Figure 8. The profile was composed of pale yellow silt loam (Unit I) overlying yellow silt loam (Unit II). The units are comparable to unit sc1 of the South Creek soil landscape.

Test Pit 660E was located at the left-bank of South Creek. A field description, photographic record and schematic is presented in Figure 9. The profile was composed of grey silty clay (Unit I) overlying black silty clay (Unit II). The units do not correspond to any typical unit of the South Creek soil landscape.

Test Pit 580E is typical of the South Creek soil landscape and is confirmed as depositional. Aboriginal objects preserved within the landform have a high probability of stratification. However, being the active floodplain of South Creek, Aboriginal sites recovered here would likely be aged only up to a few thousand years. Test Pit 660E diverges from typical characteristics of the South Creek soil landscape because of its position at the immediate left-bank of the channel. Very recent sediments had accumulated there and the wet environment has assisted preservation of the organics, causing its dark colour.

8 SCE

SCE was located on a right-bank terrace of South Creek, approximately 1.65 km north of Elizabeth Drive. The substrate was mapped as Quaternary alluvium and South Creek soil landscape supporting that the landform as depositional. A majority of test pits were available for observation and showed similar characteristics.

Test Pit 220E was located on the level-flat right-bank terrace of South Creek. A field description, photographic record and schematic is presented in Figure 10. The profile was composed of pale brown silty clay loam (Unit I) overlying red medium clay (Unit II). Units I and II were comparable to sc2 and sc3 of the South Creek soil landscape.

Landscape position, published geological maps, and observed regolith characteristics of site SCE all indicate a depositional landform. Preserved Aboriginal objects have a high probability of stratification.

9 KNW

KNW was located on a very gently inclined lower slope flanking the left-bank of Kemps Creek approximately 1.25 km north of Elizabeth Drive, east and parallel to Clifton Avenue. The substrate was mapped as Bringelly Shale and Blacktown soil landscape suggesting the site was residual. The proximity of excavation to Kemps Creek posed the possibility that sediments had been added to the ground surface and that archaeological stratigraphy might exist.

A single test pit was available for observation during the field inspection and described as representative of the site. Test Pit DB300N was located on the very gently inclined lower slope. A field description, photographic record and schematic is presented in Figure 11. The profile was composed of brown silty clay loam (Unit I) overlying yellow loamy sand (Unit II) overlying white loamy sand (Unit III) overlying brown medium clay (Unit IV). The properties of Unit II and Unit

IV were comparable to units sc1 and sc3 of the South Creek Soil Landscape. Unit I was likely to have acquired a darker colour from the improvements from farming activities. Unit III was an eluvial version of Unit II, where colouring agents have been leached by the lateral flow of water over the less permeable clay of Unit IV.

The correspondence of the physical regolith properties observed at site KNW to the South Creek soil landscape shows that the profile was depositional rather than residual in contrast to the mapped interpretation. The potential for Aboriginal objects to occur stratigraphically was high.

10 KCW

KCW was located on a level-flat flanking the left-bank of Kemps Creek approximately 300 m north of Elizabeth Drive, east and parallel to Clifton Avenue. The substrate was mapped as Quaternary alluvium and South Creek soil landscape indicating the site to be depositional.

A single test pit was available for observation during the field inspection and described as representative of the site. Test Pit 340E260N was located on the level-flat approximately 20 m from the left-bank of Kemps Creek. A field description, photographic record and schematic is presented in Figure 12. The profile was composed of brown loamy sand (Unit I) overlying yellow loamy sand (Unit II) overlying white loamy sand (Unit III). The properties of Unit II were comparable to unit sc1 of the South Creek Soil Landscape. Unit I was likely to have acquired a darker colour from improvements by farming activities. Unit III was an eluvial version of Unit II, where colouring agents have been leached by the lateral flow of water over the less permeable clay of Unit IV.

The physical regolith properties observed at site KCW were consistent with the landscape position and mapped substrates and indicate site KCW to have been depositional. Aboriginal objects recovered from the site have a high probability of occurring stratigraphically.

11 RRD

RRD was located on a moderately inclined midslope and spanning an unnamed ephemeral incising stream approximately 250 m south of Elizabeth Drive and 400 m east of the intersection with Mamre Road. The substrate was mapped as Bringelly Shale and Luddenham soil landscape indicating it to be residual. The proximity of test pits to the stream channel posed a possibility that sediments could have contributed to the surface of the site, however, the midslope position of the site made that unlikely.

No distinct surface morphological variation was observed and so a single test pit, Test Pit 100E140N, was selected as representative of the site. Test Pit 100E 140N was located centrally to the distribution of excavation, on the left bank of the incisive stream channel. A field description, photographic record and schematic is presented in Figure 13. The profile was composed of yellow clay loam (Unit I) including common fine redoximorphic nodules overlying red medium clay (Unit II). The properties of units I and II were consistent with units lu2 and lu3 of the Luddenham soil landscape.

The landscape position, mapped substrates, and observed physical properties are consistent with site RRD being developed on a residual landform. No archaeological stratigraphy was likely to occur.

12 PCP8

PCP8 was located on a hillcrest immediately south of Elizabeth Drive and approximately 350 m southwest of the intersection with Duff Road. The substrate was mapped as Bringelly Shale and Luddenham soil landscape indicating the site to have been residual.

A single test pit was available for observation during the field inspection and described as representative of the site. Test Pit 200N was located at the most elevated position of the hillcrest. A field description, photographic record and schematic is presented in Figure 14. The profile was composed of brown fine sandy clay loam (Unit I) overlying red medium clay (Unit II). The properties of units I and II are comparable to units lu1 and lu5 of the Luddenhamsoil landscape.

The physical regolith properties observed at site PCP8 were consistent with the landscape position and mapped substrates and indicate site PCP8 to have been residual. No archaeological stratigraphy was likely to occur.

13 CHRP

CHRP was located on an upper slope and crest adjacent to the M4 motorway and approximately 500 m south of Elizabeth Drive. The substrate was mapped as Bringelly Shale and Picton soil landscape indicating the site to be residual. Two test pits were selected for formal description of the slope and the crest.

Test Pit 100E200N was located on an upper slope. A field description, photographic record and schematic are presented in Figure 15. The profile was composed of brown clay loam (Unit I) overlying red medium clay (Unit II). Units I and II are comparable to pn1 and pn2 of the Picton soil landscape.

Test Pit 100E100N was located on a crest. A field description, photographic record and schematic are presented in Figure 16. The profile was composed of yellow clay loam (Unit I) overlying brown light medium clay (Unit II). Units I and II were comparable to pn1 and pn3 of the Picton soil landscape.

The landscape positions, mapped substrates, and observed regolith characteristics at CHRP all support an interpretation of a residual landform. No stratification of preserved Aboriginal objects was likely to occur.

14 Conclusion

Many test pits sampled along the designated route of the M12 motorway were located on residual regolith. They include, the upslope test pits at BCW, the far eastern upslope pits at BCE, the north-south bearing test pit transect at SCW, and all pits at RRD, PCP8, and CHRP. The archaeological consequence for the listed test pits are that no stratification of Aboriginal objects is possible excepting under exceptional and irregular circumstances.

All other test pits were situated on depositional landforms. They include test pits at BCW, the test pits on the western rise and open depression at BCE, the test pits bearing east-west at SCW, test pits at SCE, potentially all test pits at KNW (if those not observed are similar in character to the representative sample described here), and test pits at KCW. The archaeological consequence for the listed test pits are that Aboriginal objects may occur stratigraphically and therefore be of high scientific value. Within this group test pits of particular interest include DB300N at KNW and 340E260N at KCW. Both these test pits were composed of coarser materials which make them more

reliable for OSL dating, and more likely to have been deposited in more rapid episodes and thereby more likely to preserve the sequence of Aboriginal objects.

While the larger quantity of Aboriginal objects are predominantly found in the upper units, however, the South Creek alluvium poses the problem that buried units within the age-range of human habitation of Australia may occur buried at depth, within or below clay units that are usually used as a trigger to cease excavation. The spatial distribution, stratigraphy, and chronology of such buried units are poorly understood but may preserve Aboriginal objects. It is uncertain what the long-term solution to this problem is given that pursuit of deeper targets would increase the cost of archaeological assessment on the South Creek alluvium exponentially. In the short term, some investment in minor but deep geological test trenches or boreholes during archaeological salvage operations would at least increase our knowledge of the deeper substrate.

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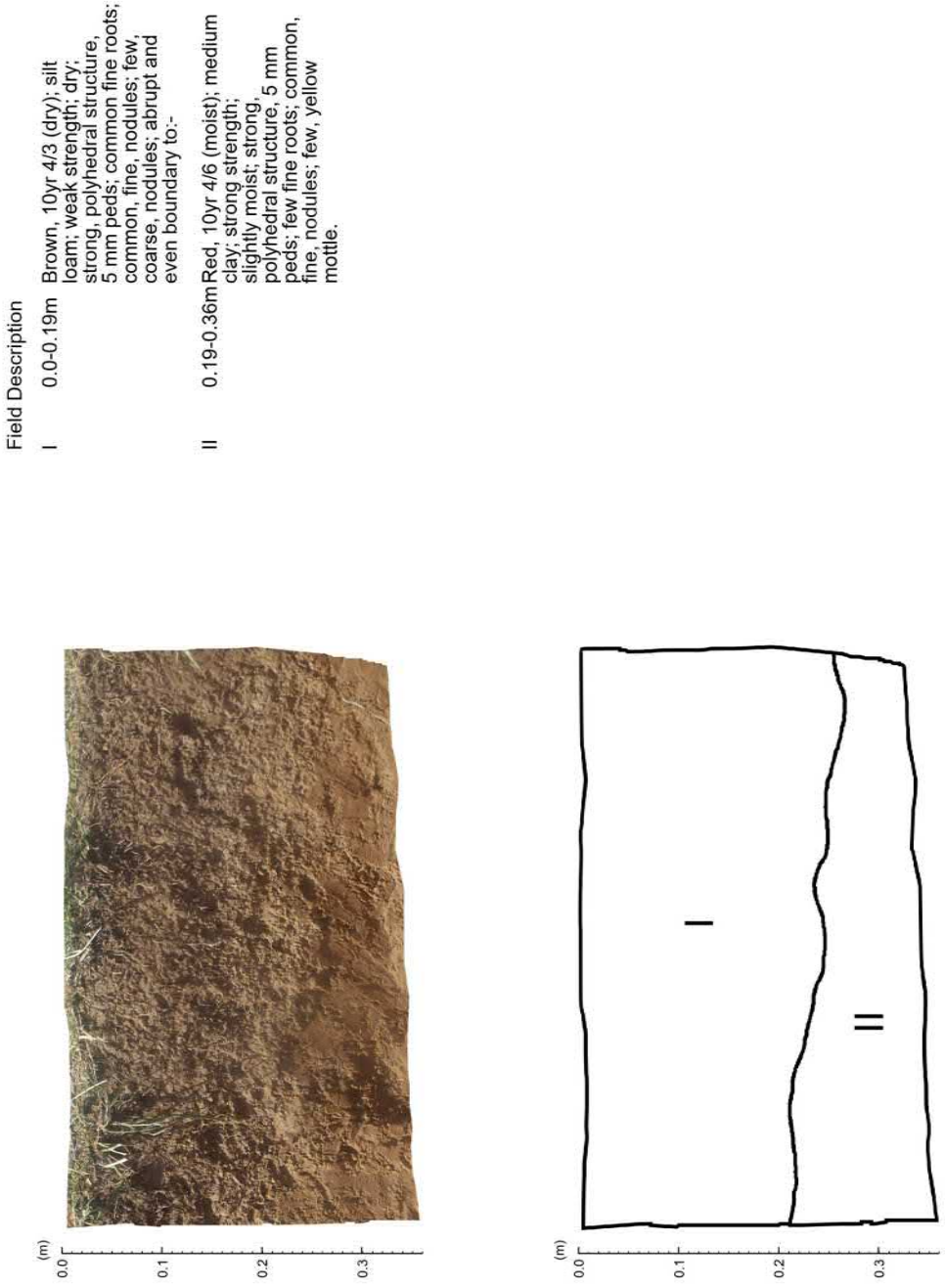

Figure 2: Photographic record, schematic and field description of Test Pit 660E, site BCE.

Field Description

I	0.0-0.21m	Brown, 10yr 4/3 (dry); silt loam; weak strength; dry; strong, crumb structure; few fine roots; many, fine, nodules; clear and even boundary to:-
II	0.21-0.5m	Red, 5yr 4/6 (dry); medium clay; weak strength; dry; strong, polyhedral structure, 5 mm peds; common, fine, nodules.

Figure 3: Photographic record, schematic and field description of Test Pit 580E, site BCE.

Field Description		
I	0.0-0.16m	Brown, 10yr 4/2 (dry); silt loam; weak strength; dry; strong, crumb structure; common fine roots; common, fine, nodules; clear and even boundary to:-
II	0.16-0.28m	Pale grey, 10yr 6/3 (dry); silt loam; moderate strength; dry; massive structure; few fine roots; common, fine, nodules; gradual and even boundary to:-
III	0.28-0.5m	Yellow, 10yr 5/6 (dry); silty clay loam; moderate strength; dry; weak, polyhedral structure, 5 mm peds; common, fine, nodules; clear and even boundary to:-
IV	>0.5	Yellow, 10yr 5/6 (dry); light medium clay; moderate strength; dry; weak, polyhedral structure, 5 mm peds; common, fine, nodules.

Figure 4: Photographic record, schematic and field description of Test Pit 540E, site BCE.

Field Description		
I	0.0-0.16m	Pale grey, 10yr 7/2 (dry); silty clay loam; strong strength; dry; massive structure; few fine roots; clear and even boundary to:-
II	0.16-0.39m	Pale grey, 10yr 7/2 (dry); silty clay loam; strong strength; dry; massive structure; common, fine, orange mottle; few, fine, black mottle; clear and even boundary to:-
III	0.39-0.5m	Yellow, 2.5yr 4/4 (moist); silty clay loam; moderate strength; dry; weak, polyhedral structure, 10 mm peds; few, pale grey mottle; clear and even boundary to:-
IV	>0.5	Yellow, 2.5yr 4/4 (moist); silty clay; moderate strength; dry; massive structure; few, pale grey mottle.

Figure 5: Photographic record, schematic and field description of Test Pit 460E, site BCE.

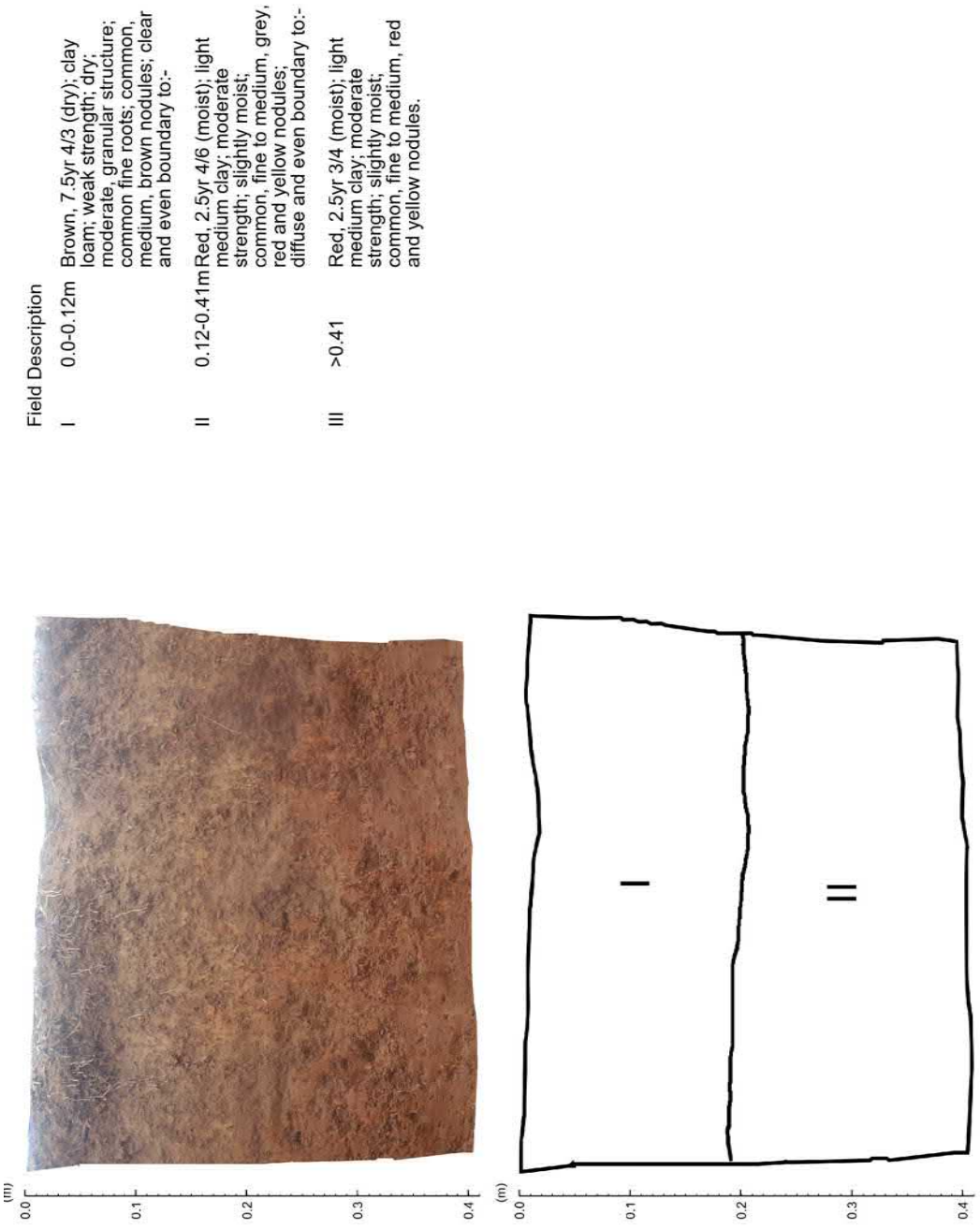

Figure 6: Photographic record, schematic and field description of Test Pit 120N, site SCW.

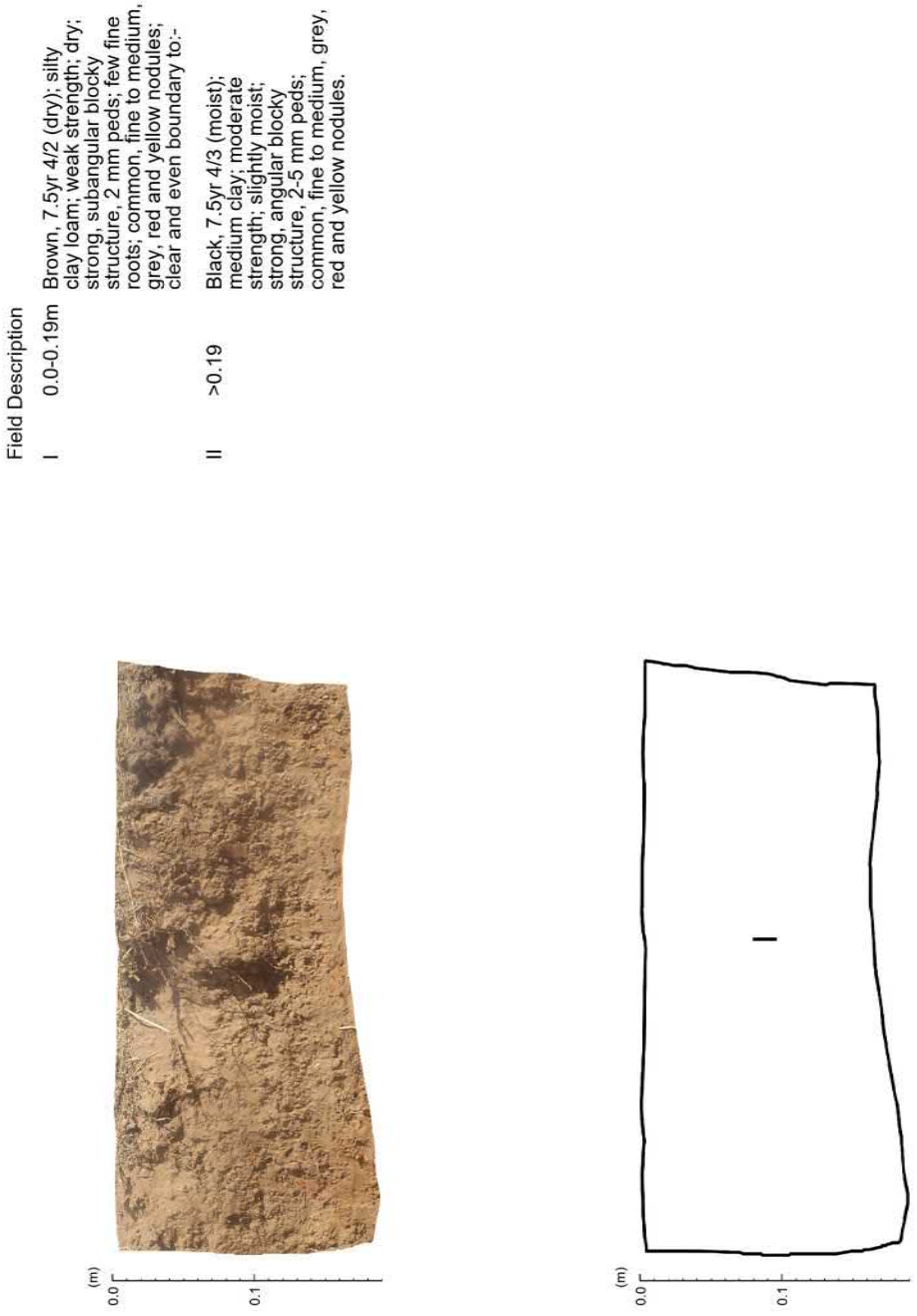

Figure 7: Photographic record, schematic and field description of Test Pit 160N, site SCW.

Field Description

I	0.0-0.04m	Brown, 10yr 4/4 (moist); silt loam; weak strength; dry; granular structure; few, medium, clay coarse fragments; finecommon; many fine roots; few, fine, black nodules; few, fine, red nodules; clear and even boundary to:-
II	0.04-0.51m	Pale yellow, 10yr 6/4 (dry); silt loam; weak strength; dry; single-grain structure; few, medium, clay coarse fragments; finecommon; few, fine, black nodules; few, fine, red nodules; clear and even boundary to:-
III	>0.51	Yellow, 10yr 6/6 (dry); medium clay; weak strength; dry; single-grain structure; very finecommon; orange masses.

Figure 8: Photographic record, schematic and field description of Test Pit 580E, site SCW.

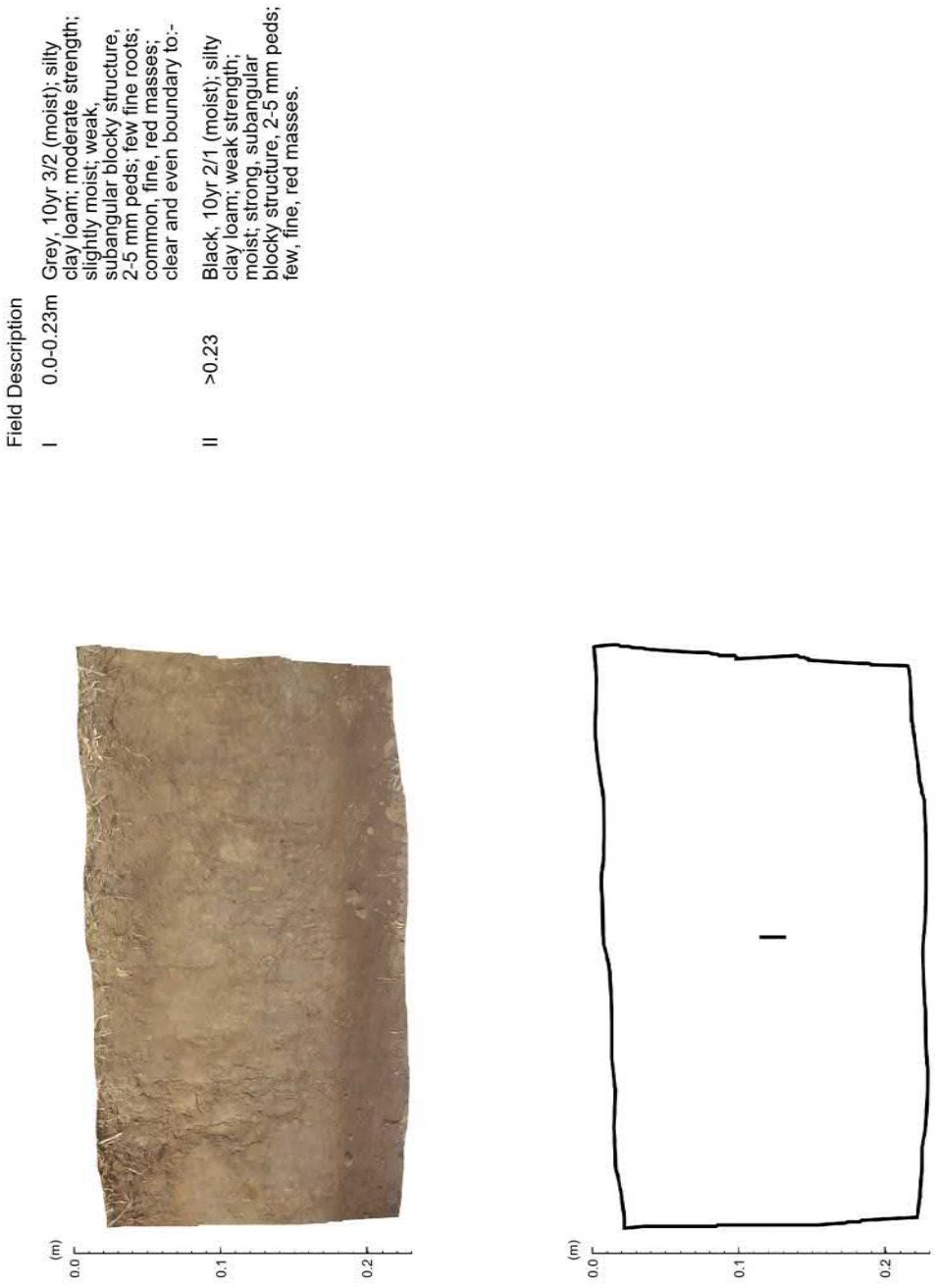

Figure 9: Photographic record, schematic and field description of Test Pit 660E, site SCW.

Figure 10: Photographic record, schematic and field description of Test Pit 220E, site SCE.

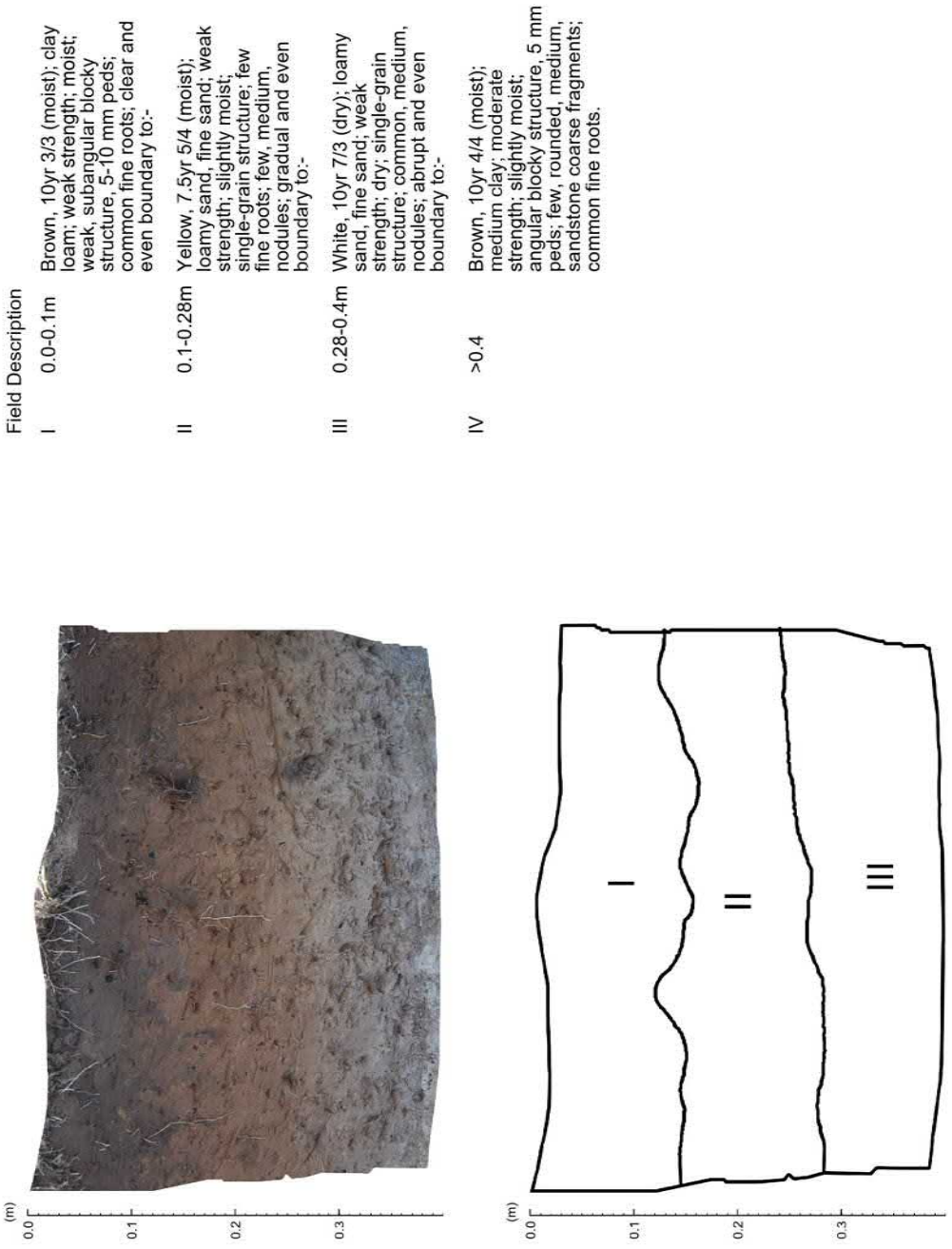

Figure 11: Photographic record, schematic and field description of Test Pit DB300N, site KNW.

Figure 12: Photographic record, schematic and field description of Test Pit 340E260N, site KCW.

Field Description		
I	0.0-0.14m	Yellow, 10yr 5/4 (dry); clay loam; moderate strength; dry; weak, subangular blocky structure, 5-10 mm peds; few fine roots; common, fine, nodules; clear and even boundary to:-
II	>0.14	Red, 5yr 4/3 (moist); medium clay; moderate strength; slightly moist; strong, subangular blocky structure, 5-10 mm peds.

Figure 13: Photographic record, schematic and field description of Test Pit 100E140N, site RRD.

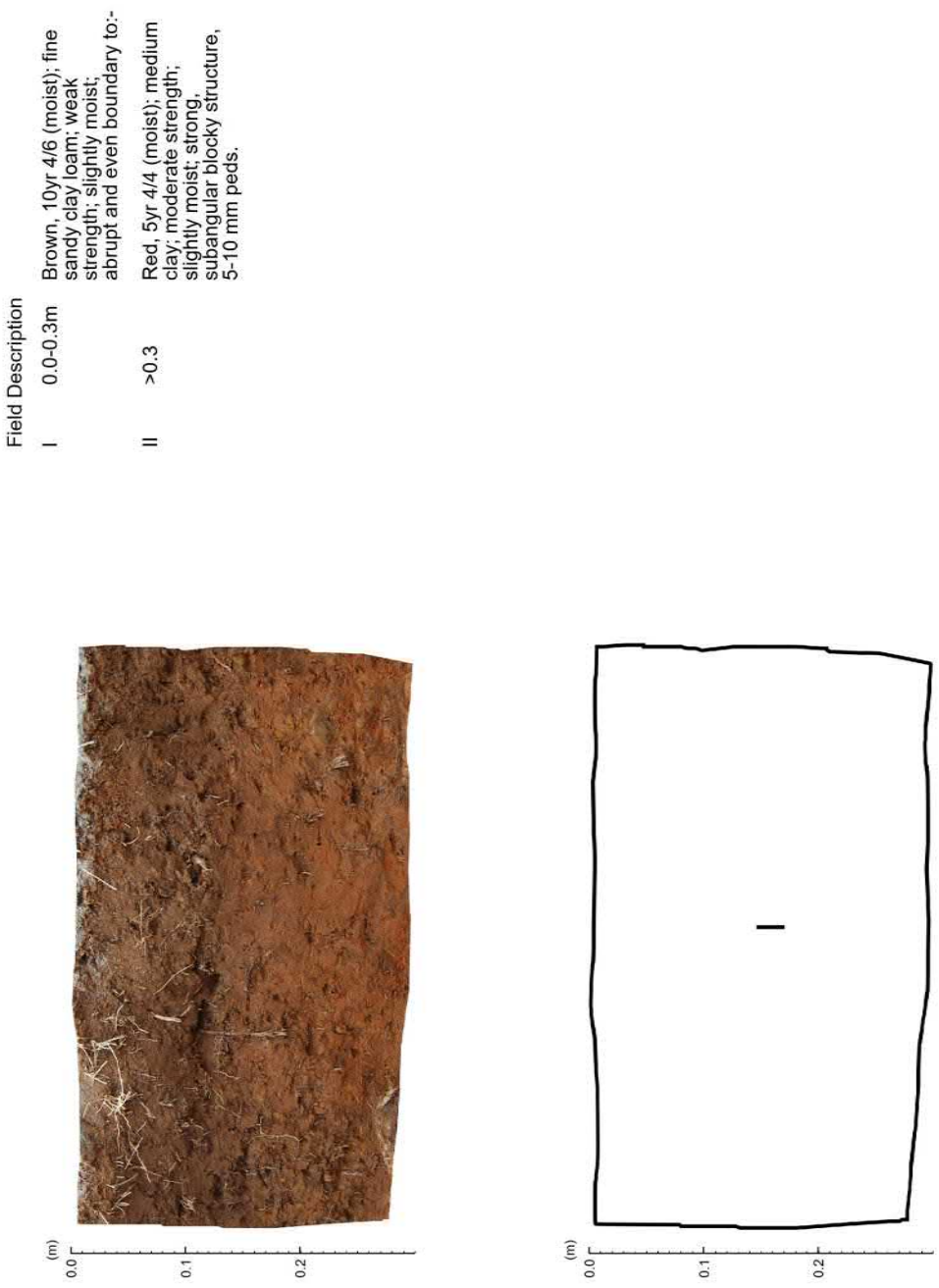

Figure 14: Photographic record, schematic and field description of Test Pit 200N, site PCP8.

Field Description

I	0.0-0.07m	Yellow, 10yr 4/4 (moist); clay loam; weak strength; slightly moist; moderate, subangular blocky structure, 5-10 mm peds; common, yellow masses; abrupt and even boundary to:-
II	0.07-0.22m	Brown, 10yr 3/4 (moist); medium clay; weak strength; slightly moist; strong, structure_type structure, 5-10 mm peds; few fine roots to:-
III	>0.22	Shale.

Figure 15: Photographic record, schematic and field description of Test Pit 100E200N, site CHRP.

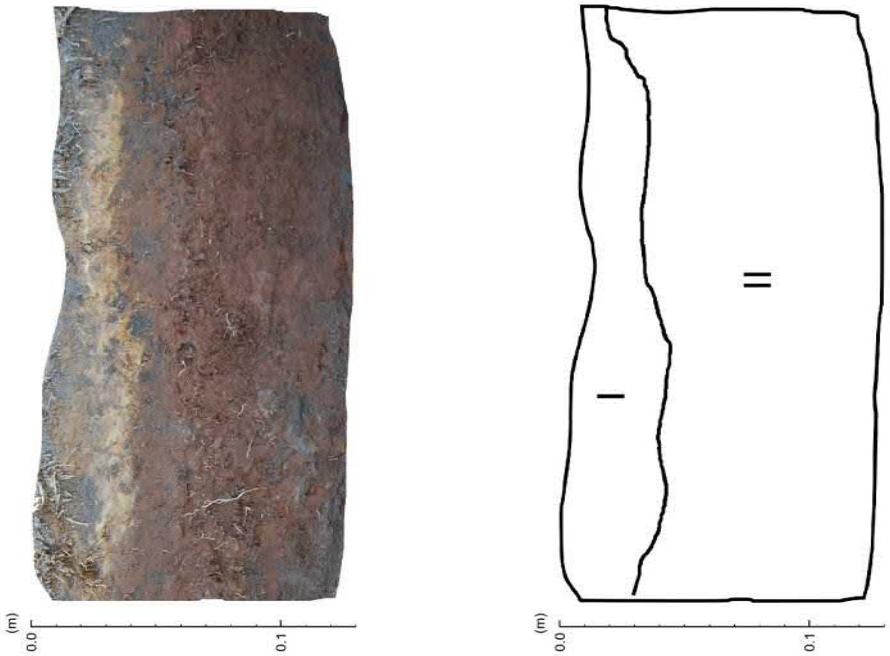

Figure 16: Photographic record, schematic and field description of Test Pit 100E100N, site CHRP.

Appendix E. Fieldwork Calendar

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
21/02/2018	M12- Cosgroves Creek East PAD	Andrew Costello (Senior archaeologist) Deb Farina (Senior Archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Richard Dutton (Goobah) Fred Trewlynn (Darug Land Observations (DLO)) Paul Boyd (Didge Ngunawal Clan (DNC)) Jamie Eastwood (Darug Aboriginal Cultural Heritage Assessments (DACHA)) Rod Hickey (Kawul) Justine Coplin (Darug custodian Aboriginal Corporation (DCAC)) Raymond Adams (Deerubbin Local Aboriginal Land Council (Deerubbin)) Jamie Currell (Kamilaroi Yankuntjatjara Working Group (KYWG)) Arika Jalomari (Warrigal Cultural Services)	Steve Maybury	N/A
22/02/2018	M12- Cosgroves Creek East PAD	Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Jamie Eastwood (DACHA) Justine Coplin (DCAC) Paul Boyd (DNC) Fred Trewlynn (DLO) Rod Hickey (Kawul Cultural Services (Kawul)) Aaron Slater (Warringal Cultural Services) Raymond Adams (Deerubbin) Jamie Currell (KYWG)	Steve Maybury	N/A
23/02/2018	M12- Cosgroves Creek East PAD	Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Rod Hickey (Kawul) Jamie Eastwood (DACHA) Jamie Currell (KYWG) Raymond Adams (Deerubbin) Fred Trewlynn (DLO) Paul Boyd (DNC) Arika Jalomari (Warrigal Cultural Services) Libby Coplin (DCAC)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
27/02/2018	M12- Cosgroves Creek East PAD	Andrew Costello (Senior archaeologist) Deb Farina (Senior Archaeologist) Minoshi Weerasinghe (Graduate Environmental Planner)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Raymond Adams (Deerubbin) Jamie Eastwood (DACHA) Phil Bowey (KYWG) Rod Hickey (Kawul) Paul Boyd (DNC) Carolyn Hickey (Widescope Indigenous Group (WIG)) Steven Hickey (WIG) Richard Dutton (Goobah) Justine Coplin (DCAC) Arika Jalomari (Warrigal Cultural Services) Fred Trewlynn (DLO)	Steve Maybury	N/A
28/02/2018	M12-Cosgroves Creek East (am) and Badgerys Creek West (pm)	Deb Farina (Senior Archaeologist) Minoshi Weerasinghe (Graduate Environmental Planner)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Jamie Eastwood (DACHA) Paul Boyd (DNC) Luke Balaan (DLO) Rod Hickey (Kawul) Aaron Slater (Warringal Cultural Services) Richard Dutton (Goobah) Steven Hickey (WIG) Justine Coplin (DCAC) Raymond Adams (Deerubbin) Phil Bowey (KYWG)	Steve Maybury	Anthony Broekhuyse (Roads and Maritime)
1/03/2018	M12-Badgerys Creek West	Andrew Costello (Senior archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Luke Balaan (DLO) Jamie Eastwood (DACHA) Raymond Adams (Deerubbin) Phil Bowey (WYWG) Justine Coplin (DCAC) Aaron Slater (Warringal Cultural Services) Rod Hickey (Kawul) Richard Dutton (Goobah) Paul Boyd (DNC) Steven Hickey (WIG)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
2/03/2018	M12-Badgerys Creek West (am) and Cosgroves Creek East (pm)	Andrew Costello (Senior archaeologist) Deb Farina (Senior archaeologist) Chelsea Jones (Graduate archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Luke Balaan (DLO) Aaron Slater (Warringal Cultural Services) Rod Hickey (Kawul) Paul Boyd (DNC) Phil Bowey (WYWG) Jamie Eastwood (DACHA) Raymond Adams (Deerubbin) Richard Dutton (Goobah) Steven Hickey (WIG) Libby Coplin (DCAC)	Steve Maybury	N/A
7/03/2018	TNR PAD	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist) Deb Farina (Senior Archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Jamie Eastwood (DACHA) Paul Boyd (DNC) Justine Coplin (DCAC) Rod Hickey (Kawul) Luke Balaan (DLO) Aaron Slater (Warringal Cultural Services) Steven Hickey (WIG) Raymond Adams (Deerubbin) Jamie Currell (KYWG) John Carriage (Goobah)	Steve Maybury	N/A
8/03/2018	TNR PAD (am) and Cosgroves West PAD (pm)	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Paul Boyd (DNC) John Carriage (Goobah) Luke Balaan (DLO) Rod Hickey (Kawul) Steven Hickey (WIG) Justine Coplin (DCAC) Jamie Currell (KYWG) Raymond Adams (Deerubbin) Jamie Eastwood (DACHA)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
9/03/2018	Cosgroves Creek West PAD	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Justine Coplin (DCAC) Shannon Spilstuadi (DCAC) Luke Balaan (DLO) John Carriage (Goobah) Paul Boyd (DNC) Raymond Adams (Deerubbin) Jamie Currell (KYWG) Jamie Eastwood (DACHA) Steven Hickey (WIG) Arika Jalomari (Warrigal Cultural Services) Rod Hickey (Kawul)	Steve Maybury	N/A
12/03/2018	Cosgroves Creek West PAD	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist) Deb Farina (Senior Archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Luke Balaan (DLO) Justine Coplin (DCAC) Steven Hickey (WIG) Jamie Currell (KYWG) Raymond Adams (Deerubbin) John Carriage (Goobah) Arika Jalomari (Warrigal Cultural Services) Mark Pittman (DNC) Rod Hickey (Kawul)	Steve Maybury	N/A
14/03/2018	Cosgroves Creek West	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Jamie Currell (KYWG) Raymond Adams (Deerubbin) Jamie Eastwood (DACHA) Rod Hickey (Kawul) John Carriage (Goobah) Aaron Slater (Warrigal Cultural Services) Luke Balaan (DLO) Steven Hickey (WIG) Mark Pittman (DNC) Justine Coplin (DCAC)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
20/03/2018	Range Road	Chelsea Jones (Graduate archaeologist) Chris Tsiplakis (Graduate archaeologist) Andy Roberts (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Luke Balaan (DLO) Justine Coplin (DCAC) Richard Dutton (Goobah) Jamie Eastwood (DACHA) Raymond Adams (Deerubbin) Rod Hickey (Kawul) Mark Pittman (DNC) Arika Jalomari (Warrigal Cultural Services) Steven Hickey (WIG)	Steve Maybury	N/A
26/03/2018	Badgerys Creek West B	Chelsea Jones (Graduate archaeologist) Chris Tsiplakis (Graduate archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Paul Boyd (DNC) Jamie Eastwood (DACHA) Richard Dutton (Goobah) Steven Hickey (WIG) Justine Coplin (DCAC) Jamie Currell (KYWG) Raymond Adams (Deerubbin) Arika Jalomari (Warrigal Cultural Services) Luke Balaan (DLO) Rod Hickey (Kawul)	Steve Maybury	N/A
27/03/2018	Badgerys Creek West B	Chelsea Jones (Graduate archaeologist) Chris Tsiplakis (Graduate archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Luke Balaan (DLO) Justine Coplin (DCAC) Richard Dutton (Goobah) Steven Hickey (WIG) Paul Boyd (DNC) Rod Hickey (Kawul) Jamie Currell (KYWG) Raymond Adams (Deerubbin) Jamie Eastwood (DACHA)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
28/03/2018	Badgerys Creek West B	Chelsea Jones (Graduate archaeologist) Chris Tsiplakis (Graduate archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Luke Balaan (DLO) Richard Dutton (Goobah) Steven Hickey (WIG) Rod Hickey (Kawul) Aaron Slater (Warrigal Cultural Services) Paul Boyd (DNC) Raymond Adams (Deerubbin) Jamie Eastwood (DACHA) Lana Wedgewood (DCAC)	Steve Maybury	N/A
29/03/2018	Badgerys Creek East	Chelsea Jones (Graduate archaeologist) Chris Tsiplakis (Graduate archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Paul Boyd (DNC) Richard Dutton (Goobah) Rod Hickey (Kawul) Steven Hickey (WIG) Jamie Currell (KYWG) Arika Jalomari (Warrigal Cultural Services) Libby Coplin (DCAC)	Steve Maybury	N/A
3/04/2018	Badgerys Creek East	Chelsea Jones (Graduate archaeologist) Chris Tsiplakis (Graduate archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Jamie Eastwood (DACHA) Steven Hickey (WIG) John Carriage (Goobah) Luke Balaan (DLO) Rod Hickey (Kawul) Justine Coplin (DCAC) Mark Pittman (DNC) Jamie Currell (KYWG) Raymond Adams (Deerubbin)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
4/04/2018	Badgerys Creek East	Chelsea Jones (Graduate archaeologist) Chris Tsiplakis (Graduate archaeologist)	Neville Baker Nestor Nicola Michael Murray	Justine Coplin (DCAC) Rod Hickey (Kawul) Steven Hickey (WIG) John Carriage (Goobah) Luke Balaan (DLO) Jamie Eastwood (DACHA) Mark Pittman (DNC) Raymond Adams (Deerubbin) Aaron Slater (Warrigal Cultural Services) Jamie Currell (KYWG)	Steve Maybury	N/A
5/04/2018	Badgerys Creek East	Chelsea Jones (Graduate archaeologist) Chris Tsiplakis (Graduate archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Luke Balaan (DLO) John Carriage (Goobah) Jamie Currell (KYWG) Steven Hickey (WIG) Jamie Eastwood (DACHA) Mark Pittman (DNC) Rod Hickey (Kawul) Aaron Slater (Warrigal Cultural Services) Lana Wedgewood (DCAC)	Steve Maybury	N/A
6/04/2018	Badgerys Creek East	Chelsea Jones (Graduate archaeologist) Chris Tsiplakis (Graduate archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Jamie Eastwood (DACHA) Jamie Currell (KYWG) Luke Balaan (DLO) Rod Hickey (Kawul) John Carriage (Goobah) Steven Hickey (WIG) Mark Pittman (DNC) Aaron Slater (Warrigal Cultural Services) Libby Coplin (DCAC)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
9/04/2018	Badgerys Creek East	Chelsea Jones (Graduate archaeologist) Deb Farina (Senior archaeologist) Chris Tsiplakis (Graduate archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Justine Coplin (DCAC) Jamie Eastwood (DACHA) Richard Dutton (Goobah) Steven Hickey (WIG) Luke Balaan (DLO) Jamie Currell (KYWG) Rod Hickey (Kawul)	Steve Maybury	N/A
10/04/2018	Badgerys Creek East	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist) Deb Farina (Senior archaeologist) Chris Tsiplakis (Graduate archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Justine Coplin (DCAC) Mark Pittman (DNC) Richard Dutton (Goobah) Steven Hickey (WIG) Rod Hickey (Kawul) Luke Balaan (DLO) Jamie Eastwood (DACHA) Jamie Currell (KYWG)	Steve Maybury	N/A
11/04/2018	Badgerys Creek East	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Luke Balaan (DLO) Jamie Eastwood (DACHA) Jonathan Whitton (DALC) Mark Pittman (DNC) Aaron Slater (Warrigal Cultural Services) Jamie Currell (KYWG) Rod Hickey (Kawul) Richard Dutton (Goobah) Justine Coplin (DCAC) Steven Hickey (WIG)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
12/04/2018	South Creek West	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Mark Pittman (DNC) Aaron Slater (Warrigal Cultural Services) Rod Hickey (Kawul) Richard Dutton (Goobah) Steven Hickey (WIG) Lana Wedgewood (DCAC) Luke Balaan (DLO) Jamie Eastwood (DACHA) Raymond Adams (Deerubbin) Jamie Currell (KYWG) Jamie Eastwood (DACHA)	Steve Maybury	N/A
13/04/2018	South Creek West	Chelsea Jones (Graduate archaeologist) Deb Farina (Senior archaeologist) Chris Tsiplakis (Graduate archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Luke Balaan (DLO) Raymond Adams (Deerubbin) Jamie Eastwood (DACHA) Steven Hickey (WIG) Jamie Currell (KYWG) Rod Hickey (Kawul) Richard Dutton (Goobah) Mark Pittman (DNC) Libby Coplin (DCAC)	Steve Maybury	N/A
16/04/2018	South Creek West	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Nestor Nicola Michael Murray	John Carriage (Goobah) Paul Boyd (DNC) Raymond Adams (Deerubbin) Luke Balaan (DLO) Jamie Currell (KYWG) Justine Coplin (DCAC) Steven Hickey (WIG) Vicky Slater (KCS) Arika Jalomari (Warrigal Cultural Services)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
17/04/2018	South Creek West	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Nestor Nicola Michael Murray	Justine Coplin (DCAC) Jamie Currell (KYWG) Raymond Adams (Deerubbin) Luke Balaan (DLO) John Carriage (Goobah) Jamie Eastwood (DACHA) Steven Hickey (WIG) Arika Jalomari (Warrigal Cultural Services) Vicky Slater (KCS) Paul Boyd (DNC)	Steve Maybury	N/A
18/04/2018	South Creek West	Chelsea Jones (Graduate archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Raymond Adams (Deerubbin) Luke Balaan (DLO) John Carriage (Goobah) Jamie Eastwood (DACHA) Steven Hickey (WIG) Jamie Currell (KYWG) Justine Coplin (DCAC) Vicky Slater (KCS) Paul Boyd (DNC)	Steve Maybury	N/A
19/04/2018	South Creek West (am) and South Creek East (pm)	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Luke Balaan (DLO) Vicky Slater (Kawul) Steven Hickey (WIG) Jamie Eastwood (DACHA) Aaron Slater (Warrigal Cultural Services) Lana Wedgewood (DCAC) John Carriage (Goobah) Mark Pittman (DNC) Jamie Currell (KYWG)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
20/04/2018	South Creek East	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Nestor Nicola Michael Murray	Luke Balaan (DLO) Steven Hickey (WIG) Jamie Eastwood (DACHA) John Carriage (Goobah) Mark Pittman (DNC) Vicky Slater (Kawul) Aaron Slater (Warrigal Cultural Services) Jamie Currell (KYWG) Libby Coplin (DCAC)	Steve Maybury	N/A
23/04/2018	South Creek East	Chelsea Jones (Graduate archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Luke Balaan (DLO) Raymond Adams (Deerubbin) Mark Pittman (DNC) Steven Hickey (WIG) Jamie Eastwood (DACHA) Richard Dutton (Goobah) Justine Coplin (DCAC) Vicky Slater (KCS) Aaron Slater (Warrigal Cultural Services) Jamie Currell (KYWG)	Steve Maybury	N/A
24/04/2018	South Creek East	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Nestor Nicola Michael Murray	Luke Balaan (DLO) Jamie Eastwood (DACHA) Richard Dutton (Goobah) Justine Coplin (DCAC) Jamie Currell (KYWG) Mark Pittman (DNC) Aaron Slater (Warrigal Cultural Services) Arika Jalomari (Warrigal Cultural Services) Jonathan Whitton (DALC) Steven Hickey (WIG)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
26/04/2018	South Creek East	Chelsea Jones (Graduate archaeologist) Deb Farina (Senior archaeologist)	Gary Dunnett Nestor Nicola Michael Murray	Luke Balaan (DLO) Jamie Eastwood (DACHA) Rod Hickey (Kawul) Jonathan Whitton (DALC) Richard Dutton (Goobah) Justine Coplin (DCAC) Jamie Currell (KYWG) Mark Pittman (DNC) Steven Hickey (WIG)		N/A
27/04/2018	South Creek East (am) and Kemps Creek West (pm)	Chelsea Jones (Graduate archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Luke Balaan (DLO) Steven Hickey (WIG) Aaron Slater (Warrigal Cultural Services) Jamie Eastwood (DACHA) Rod Hickey (Kawul) Mark Pittman (DNC) Richard Dutton (Goobah) Jamie Currell (KYWG) Jonathan Whitton (DALC) Libby Coplin (DCAC)	Steve Maybury	N/A
30/04/2018	Kemps Creek West	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Justine Coplin (DCAC) Aaron Slater (Warrigal Cultural Services) Luke Balaan (DLO) Jamie Currell (KYWG) John Carriage (Goobah) Jamie Eastwood (DACHA) Jonathan Whitton (DALC) Steven Hickey (WIG) Rod Hickey (Kawul) Mark Pittman (DNC)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
1/05/2018	Kemps Creek West	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Steven Hickey (WIG) John Carriage (Goobah) Aaron Slater (Warrigal Cultural Services) Rod Hickey (Kawul) Mark Pittman (DNC) Luke Balaan (DLO) Jamie Currell (KYWG) Jonathan Whitton (DALC) Jamie Eastwood (DACHA) Justine Coplin (DCAC)	Steve Maybury	N/A
2/05/2018	Kemps Creek West (am) and Kemps Creek East (pm)	Chelsea Jones (Graduate archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	John Carriage (Goobah) Rod Hickey (Kawul) Mark Pittman (DNC) Jamie Currell (KYWG) Luke Balaan (DLO) Aaron Slater (Warrigal Cultural Services) Jonathan Whitton (DALC) Jamie Eastwood (DACHA) Steven Hickey (WIG) Lana Wedgewood (DCAC)	Steve Maybury	N/A
3/05/2018	Kemps Creek East	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Mark Pittman (DNC) Steven Hickey (WIG) Jamie Currell (KYWG) Luke Balaan (DLO) Jamie Eastwood (DACHA) John Carriage (Goobah) Jonathan Whitton (DALC) Lana Wedgewood (DCAC) Rod Hickey (Kawul) Aaron Slater (Warrigal Cultural Services)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
4/05/2018	Kemps Creek East	Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Rod Hickey (Kawul) Steven Hickey (WIG) Mark Pittman (DNC) Jamie Eastwood (DACHA) Jonathan Whitton (DALC) Luke Balaan (DLO) Jamie Currell (KYWG) Aaron Slater (Warrigal Cultural Services) Libby Coplin (DCAC)	Steve Maybury	N/A
7/05/2018	WSP Parklands	Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Paul Boyd (DNC) Luke Balaan (DLO) Jamie Currell (KYWG) Jonathan Whitton (DALC) Jamie Eastwood (DACHA) Aaron Slater (Warrigal Cultural Services) Steven Hickey (WIG) Rod Hickey (Kawul) Libby Coplin (DCAC)	Steve Maybury	N/A
8/05/2018	WSP Parklands	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Aaron Slater (Warrigal Cultural Services) Steven Hickey (WIG) Mark Pittman (DNC) Rod Hickey (Kawul) Jonathan Whitton (DALC) Jamie Currell (KYWG) Luke Balaan (DLO) Jamie Eastwood (DACHA) Justine Coplin (DCAC) Richard Dutton (Goobah)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
9/05/2018	WSP Parklands	Chelsea Jones (Graduate archaeologist) Deb Farina (Senior archaeologist)	Neville Baker Gary Dunnett Nestor Nicola Michael Murray	Rod Hickey (Kawul) Aaron Slater (Warrigal Cultural Services) Steven Hickey (WIG) Luke Balaan (DLO) Jamie Eastwood (DACHA) Jamie Currell (KYWG) Richard Dutton (Goobah) Justine Coplin (DCAC)	Steve Maybury	N/A
10/05/2018	WSP Parklands and pack up at Mellish	Chelsea Jones (Graduate archaeologist)	Neville Baker Gary Dunnett	Justine Coplin (DCAC)	Steve Maybury	N/A
4/06/2018	Kemps Creek North West	Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Michael Murray	Luke Balaan (DLO) Jamie Currell (KYWG) Paul Boyd (DNC) Jamie Eastwood (DACHA) Richard Dutton (Goobah) Rod Hickey (Kawul) Steven Hickey (WIG) Justine Coplin (DCAC)	Steve Maybury	N/A
7/06/2018	Kemps Creek North West	Deb Farina (Senior archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Michael Murray	Steven Hickey (WIG) Jamie Currell (KYWG) Luke Balaan (DLO) Richard Dutton (Goobah) Jamie Eastwood (DACHA) Justine Coplin (DCAC) Rod Hickey (Kawul) Paul Boyd (DNC	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
8/06/2018	Kemps Creek North West	Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett Michael Murray	Luke Balaan (DLO) Jamie Currell (KYWG) Steven Hickey (WIG) Paul Boyd (DNC) Richard Dutton (Goobah) Jonathan Whitton (DALC) Jamie Eastwood (DACHA) Rod Hickey (Kawul) Justine Coplin (DCAC) Aaron Slater (Warrigal Cultural Services)	Steve Maybury	N/A
21/06/2018	Cosgroves Creek East	Chelsea Jones (Graduate archaeologist)	Neville Baker Gary Dunnett	Lana Wedgewood (DCAC) Steven Hickey (WIG) Richard Dutton (Goobah) Jamie Currell (KYWG) Raymond Adams (Deerubbin) Paul Boyd (DNC) Luke Balaan (DLO) Rod Hickey (Kawul) Aaron Slater (Warrigal Cultural Services)	Steve Maybury	N/A
22/06/2018	Cosgroves Creek East	Chelsea Jones (Graduate archaeologist)	Neville Baker Gary Dunnett	Steven Hickey (WIG) Richard Dutton (Goobah) Rod Hickey (Kawul) Raymond Adams (Deerubbin) Jamie Currell (KYWG) Luke Balaan (DLO) Paul Boyd (DNC) Aaron Slater (Warrigal Cultural Services) Libby Coplin (DCAC)	Steve Maybury	N/A

Dates	PAD/site	Jacobs archaeologists	Baker Archaeologists	RAPs	Water Cart	Other personnel
25/06/2018	Kemps Creek North West	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett	Jamie Currell (KYWG) Jamie Eastwood (DACHA) Raymond Adams (Deerubbin) Richard Dutton (Goobah) Luke Balaan (DLO) Paul Boyd (DNC) Justine Coplin (DCAC) Lana Wedgewood (DCAC) Rod Hickey (Kawul) Steven Hickey (WIG)	Steve Maybury	N/A
26/06/2018	Kemps Creek North West	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett	Luke Balaan (DLO) Raymond Adams (Deerubbin) Jamie Currell (KYWG) Jamie Eastwood (DACHA) Richard Dutton (Goobah) Aaron Slater (Warrigal Cultural Services) Rod Hickey (Kawul) Steven Hickey (WIG) Lana Wedgewood (DCAC) Paul Boyd (DNC) Libby Coplin (DCAC)	Steve Maybury	N/A
27/06/2018	Kemps Creek North West	Chelsea Jones (Graduate archaeologist) Andrew Costello (Senior archaeologist)	Neville Baker Gary Dunnett	Paul Boyd (DNC) Jamie Eastwood (DACHA) Raymond Adams (Deerubbin) Jamie Currell (KYWG) Luke Balaan (DLO) Richard Dutton (Goobah) Lana Wedgewood (DCAC) Steven Hickey (WIG) Aaron Slater (Warrigal Cultural Services) Rod Hickey (Kawul) Libby Coplin (DCAC)	Steve Maybury	N/A

Appendix F. AHIMS Site Cards

REDACTED FOR PUBLIC EXHIBITION
DUE TO SENSITIVITY OF INFORMATION

www.rms.nsw.gov.au/m12
m12motorway@rms.nsw.gov.au

1800 517 155

Roads and Maritime Services
PO Box 973
Parramatta NSW 2124

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