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14 June 2018

Mr Sean Porter
Development Manager
Lend Lease
Level 2, 88 Phillip Street
PARRAMATTA NSW 2150

Our Ref: 16-0301bspc1

Re: Regional Detention Basin I—Response to Secretary's Environmental Assessment Requirements (SEARs No. 1174)—Aboriginal Cultural Heritage

Dear Mr Porter,

GML Heritage Pty Ltd (GML Heritage) has been engaged by Maryland Development Company Pty Ltd (MDC) (a trading entity of Lend Lease) to provide heritage services in regard to the management of Aboriginal heritage as part of the proposed Regional Detention Basin I (Basin I) project. This letter is intended to form part of the Environmental Impact Statement (EIS) required to be summitted in response to the Secretary's Environmental Assessment Requirements (SEARs No. 1174) for this project. The key issues to be address in the EIS include an assessment of all potential impacts to Aboriginal cultural heritage arising from the proposal being considered.

The Basin I project forms part of the St Marys Development Site (SMDS) redevelopment that has involved extensive Aboriginal heritage assessments and community consultation over the past 20 years. The MDC has been proactive in its management for Aboriginal heritage; to the effect that it engaged GML Heritage to prepare a desktop assessment for Basin I in October 2016 (Attachment A). The GML Heritage baseline assessment included a review of previous work within the SMDS and provided an initial assessment of potential impacts of the Basin I project on Aboriginal heritage. The desktop assessment concluded that the proposed location for Basin I has the potential to contain Aboriginal archaeological objects that may be impacted by the proposal and recommended that further measures be undertaken to manage these impacts. It was identified that further intangible values could be connected with the area—although this required Aboriginal community consultation to confirm the connection to the wider cultural landscape of the SMDS.

To manage Lend Lease's responsibilities in accordance with the *National Parks and Wildlife Act 1974* (NSW) (NPW Act) and the NSW Office of Environment and Heritage (OEH) guidelines for Aboriginal Heritage, GML Heritage has been engaged by the MDC to undertake the following:

- Aboriginal community consultation in accordance with the OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents,* 2010. This process was initiated in February 2018 and GML Heritage have recently supplied the Registered Aboriginal Parties (RAPs) with the

project methodology for their review in accordance with Stage 2 Step 1 of the guidelines (Attachment B).

- Preparation of an Archaeological Research Design to facilitate test excavation in accordance with the OEH *Code of Practice for Archaeological Investigation of Aboriginal objects in NSW*, 2010. A program of archaeological test excavation is currently scheduled to occur in July/August 2018.
- Preparation of an Aboriginal Cultural Heritage Assessment Report (ACHAR) in accordance with Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW that would include the results of the Aboriginal community consultation.

The tasks outlined above are intended to support an application for an Aboriginal Heritage Impact Permit (AHIP) under Section 90 of the NPW Act. Submission of an AHIP requires development consent in accordance with Part 4 of the *Environmental Planning and Assessment Act 1979* (NSW).

Should you require any further information or clarification on any of the points detailed above, I would be happy to assist and can be contacted on 9319 4811 or sophiej@gml.com.au.

Yours sincerely
GML Heritage Pty Ltd

Sophie Jennings
Heritage Consultant, Archaeologist

Attachments:

- Attachment A—ADI Site St Marys: Basin B and I, Aboriginal Archaeology Assessment, October 2016
- Attachment B—Regional Detention Basin I, SMDS, Archaeological and Cultural Assessment Methodology, Draft Report, June 2018

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GML Heritage Pty Ltd
ABN 60 001 179 362

28 October 2016

Mr Sean Porter
Development Manager, NSW / ACT Communities
Level 2, 88 Phillip Street
Parramatta NSW 2150

Our Ref: 16-0301spc1

Re: ADI Site St Marys: Basin B and I, Aboriginal Archaeology Assessment

Dear Mr Porter,

Lend Lease is proposing to construct two water quality basins, referred to in this document as Basin B and Basin I (Figure 1), within the former St Marys Development Site (SMDS). One basin is located within the Central Precinct and the other within the future Regional Park.

GML Heritage (GML) has been commissioned by Lend Lease to provide a letter outlining the status of relevant Aboriginal heritage management requirements to accompany a Development Application (DA) for the construction of the two proposed water quality basins.

GML has undertaken a review of previous Aboriginal heritage work associated with the proposed basin locations to assist Lend Lease. This letter details the statutory requirements and responsibilities relating to Aboriginal heritage in connection with the two basins.

The review has sought to identify whether the proposed basins are located in areas already covered by existing approvals and/or archaeological works previously completed by GML + Jo McDonald Cultural Heritage Management Pty Ltd (JMcDCHM). Where it has been determined that previous archaeological works have not occurred, a preliminary assessment of the environmental and historical context of the location(s) has been conducted with the aim of determining the presence/absence of intact soil deposits which may require test excavation under the Office of Environment and Heritage (NSW) (OEH) Code of Practice. As part of this research a field inspection of the proposed Basin I was undertaken to assess the current site conditions.

The outcomes of this review are detailed below. Recommendations for the need for further archaeological work necessary to obtain the statutory permits has been outlined.

Existing Approvals

Basin B—Central Precinct Aboriginal Heritage Impact Permit No. C0000362

An area-wide Aboriginal Heritage Impact Permit (AHIP), issued under Section 90 of the *National Parks and Wildlife Act* 1974, (NPW Act) for the Central Precinct was issued by OEH on 5 June 2014 and remains valid for 15 years

(until 5 June 2029). The AHIP authorises the undertaking of salvage excavations, community collections and harm to certain Aboriginal objects through the proposed works.

Basin B is located within the boundary of this AHIP and is shown on Figure 2.

Basin I

Basin I is located outside the boundary of any existing AHIP, which have been previously granted within the SMDS.

Previous Archaeological Investigations

Basin B

Basin B is situated in the northern extent of the Central Precinct (now Jordan Springs). Extensive archaeological work has been undertaken within this area since 1997 including two phases of work within the Central Precinct which incorporate the proposed location for Basin B. The first phase of work was completed between 21 August and 8 December 2014 which involved a program of surface artefact collection with Aboriginal representatives. This work covered the southeastern third of the proposed Basin footprint. A second phase of work undertaken between 27 April and 16 June 2016 comprised monitoring of topsoil stripping by Aboriginal representatives and included the remainder of the Basin footprint. As these archaeological investigations covered all of the Basin B footprint, no further archaeological works are required within this location prior to the proposed works being undertaken.

Basin I

There have been no previous archaeological investigations undertaken within the proposed location of Basin I.

Strategic Management Model

As part of the earlier phases of archaeological assessments completed for the entire SMDS a predictive model was developed for the entire area including Basin I. The Strategic Management Model (SMM) developed by JMcDCHM between 1994 and 2000 was intended to enable better management of Aboriginal cultural heritage across the entire site by identifying differing zones of archaeological potential to guide recommendations for further work.[1] The model collated information from archaeological test excavations, landscape profiles and information on historic land disturbance to generate a picture of the areas with a likelihood to contain Aboriginal archaeological remains. Through this process, the SMM identified four distinct areas defined by the level of archaeological potential—either none, low, moderate or high—which formed the basis to develop management recommendations.

Basin I

Although a significant amount of archaeological work has been undertaken since this model was developed, the SMM forms a useful baseline for understanding the potential for archaeological remains within the proposed location for Basin I.

Basin I is situated within Management Zones 2 and 3 which equate to areas assessed as having a low or moderate potential for Aboriginal archaeological remains. A small section in the southern part of the basin

[1] JMcDCHM, Interim Heritage Management Report, ADI Site, St Marys, Test Excavation Report, unpublished report prepared for the Lend Lease—ADI Joint Venture in Response to the Section 22 Committee Interim Report, September 1997.

footprint is within an area designated as having a high level of archaeological potential (Management Zone 1).

Field Inspection

A field inspection of the proposed location of Basin I was undertaken by Dr Tim Owen, Senior Associate, and Sophie Jennings, Consultant, on 19 October 2016. The purpose of the site inspection was to assess the current site conditions including the potential for Aboriginal archaeological deposits, objects or places to inform the recommendations for any future archaeological works which may be required.

To inform the field inspection, a review of existing information on the geology, soils, hydrology and previous developments within the basin footprint was undertaken. Basin I straddles a tributary of South Creek and the OEH NSW soils data shows a band of alluvial soils along the creek alignment. Previous archaeological investigations completed by GML within the wider St Marys area have demonstrated the potential for alluvium to contain vertically stratified deposits which may have Aboriginal archaeological remains. The remainder of the proposed basin overlies an erosional soil. Further archaeological assessment would seek to identify the depth of the soil profiles and its potential for archaeological remains. Historic aerial photographs of the site from the 1940s through to the 1970s shows that c85 per cent of the basin location had been cleared of vegetation; however, a detailed analysis of specific areas of disturbance has not been undertaken at this stage.

Aboriginal objects (as afforded statutory protection under the NPW Act 1974) were identified at three separate locations along the northern boundary of Basin I. The inspection confirmed the potential for intact soil profiles that may contain Aboriginal archaeological remains to be present on two alluvial terraces north of the creek, and a further alluvial terrace on the south of the creek. In line with OEH policy these locations would require archaeological test excavation to clarify the nature and extent of Aboriginal archaeological deposits prior to any development works occurring within the Basin I footprint. The presence of Aboriginal objects within the Basin I area determines that an AHIP is required before any work can commence.

We have not registered these sites on OEH AHIMS, this would be undertaken following field survey with the Aboriginal community.

Localised areas of modern disturbance were also observed—however, it is outside the scope of this assessment to investigate further the full extent of any past impacts. This would be reviewed as part of the next phase.

Conclusion and Recommendations

Basin B

This review has identified that the proposed Basin B is situated entirely within an existing AHIP and all required Aboriginal archaeological investigations within this location have been completed. GML can therefore confirm that no further Aboriginal heritage management work is required within the proposed location of Basin B.

Basin I

This review has identified that there have not been any archaeological investigations previously undertaken within the proposed location of Basin I and that it is situated outside of any existing AHIPs. The results of the field inspection have identified the potential for intact soil profiles, which may potentially contain Aboriginal objects, to be present within the basin footprint that would be impacted by the proposed works.

To mitigate against any impacts to Aboriginal remains which may arise from the proposed works it is recommended that the following mitigation measures are undertaken which follow current OEH policy and industry best practice:

- Aboriginal community consultation should be undertaken, following the OEH's guidelines for consultation, 2010.
- An Aboriginal archaeological research design (ARD) should be prepared that details how the study area will be archaeologically tested and, if relevant, subject to salvage excavation.
- An area based AHIP would need to be sought for the whole development area, including all access roads and zones used for stockpiling soil. Application for an AHIP will require the Council approved DA.

Please do not hesitate to contact us if you have any further queries in relation to the above matters.

Yours Sincerely,
GML Heritage Pty Ltd

Sophie Jennings
Consultant

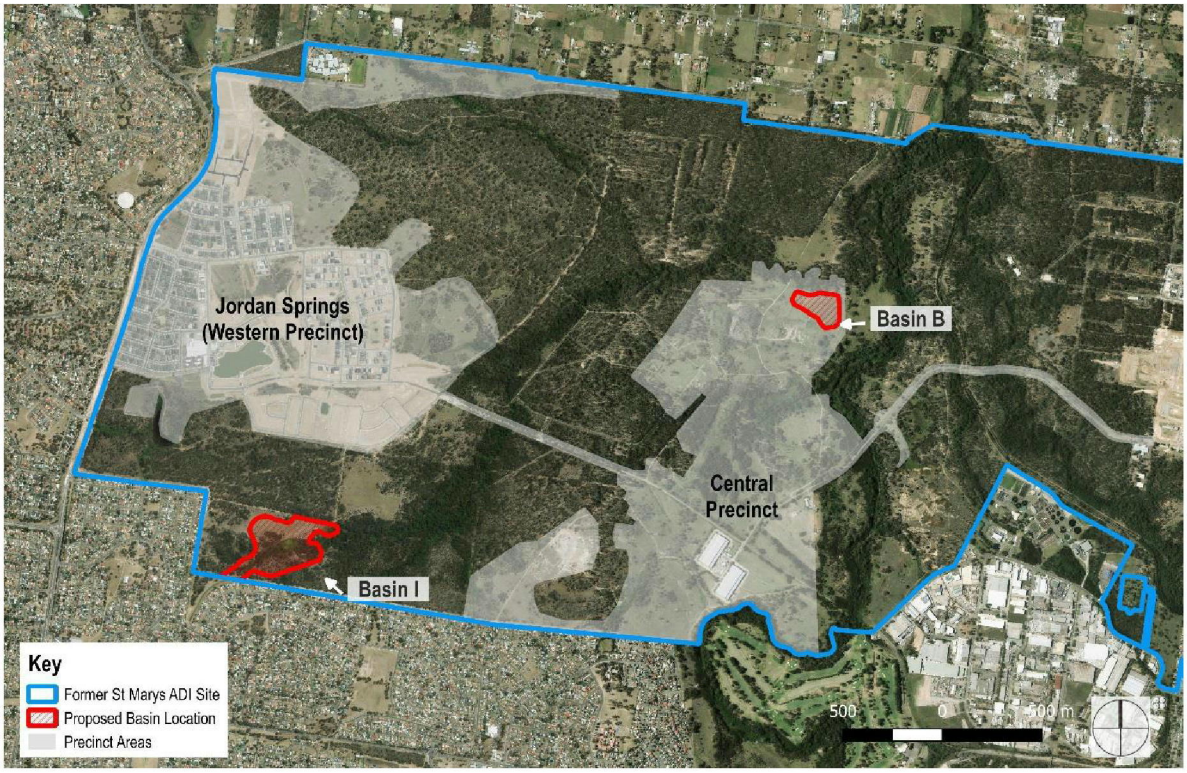

Figure 1 Location of proposed water management basins in relation to the existing precincts. (Source: NSW LPI with GML overlay)

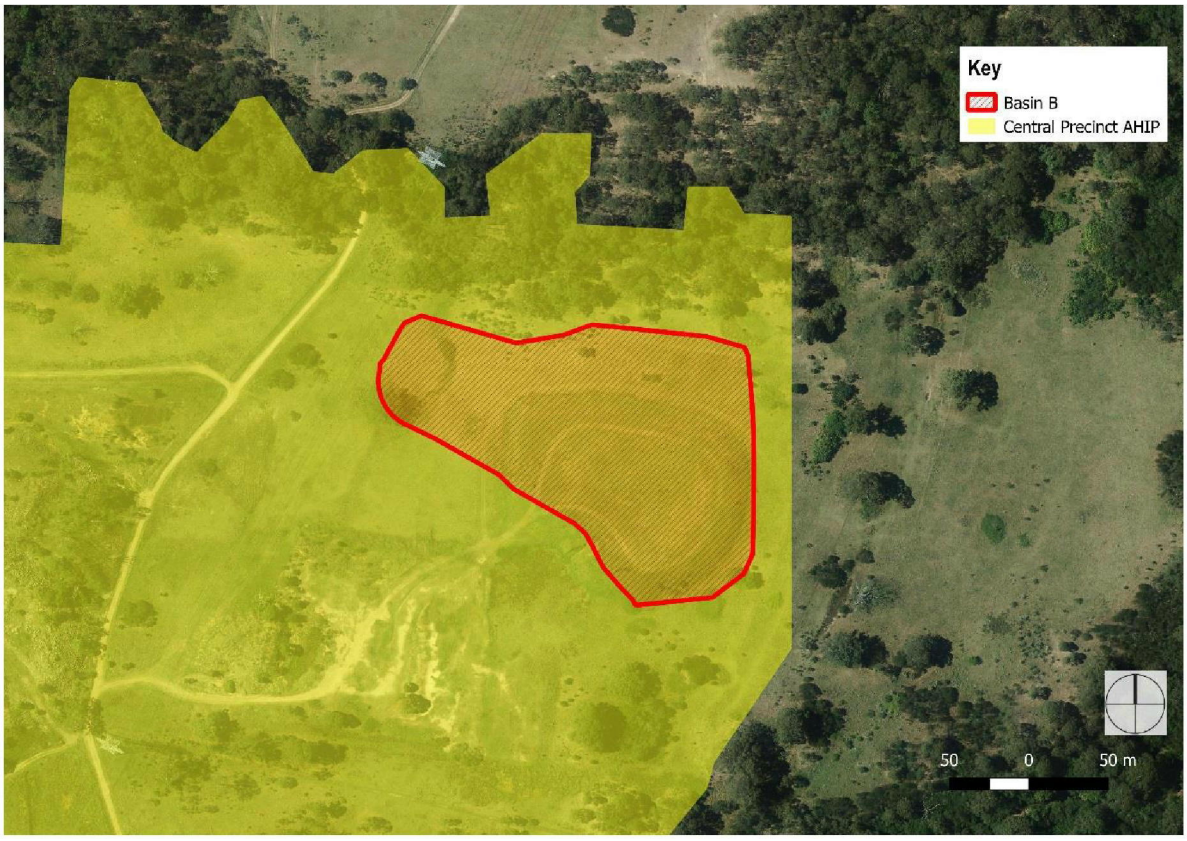

Figure 2 Location of Basin B within the boundary of the existing AHIP (No. C0000362). (Source: NSW LPI with GML overlay)

Regional Detention Basin I, SMDS

Archaeological and Cultural Assessment Methodology

Draft Report

Report prepared for Maryland Development Company

June 2018

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Report Register

The following report register documents the development and issue of the report entitled Regional Detention Basin I, SMDS—Archaeological and Cultural Assessment Methodology, undertaken by GML Heritage Pty Ltd in accordance with its quality management system.

Job No.	Issue No.	Notes/Description	Issue Date
16-0301B	1	Draft Report	3 May 2018
16-0301B	2	Draft Report (updated to incorporate minor corrections)	1 June 2018

Quality Assurance

GML Heritage Pty Ltd operates under a quality management system which has been certified as complying with the Australian/New Zealand Standard for quality management systems AS/NZS ISO 9001:2008.

The report has been reviewed and approved for issue in accordance with the GML quality assurance policy and procedures.

Project Manager:	Sophie Jennings	**Project Director & Reviewer:**	Dr Tim Owen
Issue No.	2	**Issue No.**	2
Signature		**Signature**	
Position:	Heritage Consultant	**Position:**	Senior Associate
Date:	1 June 2018	**Date:**	1 June 2018

Contents Page

1.0 Introduction

1.1 Project Background

GML Heritage Pty Ltd (GML) has been engaged by Maryland Development Company (a trading entity of Lendlease) to prepare an Aboriginal Cultural Heritage Assessment Report (ACHAR) and an Archaeological Technical Report (ATR) for the Regional Detention Basin I (Basin I) proposed development within the St Marys Development Site (SMDS). The ATR will form an Appendix to the ACHAR, which will be submitted to the NSW Office of Environment and Heritage (OEH) to support an application for an Aboriginal Heritage Impact Permit (AHIP), under Section 90 of the *National Parks and Wildlife Act 1974* (NSW) (NPW Act). This report forms part of the Environmental Assessment for the study area prepared under Part 4 of the *Environmental Planning and Assessment Act 1979* (NSW) (EPA Act).

The purpose of this document is to provide Registered Aboriginal Parties (RAPs) with information about the Regional Detention Basin I, and afford an opportunity to provide input into the project methodology and Archaeological Research Design (ARD). The current project is being undertaken to:

- ensure Aboriginal archaeological constraints and opportunities are adequately addressed and appropriately managed throughout the life of the project;
- consult with the Aboriginal community with regards to the cultural significance of the study area; and
- ensure that any risks to Aboriginal heritage values (both intangible and tangible) are appropriately identified and mitigated.

1.2 Study Area and Project Brief

The study area is located within Lot 1002 DP 1215087 and Lot 2 DP 1216994, situated in the southwest corner of the Wianamatta Regional Park, to the south of the Jordan Springs development area.

The study area is comprised of native woodland vegetation and is centred around an existing waterway. Figure 1.1 shows the general location of the study area and Figure 1.2 shows the extent of the study area and area of proposed development.

The proposed redevelopment is for construction of a detention basin for stormwater management. Works for this project would involve construction of an access road to be used both during construction and for ongoing maintenance of the detention basin; the stormwater detention basin; and a temporary construction works zone.

1.3 Statutory Context

The archaeological aspects of the study area would be assessed under the following legislation and statutory instruments:

- the *Environmental Planning Act 1979* (NSW) (EPA Act);
- the Sydney Regional Environmental Plan No. 30—St Marys (SREP 30); and
- the NPW Act.

The proposed Basin I site is located within land zoned for drainage under the SREP 30. Based on the nature and scale of the proposed works the designated development section of the EPA Act has is triggered; the project requires the preparation of an Environmental Impact Statement (EIS) to assess the impacts of the project. The Secretary's Environmental Assessment Requirements (SEARs No. 1174) have been issued for this project and include the requirement to assess potential impacts of the proposed development on Aboriginal heritage. The ACHAR will be submitted as part of the EIS for this project.

Additionally, under Section 90 of NPW Act, Basin I would require an AHIP should the development activities 'harm' any 'Aboriginal object' or 'Aboriginal place'. The area contains registered Aboriginal objects and hold the potential for further Aboriginal objects within a subsurface context. An area based AHIP will be sought by the Maryland Development Company for the project area.

1.3.1 Approach to Aboriginal Heritage Management

In order to administer the NPW Act and EPA Act, the OEH has issued a series of best practice guidelines and policies. The applicability of these depends upon the approval mechanism for a project. The current project will be assessed and granted approval under Part 4 of the EPA Act. Therefore, the approach to the preparation of this document was based on the following current best practice guidelines:

- *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (the Due Diligence Code);[1]
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (the Code of Practice);[2]
- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*;[3]
- *Aboriginal cultural heritage consultation requirements for proponents 2010*;[4]
- *Guide to Determining and Issuing Aboriginal Heritage Impact Permits*;[5] and
- the *Australia ICOMOS Burra Charter 2013* (the Burra Charter).[6]

1.4 Objectives for the Cultural Heritage Assessment

In preparing the ACHAR and ATR for the study area, we propose to undertake:

- a program of Aboriginal community consultation;
- an archaeological survey; and
- archaeological test excavation.

The aim of consulting with Aboriginal people is to facilitate a process for RAPs to contribute culturally appropriate information, as well as to enable them to participate in the determination of the cultural significance of Aboriginal objects and/or places that may be present within the study area. Consultation also provides an opportunity for RAPs to have input into the development of cultural heritage management options.

The objectives of the survey and test excavation will be to understand the location of any Aboriginal sites and the Aboriginal heritage values (tangible and intangible) within the study area, to investigate

their landscape connection at the regional level, and to determine their significance to the Aboriginal and archaeological communities.

This report (June 2018) provides the Registered Aboriginal Parties (RAPs) with information about the proposed project (OEH consultation stage 2), and an opportunity to identify and contribute culturally appropriate information and comment on the research methodology (OEH consultation stage 3). As part of this consultation, the proponent seeks cultural information from registered Aboriginal parties to identify:

- any comments on the proposed project and/or Aboriginal heritage methodology;
- whether there are any Aboriginal objects of cultural value to Aboriginal people in the area of the proposed project; and
- whether there are any places of cultural value to Aboriginal people in the area of the proposed project (whether they are Aboriginal places declared under s.84 of the NPW Act or not). This includes places of social, spiritual and cultural value, historic places with cultural significance, and potential places/areas of historic, social, spiritual and/or cultural significance.

1.5 Authors

This project methodology has been written by Sophie Jennings, Heritage Consultant. The report was reviewed by Dr Tim Owen, Senior Associate.

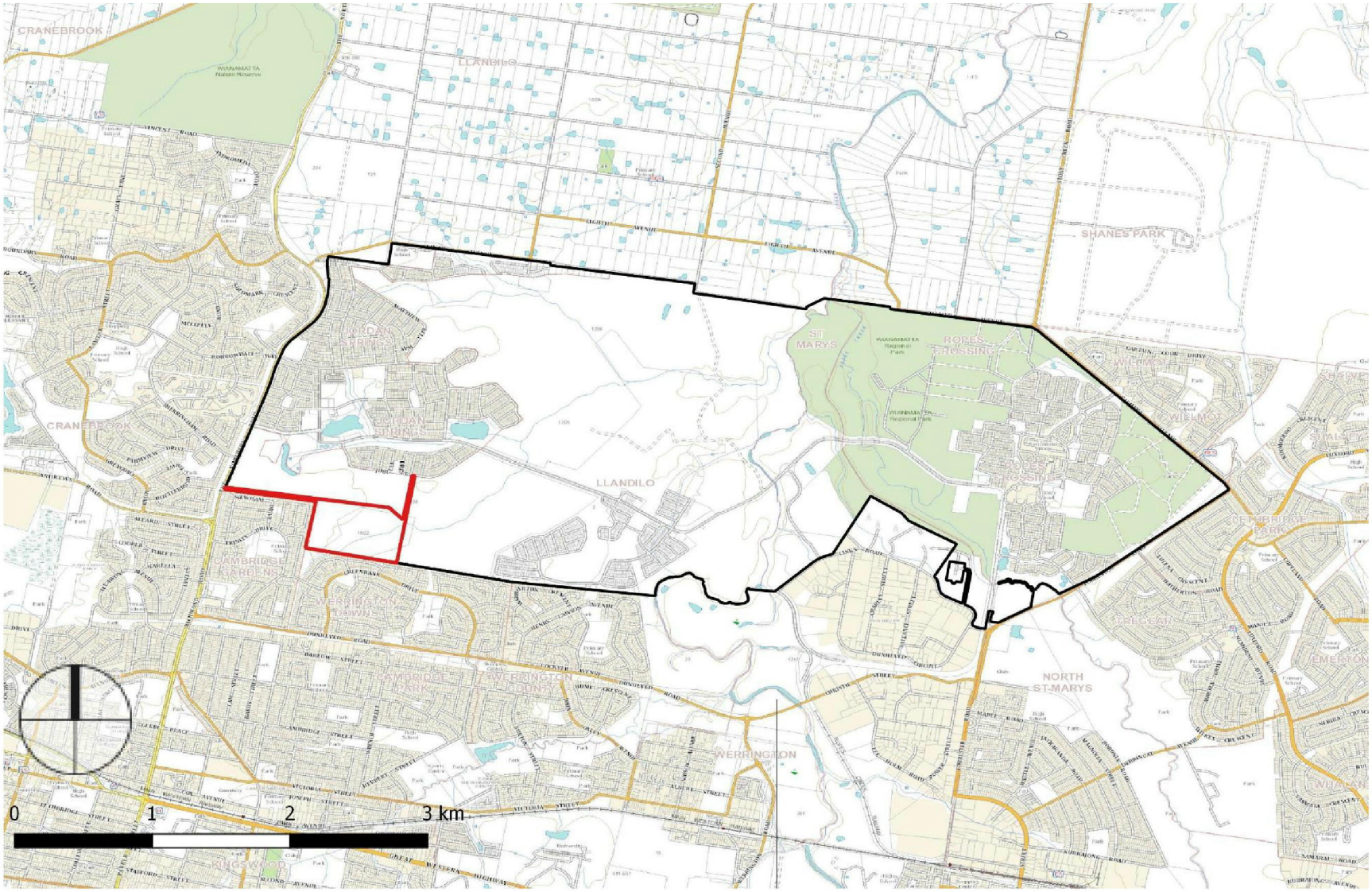

Figure 1.1 Location map showing the location of the Regional Detention Basin I (outlined in red) within the SMDS boundary (outlined in black). (Source: NSW Land and Property Information [LPI] with GML additions 2018)

Figure 1.2 Study area location showing extent the footprint of the Regional Detention Basin I and the boundary of the proposed AHIP application is outlined in black. (Source: Cardno dwg 89914020-SK1022 Rev 1, 10/4/2018)

1.6 Endnotes

1 Department of Environment, Climate Change and Water, *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW*, Department of Environment, Climate Change and Water, September 2010.

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

3 Office of Environment and Heritage, *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*, Office of Environment and Heritage, Sydney, April 2011.

4 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, April 2010.

5 Department of Environment and Climate Change, *Guide to Determining and Issuing Aboriginal Heritage Impact Permits*, 2009 <http://www.environment.nsw.gov.au/resources/cultureheritage/09121AHIPGuide.pdf>.

6 Australia ICOMOS Inc, *The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance 2013*, Australia ICOMOS Inc, Burwood, VIC.

2.0 Environmental and Archaeological Context

In line with OEH reporting requirements,[1] this section provides a review of the landscape context, previous archaeological work, regional character and an Aboriginal heritage predictive model.

GML has recently completed extensive reporting on the archaeological works undertaken within the Central Precinct of the Wianamatta Regional Park. This complimented the outcomes of heritage work from the Jordan Springs development area. The current project represents a continuation of this regional work; the final Central Precinct report will be provided as an appendix to the draft ACHAR.

2.1 Regional Landscape and Characterisation

The purpose of this section is to provide contextual information for use in developing a predictive model relating to evidence of Aboriginal occupation and use of the study area. Interactions between people and their surroundings are of integral importance in both the initial formation and the subsequent preservation of the archaeological record. The nature and availability of resources including water, flora and fauna and suitable raw materials for the manufacture of stone tools and other items had (and continues to have) a significant influence over the way in which people utilise the landscape.

Alterations to the natural environment also impact upon the preservation and integrity of any cultural materials that may have been deposited, whilst current vegetation and erosional regimes affect the visibility and detectability of Aboriginal sites and objects. For these reasons, it is essential to consider the environmental context as a component of any Aboriginal heritage assessment.

2.1.1 Geology and Soils

The study area is located over the Bringelly Shale, predominantly shale with some sandstone (70%), and Quaternary Floodplain (30%) geomorphological formations (Figure 2.1). The terrace of Quaternary Alluvium connected with landforms abutting South Creek and its tributaries is morphologically comparable to the Cranebrook Terrace on the Nepean River, immediately north of Penrith. The Cranebrook Terrace has been dated to approximately 40,000–45,000 years old and it is possible that base layers of the South Creek terrace is of an equivalent age.[2] The Shale Uplands in the (St Marys Development Site) SMDS comprise the Luddenham soil landscape, a residual soil which has been subject to extensive archaeological excavation in the Central Precinct and Jordan Springs areas of the SMDS.

2.1.2 Landforms and Topography

The study area is located within a low-lying area in the southwest corner of the Wianamatta Regional Park. The ground level within the subject site ranges from 40m Australian Height Datum (AHD) in the centre rising to 52m AHD at the northwest corner. In the western half of the subject site the ground gently rises upslope towards a low hill situated at the northwest corner with a narrow section of the subject site running along a low ridge line. The southeast half of the subject site contains distinct raised alluvial terraces either side of a water course.

2.1.3 Vegetation

Vegetation communities are comprised of an area of grassland in the northwest (created by clearing of the natural woodland), with shale woodland regrowth covering c70% of the study area. The creek

banks and a small wetland area towards the centre of the study area contain freshwater wetland vegetation, associated with the alluvial soil landscape.

2.1.4 Hydrology

South Creek is the major water course in the area, and two major junctions with South Creek and a representative set of nodes, from first to fourth order streams, are located within the SMDS.[3] A second order water course, a tributary of South Creek, runs from southwest to northeast through the centre of the subject site (Figure 2.2).

2.1.5 Land Use Impact Analysis

Land use over the past 200 years has an impact on the integrity and condition of any archaeological sites. The area was used for grazing and farming for c150 years prior to establishment of Australian Defence Industries (ADI) St Marys site in 1941. Historic aerials indicate that most of the study area (c90%) was stripped of vegetation, although areas south of the creek remained intact. Military use resulted in topsoil stripping over the northern (c20%) part of the study area. The pattern of land use impact is shown in Figure 2.3 to Figure 2.6.

Military use focused on the hill slope above the creek. These actions are likely to have significantly impacted the shallow soils across the sloping landforms, resulting in a loss of both soil condition and integrity.

Vegetation stripping across the remainder of the land has occurred, although the mode of stripping is unknown, comparable analysis of this process in the regional park suggests a process of cutting and stump burning, rather than chain ripping. Vegetation stripping is therefore unlikely to have resulted in major impacts to the integrity of the study area. Post vegetation stripping, the land use is ambiguous—ploughing and cropping does not appear to have occurred. The use for grazing will have impacted soils immediately adjacent to the creek, resulting in erosion; away from the creek bank margins, erosion will have been limited.

Landforms to the south of the creek were revegetated by the 1970s, and in general this zone appears to be intact. Landforms to the north of the creek have been impacted by fire breaks, a dirt road and WWII use. A preliminary inspection of the area also confirmed deep soil stripping (0.5m) had occurred in the northeast adjacent to the creek.

In summary, all landforms to the south of the creek are expected to retain a high level of both condition and integrity. Flat landforms to the immediate north of the creek may hold moderate integrity and soil condition. The sloping landforms, and areas associated with tracks and soil stripping will have low integrity and condition.

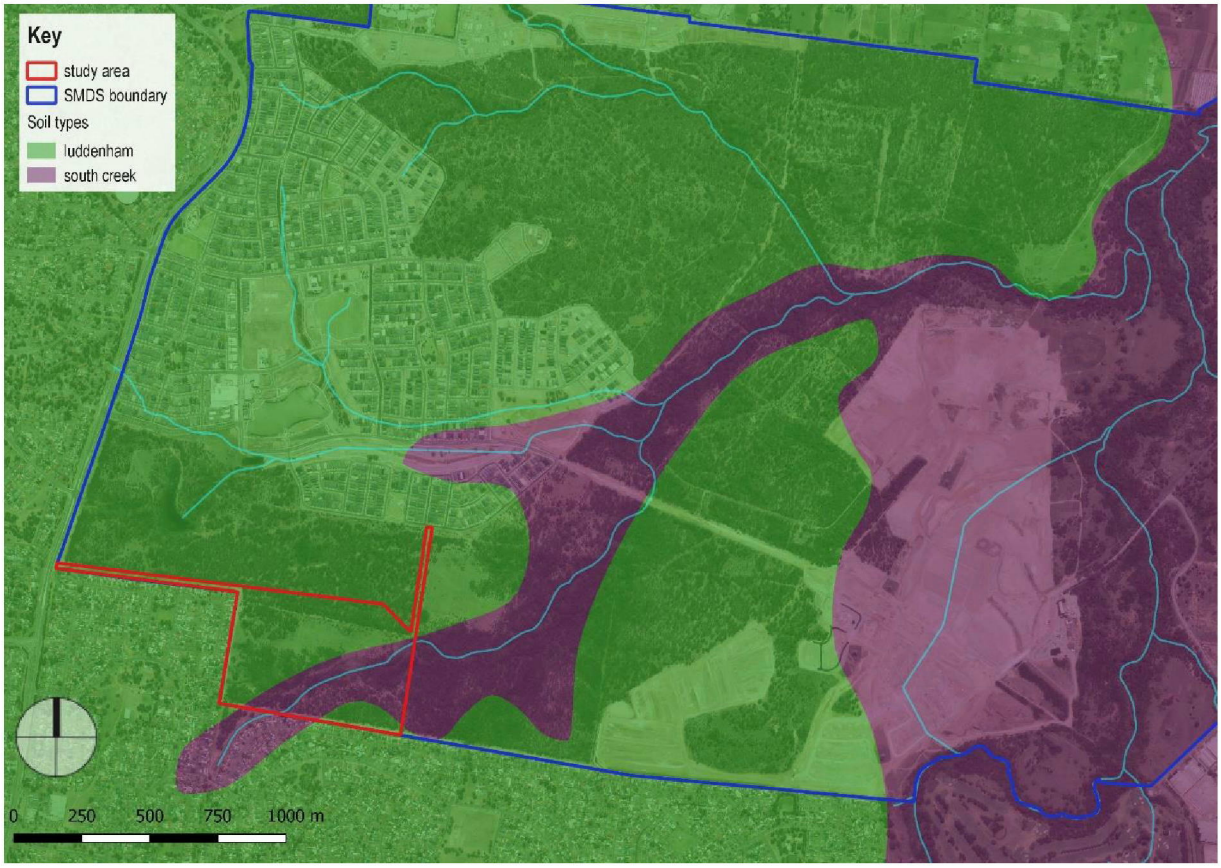

Figure 2.1 Soils mapping. (Source: NSW LPI with GML overlay 2018)

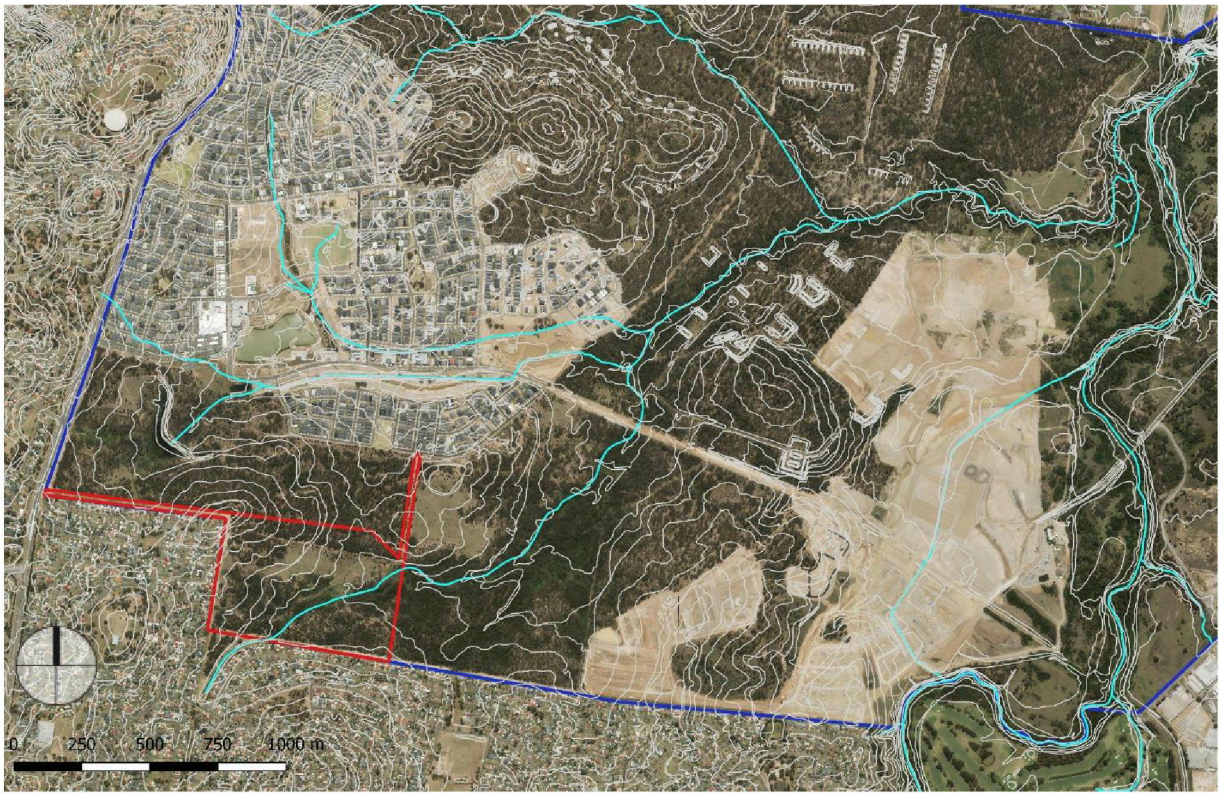

Figure 2.2 Hydrology and contour data (the study area is outlined in red). (Source: NSW LPI with GML overlay 2018)

Figure 2.3 1940s historical aerial photo (study area outlined in black). (Source: NSW LPI with GML additions 2018)

Figure 2.4 1955 historical aerial photo (study area outlined in black). (Source: NSW LPI with GML additions 2018)

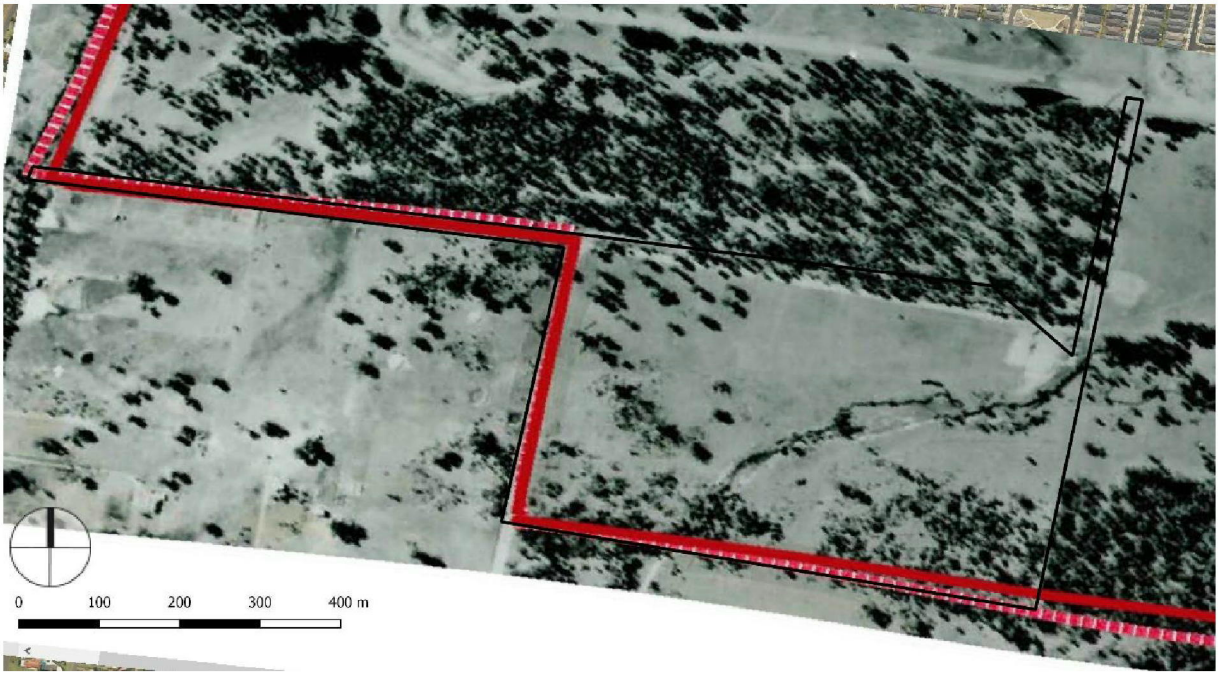

Figure 2.5 1965 historical aerial photo (study area outlined in black). (Source: NSW LPI with GML additions 2018)

Figure 2.6 1978 historical aerial photo (study area outlined in black). (Source: NSW LPI with GML additions 2018)

2.2 Aboriginal Ethnohistory

The SMDS, as with much of the Cumberland Plain, was part of the territory of the Gomerigal clan of the Darug (various spellings including Dharug, Dharrook, Dharruk, Dhar-rook, etc) people for thousands of years prior to European occupation, which inscribed the land with a different pattern and form (Attenbrow 2002, p 33; Kohen 1993, p 21). The Darug was a language group that represented a number of different groups of people who occupied the Sydney basin from the coast between South Head and the north shore of Botany Bay, out to the edge of the Blue Mountains. Within this area there

were approximately 20 different bands, each having a different territory, boundaries and sacred spaces (Murray and White 1988, p 20).

The SMDS is traversed by two major watercourses (Ropes Creek and South Creek) and the resulting floodplain would have created wetlands and river terraces, providing a range of food resources (associated with the varied ecological communities) and raw materials for tools, shelters, clothes and other purposes. The Darug people would have used the landscape seasonally, and formed open campsites on the higher ground with ready access to numerous natural water sources present across the land in association with Ropes and South Creeks. Campsite locations were seasonally occupied based on the abundance of food and climatic conditions. The surrounding plains provided native animals and vegetable foods and other resources including timber and leaves, natural gums and resins that were used for a range of implements and tasks. The Darug would have fired areas within their traditional Country to maintain a clear and open understorey. This encouraged the fruiting of plants and the growth of fresh herbage for animals to graze. Kangaroos, emus, snakes, bandicoots, possums and other game foods would have been eaten. Roots and tubers including yams would have been dug along the creeks and roasted in open campfires.

Stone was a vital material and its distribution in the landscape played a role in determining people's movements and patterns of trade and exchange with other language groups (Attenbrow 2002, p 43). Silcrete was the dominant stone material used in the manufacture of the stone tools in the region; however, the Darug people also utilised other locally available stone such as silicified tuff, chert and quartz.

It is likely that the Darug clans of the Cumberland Plain had the rights to the natural resources that occurred in their respective habitation area (Kohen 1993, p 6). As such, the silcrete quarry located within the former Eastern Precinct of the SMDS (ADI/FF22), and the acquisition and use of the silcrete from this location, may have been subject to the control by members of the South Tribe Gomerigal clan. Archaeologically there are distinct patterns of stone access and consequent use either side of South Creek.

The SMDS contains a number of natural features which would have provided resources to Aboriginal people in terms of subsistence, social and/or ceremonial activities. These include:

- the confluence of South and Ropes Creeks;
- numerous lower order tributaries from both South and Ropes Creeks that flow through the SMDS;
- varying vegetation cover and type, providing food resources (ie hunting areas or locations to gather food); and
- proximity to raw material sources (silcrete) for the manufacture of stone artefacts (ie ADI-FF22).

Oral history collection and consultation with the Darug Aboriginal people currently residing in Western Sydney during the development of the CMP for the Wianamatta Regional Park has noted that a concentration of significant historical/contact period landscapes are present between South and Ropes Creeks, to the northeast of the Central Precinct.

2.3 Aboriginal Cultural Values

A CMP was prepared by GML in 2011 on behalf of the Department of Environment, Climate Change and Water (DECCW) (now OEH) for the Wianamatta Regional Park (areas designated as regional park within the SMDS); Basin I is located within the southwest section of the regional park. The CMP recognised that the park would be formally gazetted as a regional park under the NPW Act. Regional parks under this Act are managed to identify, conserve and promote the appreciation of natural and cultural heritage values whilst providing uses and visitation.[4] The report acknowledges that the Wianamatta Regional Park 'embodies a range of cultural heritage values', reflecting both natural processes and human interactions. Therefore, the CMP identified the park as a cultural landscape, and included an assessment of the contemporary social values attributed to the park by local people. This included a description of the land as Darug Country, a summary of the archaeological resource, assessment of heritage values across the land in reference to the Aboriginal landscape and, most notably, consultation with the local Aboriginal community.

Consultation was undertaken in accordance with the DECCW guidelines, and was initiated by GML in August 2009. Eight stakeholder groups were identified at this time as having a likely interest in the use and conservation of the park's heritage resources, namely: Darug Aboriginal Cultural Heritage Assessments (DACHA), Darug Cultural Aboriginal Custodians (DCAC), Darug Land Observations (DLO), Darug Tribal Aboriginal Corporation (DTAC), Darug Peoples Advisory Committee, Deerubbin Local Aboriginal Land Council (DLALC), Colin Gale, and Yarrawalk (Scott Franks). It was also noted that a Memorandum of Understanding (MOU) was negotiated in 2007 between (what was then known as) Department of Conservation (DEC), and members of the Darug community, namely the Darug Peoples Advisory Committee. This MOU acknowledged the Darug people's ongoing interest in the management of their traditional lands.

Consultation with these Aboriginal stakeholder groups was undertaken in the form of a start-up workshop, and a tour of some Aboriginal sites of social significance (both post-contact and pre-contact) within the regional park. The sites visited were suggested by Aboriginal stakeholders with input from the project team and DECCW. At each site, there was a brief discussion about the value of the site and future management. It is noted that a concentration of significant historical/contact period landscapes are present between South and Ropes Creeks, to the northeast of the Central Precinct.

Several meanings and values were identified by the Aboriginal people relating to the Wianamatta Regional Park during this consultation process, including:

- *Country is a spiritual life force—we are born into it, it is in our blood, our mother, our church.*
- *Aboriginal culture is resilient, dynamic and enduring.*
- *Continuing connections—Aboriginal cultures and interactions with other culture.*
- *Country, its form and the seasons, native flora and fauna, creeklines, routes and passages, and special places have meaning and are connected.*
- *Aboriginal history is a story of survival, displacement and exclusion, but also one of resilience and cultural continuity and connection.*
- *Wianamatta Regional Park includes tangible physical evidence of Aboriginal people's presence and use of the land's rich natural resources over thousands of years.*[5]

A range of actions and management suggestions for future park management were also discussed during consultation.

A brief summary of these is included below:

- *Display Aboriginal welcome to Country signs at the park exit and entry points.*
- *Develop an Aboriginal community/cultural centre incorporating education and arts and crafts.*
- *Refine and synthesise the scientific (archaeological) data as necessary to develop understanding of Aboriginal occupation and use of the land.*
- *Ensure that previously recorded Aboriginal sites are entered onto the Aboriginal Heritage Information Management System.*
- *When naming park features, use local Aboriginal language.*
- *Re-use stored silcrete cobbles in public art.*
- *Employ local Aboriginal artists in art projects.*
- *Ensure local Aboriginal people are engaged in ongoing park planning and management.*
- *Plan and prioritise cultural heritage assessments including archaeological surveys to align with on-park works.*
- *Where possible, explore the location and siting of interpretive nodes and initiatives to tell the story of Aboriginal cultural heritage.*
- *Remember that Aboriginal people are the rightful interpreters of their cultural heritage.*[6]

A discussion was held following the site visit. Points discussed included: the need for further archaeological assessment to be coordinated at a landscape scale in order to help develop the understanding of occupation and use of the landscape by Aboriginal people; the importance to Aboriginal people of continuing/controlled access to Aboriginal sites within the park; the importance of respect for Aboriginal history and heritage; and the need to keep the local Aboriginal community informed of processes.

Through this consultation process, it was clear that the abundant evidence of Aboriginal occupation within the Wianamatta Regional Park (and wider SMDS), as demonstrated through the archaeological record, 'connects Darug people to their ancestors and is a powerful affirmation of their cultural continuity', and the 'Aboriginal history and archaeology of the park provides an opportunity to learn more about how Aboriginal people in the past used the landscape'.[7]

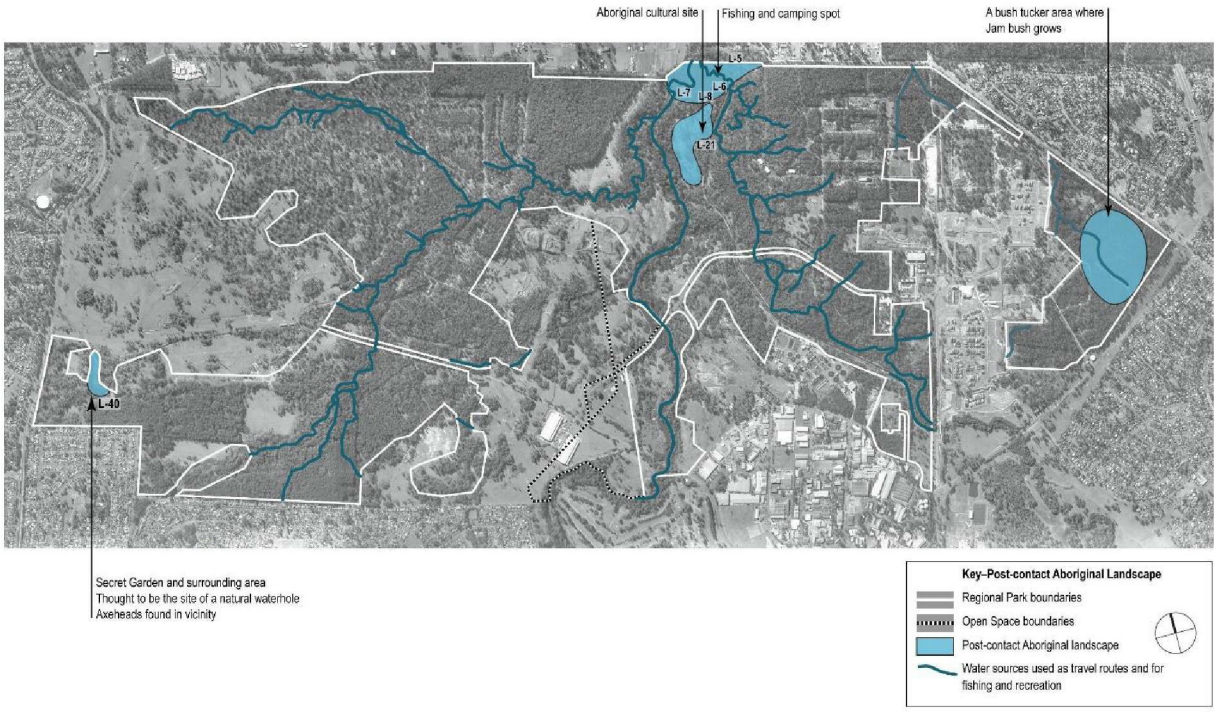

Figure 2.7 Plan of the SMDS showing post-contact and some pre-contact Aboriginal places identified and visited during consultation for the Wianamatta Regional Park CMP. (Source: GML 2011, Figure 4.1)

2.4 Previous Archaeological Work

The purpose of this section is to synthesise available information from previous archaeological and ethnohistorical studies to provide a context and baseline for what is known about Aboriginal cultural heritage in the subject area.

2.4.1 Previous Archaeological Reports

Over the past 15 years a number of studies have taken place across the SMDS. The majority of studies have been archaeological in nature; one study, the Conservation Management Plan (CMP) for Wianamatta Regional Park, includes discussions on the regional Aboriginal cultural landscape, cultural places and the significance of this area to the Darug Aboriginal people.

A literature review of the NSW OEH library (and additional reports held by GML + Jo McDonald Cultural Heritage Management [JMcDCHM]) was undertaken to understand the broader region's archaeological patterning. This review was targeted to those reports relevant to the study area. Therefore, the studies listed below are those of direct relevance to the current project. A review of key reports is undertaken in chronological order below and provides an indication of the localities of these studies.

2.4.2 JMcDCHM 1997—Test Excavation

Test excavation was undertaken in 1997 at five locations across the SMDS in order to ground-truth the Strategic Management Model (SMM) and refine the boundaries for the conservation zones of the wider site (JMcDCHM 1997a and 1997b). Each test excavation location was chosen based on its location in particular landscape zones (ie management zone, geology, creek proximity and landscape unit). One of these testing locations, Area 3, was located within the Central Precinct in an area now denoted as

ROS, towards the eastern boundary of the study area (Figure 2.8). Area 3 was located on Quaternary Alluvium on a creekbank/terrace to the west of South Creek.

A total of 18 1m^2 squares were excavated in Area 3 (only 14 were sieved), recovering 188 lithic items. Extensive levels of recent disturbance were recorded during excavation, a result of recent decontamination works, whereby the surface of the upper terrace had been scraped with a bulldozer, and two dirt roads constructed. However, review of the stratigraphy of individual test pits defines quite different levels of archaeology bearing deposit in each pit; as such, it is suggested that defined mapping of disturbance activities (based on aerial photograph analysis) should provide a good indication as to specific zones that have been subject to high disturbance (and thus zones that have not).

The excavation report determined that a 'low number of artefacts' was recovered, and that this was likely a result of the low integrity and condition of the soils in this location, rather than a reflection of the ability of the soil types and general location to yield an archaeological deposit. However, 188 stone artefacts from 14m^2 of excavation provided an average density of 13 artefacts/m^2, a relatively high density. A spatial analysis of the material recorded indicates that three separate foci for lithic items were present; the density of lithics in these three areas was 33/m^2, which reflects regionally higher densities of stone objects.

Of considerable note is the spatial nature of the archaeological deposits, which appears to result from intact archaeological deposits within an alluvial soil matrix. The spatial separation of the three deposits could represent Aboriginal use of this landscape over time (with consequential different depositional events), or repeated use of the area with societal 'regulation' of spatial separation for groups occupying and undertaking concurrent use of this landscape.

Further, the alluvial nature of the soils identified at this location, connected to the proximity to South Creek and palaeochannels, lends itself to the stratigraphical integrity of archaeological deposits. As the 1997 test excavation was undertaken in bulk, no such information is available; but recent excavations on the Cumberland Plain to the south of the SMDS (at East Leppington [GML 2013]) have identified statistically significant geochronological stratified sequences in shallower soil deposits adjacent to South Creek alluvium.

The previous mapping of the levels and locations of disturbance within this area, as well as the locations of high artefact densities and identified knapping focus areas, informed the choice of locations for test excavation for the current project.

2.4.3 JMcDCHM 2004 and 2005—Fauna Fence Survey

JMcDCHM undertook several field surveys between 2004 and 2005 along the route of a proposed fauna fence proposed to be constructed across the SMDS. The purpose of the fauna fence was to mark the boundary of the regional park and to manage macrofauna (ie kangaroos and emus) during the construction phase of residential and industrial precincts. The field surveys focused on the centre line of the proposed fence route with a 5m corridor to either side (10m corridor in total). Field surveys subsequent to the first survey were undertaken due to adjustments of the proposed path of the fence.

Through the course of these field surveys, six Aboriginal sites were located, recorded and registered within the Central Precinct. These sites included ADI-FF14, 15, 18, 19 (JMcDCHM 2004), and ADI-FF33 and 34 (JMcDCHM 2006a). PAD FF2, 3 and 4 were also identified during the course of these field surveys (detailed further in Section 2.1.4 below).

2.4.4 Navin Officer 2007—Replacement Flows Project, Cultural Heritage Impact Assessment and Field Survey

One site, WS4 & PAD, was identified in 2007 within the SMDS Central Precinct by Navin Officer during a field survey undertaken for the preparation of a Cultural Heritage Impact Assessment for the Western Sydney Recycled Water Initiative—Replacement Flows Project (RFP) (Navin Officer 2007). The survey for this project was undertaken directly along the impact corridor of the proposed pipelines for the RTP. WS4 & PAD was the only new Aboriginal site identified within the SMDS through the course of the Navin Officer Project. WS4 (45-5-3316) consisted of a 'black volcanic broken flake, and a yellow silcrete flaked piece' (Navin Officer 2007, p 32). The site was identified as an area of PAD due to its proximity to South Creek, and the identification of artefacts in the area. The area was identified to have high potential for more surface artefacts, and moderate potential for subsurface archaeological deposits which may be of moderate significance (Navin Officer 2007, p 32).

It was recommended through the report that the site WS4 & PAD would be directly impacted by the RFP project. However, due to the extensive archaeological investigation and excavation that had already taken place within the SMDS, the report stated that 'the outcomes of any subsurface program in this PAD will not add to the archaeological knowledge already gathered for this area. Subsurface testing is not required for WS4 & PAD' (Navin Officer 2007, p 52). This report also recommended the monitoring of the construction of the pipeline in this area by a qualified archaeologist, together with representatives of the Registered Aboriginal Parties.

However, one written response from an Aboriginal community group for the project stated that:

> *… concern that we have is the identification of Artifacts within the former ADI site where the pipeline is proposed, we recognise that there have already been numerous Archaeological excavations within the ADI site and that we would probably not find out any further Archaeological information if we carried out work in this area but due to the fact that there are artefacts we cannot ignore them we need to work out whether the buffer that they were located on is natural or has been pushed there.* [Navin Officer 2007, Appendix 1: 60]

This response likely prompted the requirement for testing and salvage excavation in the area (detailed below in Biosis Research 2010).

2.4.5 JMcDCHM 2008—Central Precinct Field Survey and Archaeological Assessment

JMcDCHM undertook an archaeological assessment of Aboriginal cultural heritage within the Central Precinct of the SMDS in 2008 (JMcDCHM 2008c). This assessment included desktop study of the precinct in the context of the SMM and previous work within the SMDS, landscape analysis, field survey, consultation with the local Aboriginal community, identification of locations requiring further archaeological investigation (ie salvage excavation), and an ARD for these proposed works.

This assessment recommended that:

1. *There is a significant conservation outcome in this central part of the St Marys Site, with more than 51% of the total land area and almost 97% of the land with high archaeological sensitivity being excluded from the developable lands.*
2. *The basic precepts of the strategic management model are achieved by the planning process.*
3. *Eight target areas within the developable lands (including ROS and proposed water basin) are identified as requiring archaeological salvage prior to development taking place.*

4. *… the Proponent should apply to the DECC NSW for either a s87/s90 Consent with Salvage to undertake these salvage works.* [JMcDCHM 2008c:8]

Field survey for this assessment included the identification of nine new locations with surface stone artefacts (eight of which were registered at the time with AHIMS), known as ADI-CP#, in order to distinguish them from previously recorded sites. The target salvage areas were located to cover a representative range of landscape elements present within the Central Precinct, with the average size of each target (or sample) to be around 2ha, from which a goal of 150m^2 of excavated deposit would be recovered. This sampling strategy was consistent with that proposed for the salvage excavation of sites within the Western Precinct (now known as Jordan Springs) (JMcDCHM 2008b). The eight salvage excavation areas as proposed through JMcDCHM 2008b are presented in Figure 2.3.

At the time it was written (2008), this report was considered sufficient for (and was intended to be used to accompany) the submission of an application for a Section 90 permit for the Central Precinct. However, considering the time that has passed since this assessment, the increase in local Aboriginal community interest groups in the area, and most importantly the change to the NPW Act (2010 regulation) and the introduction of the OEH guidelines, it was necessary to reassess the work and conclusions presented in the 2008 report. This reassessment was undertaken in the light and context of current (2013) regulations and legislation, and the results of subsequent archaeological excavations that have taken place since 2008 (see below). This reassessment is manifest in this current ACHAR and accompanying ATR.

2.4.6 JMcDCHM 2009—WP3 and WP4 Salvage Excavation

Assessment of the SMDS Western Precinct (Jordan Springs) (JMcDCHM 2008b) identified seven target areas to be subject to salvage excavation prior to development taking place in these areas. A precinct-wide AHIP was applied for and granted for Jordan Springs (AHIP #10996059; consistent with the area of the Western Precinct/Jordan Springs as presented in Figure 1.2).

Archaeological excavation of WP3 and WP4 in 2009 was the first phase of salvage excavation with the AHIP. A combined total of 80 1m x 1m test squares and 154m^2 of open area (OA) excavation was completed from the WP3 and WP4 excavations. A total of 2355 cultural lithics were recovered from this excavation program, with 1967 meeting technical criteria to be classified as artefacts. Artefact density and distribution from both excavated sites generally conformed to distributions identified for first order streams in other areas of the Cumberland Plain (ie low discontinuous distribution, consistent with infrequently used or one-off sites).

The excavation at WP3 demonstrated sparse distribution of artefacts, as well as small-scale flaking and discard events. The excavation of this landform, in combination with its close proximity to a source of silicified tuff and quartz (Mount Pleasant), provided the opportunity to investigate raw material preference within a discrete location. This allowed some investigation into the way in which lithic material procurement may have influenced broader trends in silcrete use (ie possibly influencing an increase in artefact discard as opposed to that common for other first order landscapes). Evidence for a silcrete heat treatment area was present within Open Area A of WP3.

The artefact assemblage from dispersed testing at WP4 included raw material types of silcrete, silicified tuff and quartz in almost equal proportions (silcrete=37%, silicified tuff=33% and quartz= 29%). Artefact density and distribution was similar to WP3.

The investigation confirmed that artefact bearing deposit can remain relatively intact even with the low to moderate disturbance associated with historic ploughing, and the more recent impacts related to the

use of the SMDS as a munitions storage area by ADI (JMcDCHM 2009). Excavation of both sites also provided an insight into the nature of raw material procurement in association with distance from sources.

2.4.7 Biosis Research 2010—Western Sydney Replacement Flows Project, WS4 & PAD Test and Salvage Excavation

Biosis Research undertook test and salvage excavation between October 2008 and July 2009 of relevant sites, identified by Navin Officer in 2007, along the path of the Western Sydney Replacement Flows Project (WSRFP) pipeline, which would be impacted by the project. This program of excavation included the test and salvage excavation of the site WS4 & PAD (45-5-3316).

Test excavation entailed the excavation of 33 shovel probes along the WSRFP easement centre line within WS4 & PAD. This test excavation was divided into two areas: the area of PAD to the west of a chain wire fence (10 shovel probes), and the area of PAD to the east of the fence (23 shovel probes). The area to the west of the fence had some evidence for disturbance, but not obvious landform modifications, while the area to the east of the fence included areas of cut and fill associated with a flood/levee bund, warehouse, and associated railway lines. The test excavation identified artefact densities of 1.2 artefacts/m^2 and 4.3 artefacts/m^2 within the western and eastern testing areas respectively. These densities, particularly in the eastern part of the PAD, are not consistent across the PAD, and demonstrate that there is a definite patterning of Aboriginal use of the landscape. The upper 30cm of the deposit within the eastern area of the PAD was identified as being disturbed by the presence of fill associated with the construction of the warehouses located to the north of the site, and the flood levee. It is uncertain as to where this fill originated; however, it is likely that the soil was originally sourced from the surrounding area within the former ADI site. For this reason, artefacts recovered from the top two stratigraphic units (c30cm) within WS4 & PAD were not used in the analysis of the site. While test excavation of the site did not recover any artefacts at a greater depth than 30cm, salvage excavation did recover artefacts below 30cm.

Salvage excavation constituted the excavation of 125m^2 within the WSRFP impact area. This included one contiguous 1m wide x 120m long trench, excavated by mechanical excavator, and five additional 1m x 1m hand excavated squares. A total of 2372 lithics were recovered from the salvage excavation of WS4 & PAD. Of these lithics, 1183 (49.9%) were located below 30cm in depth and were therefore used in the inter-site and comparative analysis of lithic assemblages.

This program of excavation also included the surface collection of 99 artefacts along the flood levee of South Creek. Excavation along this flood levee identified that it was an introduced soil unit, and artefacts in this location were in a highly disturbed, secondary context.

WS4 & PAD was partially located in an area assessed in the SMM (McDonald 1997a) to be of Zone 4 (low to no archaeological potential), and the lithic assemblage retrieved was therefore of interest in the wider SMDS archaeological context. Although the top 30cm of the deposit in this area was identified to be of high disturbance, which placed the artefacts from that stratigraphic unit in a disturbed context, the excavation demonstrated that the deposit deeper than 30cm was intact and capable of yielding an archaeological deposit. The results of this excavation demonstrated that lands within the SMM Zone 4 may still have the potential to possess a subsurface deposit, and the potential for the identification of intra-site patterning.

Therefore, WS4 & PAD was concluded to be of moderate scientific significance as a low density occupation site within a broader archaeological landscape, archaeological excavation which had previously targeted area with a high density of archaeological deposit.

2.4.8 GML + JMcDCHM 2011—WP2 and WP6 Salvage Excavation

Salvage excavation of WP2 and WP6 within the Jordan Springs development area was undertaken in late 2011 in accordance with AHIP #10996059. A combined total of 92 1m x 1m test squares and 217m^2 of open area excavation was completed from the WP2 and WP6 excavations. A combined total of 4282 cultural lithics were recovered from this excavation program (GML + JMcDCHM 2012).

WP2 had an average density of five artefacts/m^2, which was much higher than other first order landscapes in the comparative area. In addition, WP2 displayed a low percentage of silcrete (51%), followed by quartz (35%) and silicified tuff (13%), compared with that expected. The artefact density encountered at WP2 was more consistent with predictions for locations further down the ridge (ie locations generally predicted to possess higher artefact densities). It was concluded that the ridge landscape of WP2 would have been occupied repeatedly over the Holocene, with the highest point of the ridge top as a focus for activity.

WP6 was located in association with a third order stream which is a landscape in which fewer excavations have been undertaken across the Cumberland Plain. Lithic assemblages from WP6 were expected to show less use of rationing strategies as people were less mobile, potentially staying in one camp for several days or even weeks. However, WP6 demonstrated relatively low and/or varying proportions of silcrete compared to sites with similar landform features from other locations across the Cumberland Plain. Proximity to sources of silicified tuff and quartz within the gravels at Mount Pleasant and/or associated with the Nepean River may have influenced Aboriginal peoples' use of silcrete.

Potential explanations to account for the smaller than expected size of the lithic assemblage in association with a third order stream (WP6) include the possibility that sediments of the South Creek soil landscape may have been too sandy for the adjacent creeks to retain ponds for extended periods; alternatively, people may have preferred the open woodland of the adjacent shale slopes for residential occupation rather than the forest of the South Creek soil landscape.

The excavations undertaken at these salvage areas produced scientifically significant results and provided further information about the use and occupation of landscapes around tributaries and low hilltops in the former Western Precinct of the SMDS. As with the salvage excavations undertaken in WP3 and WP4 in 2009, the excavation of WP2 and WP6 confirmed that intact soil horizons do remain in association with landforms that have been identified as of low–moderate disturbance.

2.4.9 GML + JMcDCHM 2012—WP5 Salvage Excavation

Salvage excavation of WP5 within the Jordan Springs development area was undertaken in August and September 2012 in accordance with AHIP #10996059. A total of 42 1m x 1m test squares and 59m^2 of open area excavation was completed from excavation within WP5. A total of 1835 cultural lithics were recovered from this excavation program (GML + JMcDCHM 2013a).

Excavation at WP5 demonstrated a low density, discontinuous lithic distribution across the landform, with occasional artefact clusters. The artefact densities were slightly lower than predicted by the application of the Cumberland Plain predictive model for landforms associated with second order streams. Following test excavation, three squares were selected for expansion. The expansion of two of these three squares demonstrated evidence for on-site production of backed artefacts. One open

area (Area B) presented with possible evidence for a circular cultural burning feature; however, charcoal recovered from this feature has not yet been dated. However, artefact heat shatter and breakage surrounding the burning feature does not point to a higher percentage of artefacts demonstrating breakage through heat.

2.4.10 GML + JMcDCHM 2013—North Dunheved Test Excavation

In 2013, GML + JMcDCHM were engaged to update the Aboriginal cultural heritage assessment of the North Dunheved Precinct in the light of current regulations and legislation, as well as in the context of results of subsequent archaeological excavations that had taken place in the Western Precinct since 2008.

The North Dunheved Precinct had previously been surveyed by JMcDCHM in 2005 and a total of three surface artefact concentrations were registered within it; however, no subsurface archaeological investigation had been undertaken within this precinct.[8] The precinct was resurveyed in May 2013 and all three registered sites were relocated, with the addition of one extra surface site. In addition, two areas with PAD (ND1 and ND2) were identified and agreed upon by all RAPs and the GML + JMcDCHM archaeologists as locations to be subject to test excavation.

Test excavation was undertaken in June 2013 and a total of 42 test units (TUs) were excavated across the two areas of PAD. Of these 42 TUs, two were expanded into 1m x 1m squares (one in each area), and one was expanded into a 50cm x 1m TU, for a total of 11.5m^2 excavated across the study area (c0.02 per cent of the entire study area). A total of 299 lithics were recovered from the test excavation of the North Dunheved Precinct, 68 were recovered from ND1 and 231 from ND2. Of the total lithics, 175 could be classified as artefacts.

The soil profile across ND1 was revealed to be more highly disturbed than originally predicted, and almost all TUs demonstrated topsoil removal to some degree. This affected the integrity of the archaeological deposit across ND1. TU33 within ND1 demonstrated a low to moderate potential for chronologically stratified archaeological deposits through the vertical distribution of lithic raw materials. However, the very small sample size available at this location would likely possess a very limited potential for the recovery of further information if further excavation were undertaken in this location. The presence of cultural lithics excavated from across ND1 confirmed that the area would have been utilised by Aboriginal people; however, ND1 has limited potential to provide any further information on the nature of Aboriginal occupation in this area due to the disturbance/removal of artefact bearing topsoils.

High levels of modern soil disturbance/mechanical removal of topsoils was confirmed across much of ND2; however, one area of relatively intact, deep alluvium was identified across the raised flat in the centre of ND2. High artefact densities (average density of 37.1 artefacts/m^2) were encountered within the deep alluvial soils present across this raised flat. TU3 and expansions (TU3A, 3B and 3C) demonstrated evidence for change in raw material over time, and therefore presented with a high potential for the presence of chronologically stratified archaeological deposits.

Artefact densities across the study area were lower than expected for a landscape in association with a high order stream (ie South Creek) (in accordance with the Cumberland Plain predictive model); however, they were relatively similar to densities recovered from the test excavation of alluvial landscapes in association with South Creek within the Central Precinct (Section 3.3.12).[9] A comparison was subsequently undertaken between lithic assemblages located on alluvial and non-alluvial landscapes, both within the SMDS and on the wider Cumberland Plain. This comparison indicated that

alluvial landscapes within the SMDS in association with high order streams (ie South Creek) had a lower presence of backed artefacts and backed artefact production than non-alluvial landscapes, or alluvial landscapes in association with lower order streams (eg WP6). It is possible that this indicates a different use of alluvial landscapes in association with major streams, to non-alluvial landscapes, or alluvial landscapes associated with smaller streams.

Based on the results of the test excavation of the North Dunheved Precinct it was determined that no further archaeological work would be required at ND1 as this area was unlikely to yield any additional information regarding the nature of Aboriginal occupation and use of alluvial landscapes within the North Dunheved Precinct. However, further archaeological investigation of the raised alluvial flat located in the centre of ND2 was determined to have potential to contribute to our understanding of the nature of Aboriginal occupation of alluvial landscapes within the wider SMDS and Cumberland Plain.

An AHIP was applied for with the recommendation that all registered surface artefact sites be collected and archaeological salvage excavation be undertaken within ND2 prior to earth disturbance within the North Dunheved Precinct. AHIP No. C0000475 was issued on 17 July 2014; however, no further development work has yet occurred within the areas subject to the Aboriginal heritage management conditions of the AHIP therefore these investigations are currently on hold.

2.4.11 GML Heritage 2013–2014—Central Precinct Test and Salvage Excavations

Test excavations were undertaken at six locations (CP1–CP6) across the Central Precinct between June and July 2013 by GML Heritage under AHIP No. C0000362. The results of the test excavation identified the presence of, and potential for, stratified archaeological deposits and recommended further salvage excavation of four of the six locations (CP1, CP3, CP 4 and CP6). No further salvage excavations were recommended for site CP2, where the low density of artefacts and absence of cultural features did not warrant the need for further work, nor at CP5 where the test excavations did not recover any archaeological deposits.

Following the testing phase, salvage excavations were undertaken across the four sites (CP1, CP3, CP4 and CP6) between 21 August and 8 December 2014 by GML Heritage.[10] As a result of the salvage excavations a total of 14,485 cultural lithics were recovered from 17 open areas (and five geotechnical pits) from the four sites, with a total area of 489.25m^2 excavated. The results of the testing and salvage excavations confirmed the range of sites that exist within the wider SMDS area. CP1 exhibited evidence of intensive repeated occupation, predominantly as a knapping location, with the results also highlighting the importance of multiple excavation areas to capture variation in lithic assemblages across a landscape. In contrast, remains of hearths, heat retainer stones, manuports, backed artefacts and a varied tool type assemblage indicates the use of CP3 as a domiciliary area. CP4 also exhibited evidence for multiple phases of occupation over a long span of time, with a varied lithic assemblage and two cultural features (a possible hearth and a cache of baked clay balls). CP6 presented with a general background scatter of lithics, suggesting the use of the area over a relatively long period of time but without any concentrated camp intensity.

South Creek, a major water course, crosses the SMDS in a south–north direction along the eastern boundary of the Central Precinct. Open area excavations within the Central Precinct focused on a comparison of the use of alluvial (South Creek soils) versus non-alluvial landscapes though an analysis of the nature and extent of lithic assemblages, with the aim of recovering stratigraphically intact archaeological deposits. Although the excavations did not identify intact stratified archaeological deposits, the results have demonstrated that Aboriginal people within the SMDS were likely utilising alluvial landscapes in association with significant water courses (ie South Creek) in a different manner

to those landscapes on ridgelines and hillslopes at a greater distance from South Creek. In addition, the results of the excavation did not conform with the commonly applied Cumberland Plain predictive model (the distance-decay/stream order model), further indicating a significant variation in the patterning of sites associated with alluvial deposits. Therefore, alluvial locations within the SMDS, particularly those with less historical disturbance through farming and the ADI use of the site, have the research potential to provide further information about Aboriginal use of alluvial landscapes on the Central Cumberland Plain.

Additionally, geophysical analysis of deposits in the form of investigation of non-stone based cultural heated features, such as hearths and earth ovens, was undertaken.

Seven cultural features were identified during the salvage excavations and were considered in relation to nearby and related lithic densities. However, no trend was able to be identified in relation to the presence of lithics and a cultural burning feature. For example, while Feature 2 (CP4/OA8, squares 2+3) was associated with a low lithics count in the same square (n=4), this excavation area in general had a relatively low lithic density, and therefore this low count is not necessarily associated with the presence of the clay ball mound.

Conversely, none of the four cultural burning features from CP3 (Feature 7, 8, 9 and 11) were directly associated with a particularly low density of lithics. However, three of these features were located in close proximity to each other, and also in association with a general area of high lithic density. Therefore, spatial association between lithics and cultural burning features was not able to provide any further indication of specific use other than that already interpreted through the form of the features and nature of the lithic assemblages.

Magnetic prospecting at the Central Precinct for subsurface heating events potentially related to anthropogenic activity was generally successful. A number of correlations were made between strong negative magnetic signatures and heated clay. Identified manuports with magnetic properties (ie heat retained stones/hearthstones at CP3) were also evident in the magnetic maps, which was an unexpected but positive outcome.

The method suffered where the number of magnetic signatures were numerous in a given survey area. Heating events caused by natural processes cannot currently be distinguished from anthropogenic ones; therefore, in the case that numerous signatures occur, the amount of exploratory excavation required increases proportionately. Appropriate management of the problem was demonstrated at CP3 where only stronger magnetic signatures associated with positive excavation results were investigated. OA11, which turned out to be the largest and most complex site excavated from the entire salvage excavation of the Central Precinct, was expanded on the basis of strong magnetic signatures and was found to be archaeologically productive. OA11 included the largest number of cultural lithics recovered from any one OA—evidence for cultural hearths, knapping, complex occupation and repeated use. Without magnetic survey, OA11 may not have been identified or excavated.

The method also suffered by numerous occasions where no explanation could be found for a magnetic signature. The problem was partially managed by more comprehensive exploratory excavation. At CP4 a potential hearth was discovered by excavating two diagonally oriented 1m x 1m squares centred on the identified magnetic signature. Single 50cm x 50cm test squares were found to be insufficient to locate the source of identified magnetic signatures, as the earth's magnetic field lines intersect the ground at an angle and so the strongest location of the signature source is not directly above it. On other occasions no source could be found for identified signatures. Potentially the unidentified sources for these signatures were below the maximum depth of excavation, which predominantly targeted the

biologically active topsoil. Nevertheless, the successes of the method generally outweigh the null results given that such heated features are highly unlikely to be located by regular grid test excavation strategies. Also, where one heated feature is located by excavation, other nearby features can readily be located.

A secondary but important outcome of the magnetic method was the identification of recent surface disturbance, specifically at CP1 where linear patterns could be directly attributed to mechanised surface disturbance. The magnetic method can therefore be used as an effective means to identify and avoid areas of disturbance prior to archaeological excavation. While the chance of constant and correct identification of ground disturbance at a site based solely on magnetic results across a wider range is unlikely, use of previous magnetic surveys identifying ground disturbance could potentially be used as a comparative basis for future work.

It should be noted that not all excavated burning features were visible as a strong magnetic signature, and this has been tentatively associated with the presence or absence of large areas of burnt/heat affected clay or ferrous nodules. While this should be considered for future application to archaeological excavations (ie a higher likelihood of detection of features that intersect the clay subsoil or larger burning features, therefore potentially skewing the representation of the nature of features), it is also a possible explanation for the lack of magnetic correspondence of some features, and not necessarily indicative of the inadequacy of the technique.

In summary, the application of magnetic survey to archaeological investigation possibly has a beneficial use in refining areas to sample for test excavation/further archaeological investigation, possibly reducing time spent undertaking test excavation as an alternative method for identification of burning features.

2.4.12 Summary

The overview of previous archaeological work undertaken across the SMDS shows that archaeological sites at a regional level are predominantly stone based. A review of the contexts where surface objects have been recorded has indicated that the majority have been recorded in disturbed or eroded contexts; that is, in locations which do not possess a level of archaeological potential for the recovery of a subsurface deposit. Contrasting the surface deposits against the locations subject to prior subsurface investigation (in the SMDS) provides evidence that the surface exposure of objects is not an indication of dense subsurface deposits—a notion that exists for the entire Cumberland Plain.

It is evident through the results of the previous archaeological work that has been undertaken across the SMDS that the entire site can be viewed as an Aboriginal landscape. Aboriginal stone objects across the SMDS are ubiquitous, present across all landforms (in varying densities), and present as surface manifestations in almost all soil exposures across the site. It is clear that the entire SMDS has the potential to possess Aboriginal stone objects in varying densities in any location where conditions exist that are suitable for the preservation of archaeological deposits (ie low levels of historical disturbance and soils of moderate to high integrity and condition). However, archaeological excavation has also demonstrated that even in zones of the SMDS assessed to have high levels of disturbance and therefore low archaeological potential (SMM Zone 4), in situ archaeological deposits can still be present (Biosis Research 2010).

The taphonomy of Cumberland Plain duplex soils (associated with soil landscapes such as the Blacktown or Luddenham soil landscapes, etc) determines that vertical movement of Aboriginal objects occurs through the A_1 and A_2 horizons, where objects frequently settle above the B horizon clay (this is

evidenced by practically every excavation on the Cumberland Plain to date). Intact archaeological deposits connected with alluvial soil landscapes (such as South Creek) are associated with stratigraphical integrity, and thus cannot have a surface expression, unless reflective of a final surface depositional event.

As such, the pattern of recorded stone objects within the Central Precinct identifies that there is a range of material present in a number of landscape locations. The identification of this material is reflective of both the locations of prior archaeological survey and, more tellingly, a consequence of erosion and disturbance of subsurface deposits. Thus, an understanding of impacts connected with the Central Precinct is critical to determining locations with high levels of soil condition and integrity, which could possess a subsurface expression of archaeological material. A summary of relevant local site patterning is summarised below.

Lower Hillslopes near First, Second and Third Order Streams (WP1, WP4 and WP5)

This section is taken from the SMDS Central Precinct Aboriginal Archaeological Salvage Post-Excavation Report.[11]

> *The predictive model hypothesises that with increasing stream order (ie water permanence), evidence for Aboriginal occupation would become denser, more continuous and evidence for more complex activities may be present.*
>
> *Evidence from WP4, a lower hillslope near a first order stream, can be described as a generally low distribution across the landform with discrete areas of moderate artefact densities in Area B and Area C (8 artefacts/m^2 and 11.2 artefact/m^2 respectively). Silicified tuff was the predominant raw material recorded at WP4 and a diverse range of activities appear to have occurred here. The assemblage from WP4 Area C was interpreted as Bondaian in nature (circa 5000 BP) due to the prevalence of backed blades and asymmetrical flaking. In addition, little evidence of material conservation was observed as both silicified tuff and silcrete artefacts were relatively large, indicating that raw material was not exhausted before it was discarded. The nature of the assemblage at WP4 was unexpected for the landform type, a lower hillslope next to a first order stream. In this location it was expected that the archaeological evidence would be sparse and represent little more than a background scatter. In addition it was expected that raw material conservation would be observed however the opposite is true for WP4.*
>
> *As expected, higher artefact densities were observed at WP5 due to its proximity to a more permanent water source (a second order stream). The predictive model stated that archaeological evidence would be sparse but with areas of focused activity such as knapping floors.[12] The assemblage from WP5 generally conforms to this statement whereby the mean artefact densities ranged from 3.8 artefacts/m^2 (test excavation) up to 28.8 artefacts/m^2 in Area B. Silcrete was the predominant material in WP5 with evidence for intensive knapping and production of backed blades.*
>
> *At WP1, a lower hillslope near a third order stream, the predictive model hypothesised evidence for prolonged and intensive Aboriginal occupation such as increased artefact density and a wider range of activities. However, of all the landforms excavated in the Western Precinct, WP1 contained the lowest artefact densities with the average artefact density from test excavation 1.1 artefacts/m^2. After open area excavation, the mean density rose to only 2.3 artefacts/m^2 and the highest mean density for a single open excavation area was only 5.8 artefacts/m^2. Little evidence of on-site knapping was observed in this location although two possible ground ovens were identified. Comparative results were obtained from the earlier excavation of the Xavier College site (ADI 47 + 48), 650m west along the same tributary, in which a generally low density artefact scatter with discrete peaks of moderate to high densities was observed. Based on descriptions in the excavation report a potential ground oven may have also been observed at the Xavier College site although it was not interpreted as such at the time.*[13]

Alluvial Flats near Third Order Streams (WP6)

This section is taken from the SMDS Central Precinct Aboriginal Archaeological Salvage Post-Excavation Report.[14]

Only one site within the Western Precinct, WP6, was located on an alluvial flat. WP6 was located near a third order stream and was anticipated to provide evidence of more repeated and possibly long term occupation with people camping in this location for several days and possibly weeks. However, mean artefact densities recovered during test excavation were much lower than expected at 3.6 artefacts/m^2. After open area excavation, this average only rose to 9 artefacts/m^2 which is at the lower end of that predicted for this type of landform and stream order combination.

Discrete areas of intensive occupation, flaking and formal tool production were observed at WP6 in Trenches 2 and 3 but more continuous evidence of this nature was expected to be found in close proximity to permanent freshwater. However, formal tools, unusual for this region of the Cumberland Plain, were found in Trench 3 which could be suggestive of more complex lithic activities being carried out here as opposed to more casual tool maintenance and production.

As WP6 was the only alluvial landscape to be excavated within the Western Precinct, few comparisons could be drawn before now between Aboriginal occupation of alluvial versus shale hillslope landforms. Salvage excavations within the Central Precinct have provided us with the first opportunity to compare a large body of evidence from both landscape types and examine the current predictive model for the SMDS.[15]

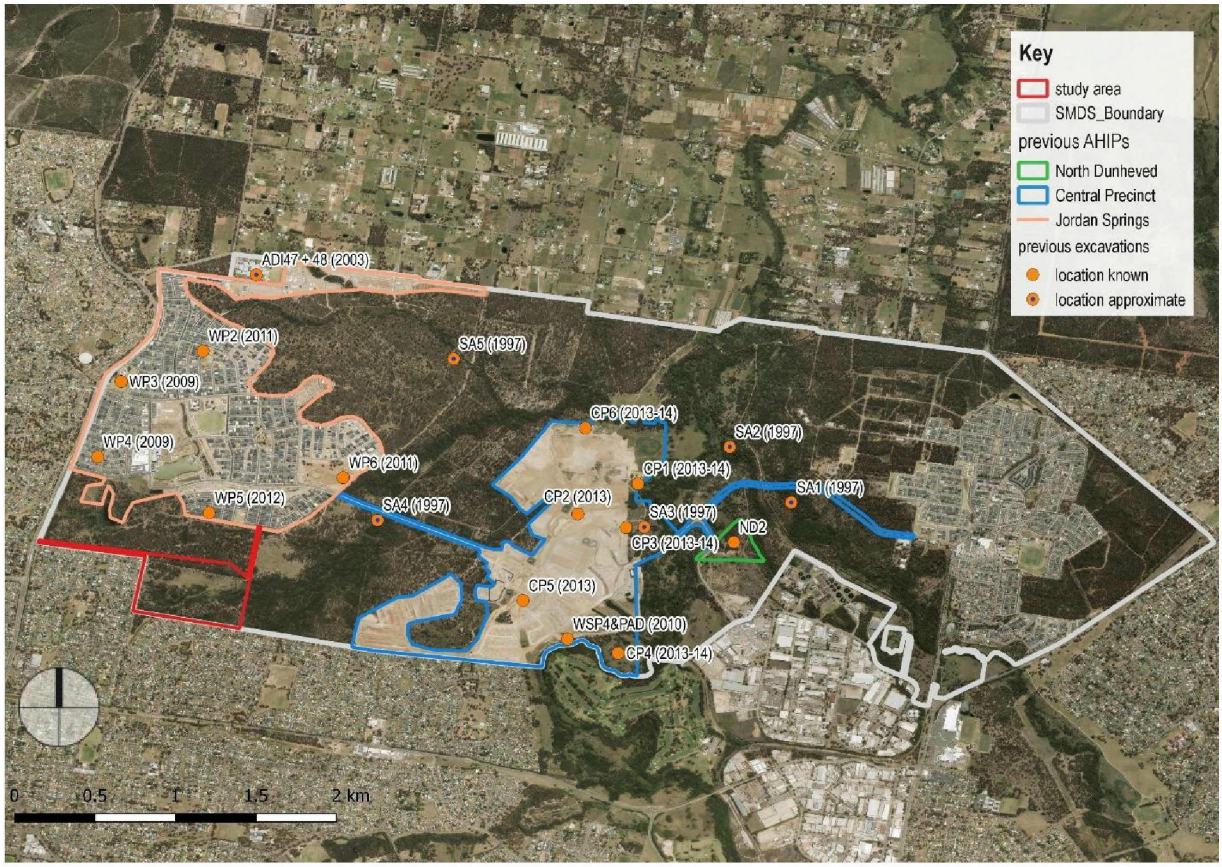

Figure 2.8 Previous archaeological work in the local archaeological context. (Source: NSW LPI with GML additions 2018)

Three prior consents to destroy Aboriginal heritage sites (under Section 90 of the NPW Act) have been used for Aboriginal sites near the study area—AHIP Nos 10996059 (North Dunheved), C0000475 (Jordan Springs) and C0000362 (Central Precinct) have been issued within the SMDS. None of these AHIPs can be used in association with the proposed development activities.

2.4.13 AHIMS Search

An extensive search of the OEH AHIMS database between a latitude and longitude from -33.7409, 150.7167 to -33.7167, 150.7551 surrounding the study area was undertaken on 10 April 2017

(Appendix A). A basic search undertaken on 29 April 2018 for the same area confirmed that no additional sites have been recorded within this area. The results of this search are shown in Table 2.1, Figure 2.9 and Figure 2.10.

There are currently four registered sites or Aboriginal places within the study area (AHIMS sites 45-5-1025, 45-5-1026, 45-5-1031, and 45-5-1032). The search also identified 92 recorded Aboriginal sites surrounding the study area. Twenty-four of the sites have been listed as destroyed (listed in Appendix A); as such, there are 72 valid registered Aboriginal sites surrounding the study area.

Table 2.1 AHIMS Search Results for Basin I Study Area.

Site Type (Features Listed in Brackets)	Frequency	Percentage (%)
Artefact (Unclassified)	40	41.6
Artefact (Isolated Find)	15	15.6
Artefact (Open Camp Site)	36	37.5
Artefact (Potential Archaeological Deposit)	5	5.2
Total	96	100%

The five registered sites within the study area are all artefact scatters—four isolated artefacts, and one artefact scatter—and are consistent with the overall patterning of site types recorded within the wider SMDS. During a preliminary field inspection (outlined in Section 2.6) the previously recorded site AHIMS #45-5-1031 within the study area was re-located. This site was recorded in 1995 by JMcDCHM and comprised three quartz flakes observed on an eroded 4WD track located on a gentle slope which slopes downwards to the east towards the creek. During the field inspection two artefacts, both silcrete flakes, were observed at this location; the quartz artefacts previously recorded were not observed during this inspection. Visibility along the track at the time of the inspection was high (80%); north and south of the track, visibility was reduced to 10–20% due to vegetation coverage.

The limited range of site types recorded on AHIMS is consistent with what is known of the archaeological profile of the SMDS based on previous archaeological investigations in this area. That is, the archaeological profile of the region is predominated by stone artefact sites (representing 94.7% of the AHIMS sites).

The sites are predominantly located on Luddenham soil landscape (n=78), with South Creek alluviums next most frequent (n=18). However, this is more likely to reflect the location of previous impacts, with an avoidance of South Creek alluviums for conservation, rather than an accurate patterning of Aboriginal sites, as a substantial number of sites from the AHIMS search correlate with the Central Precinct and Jordan Springs development areas.

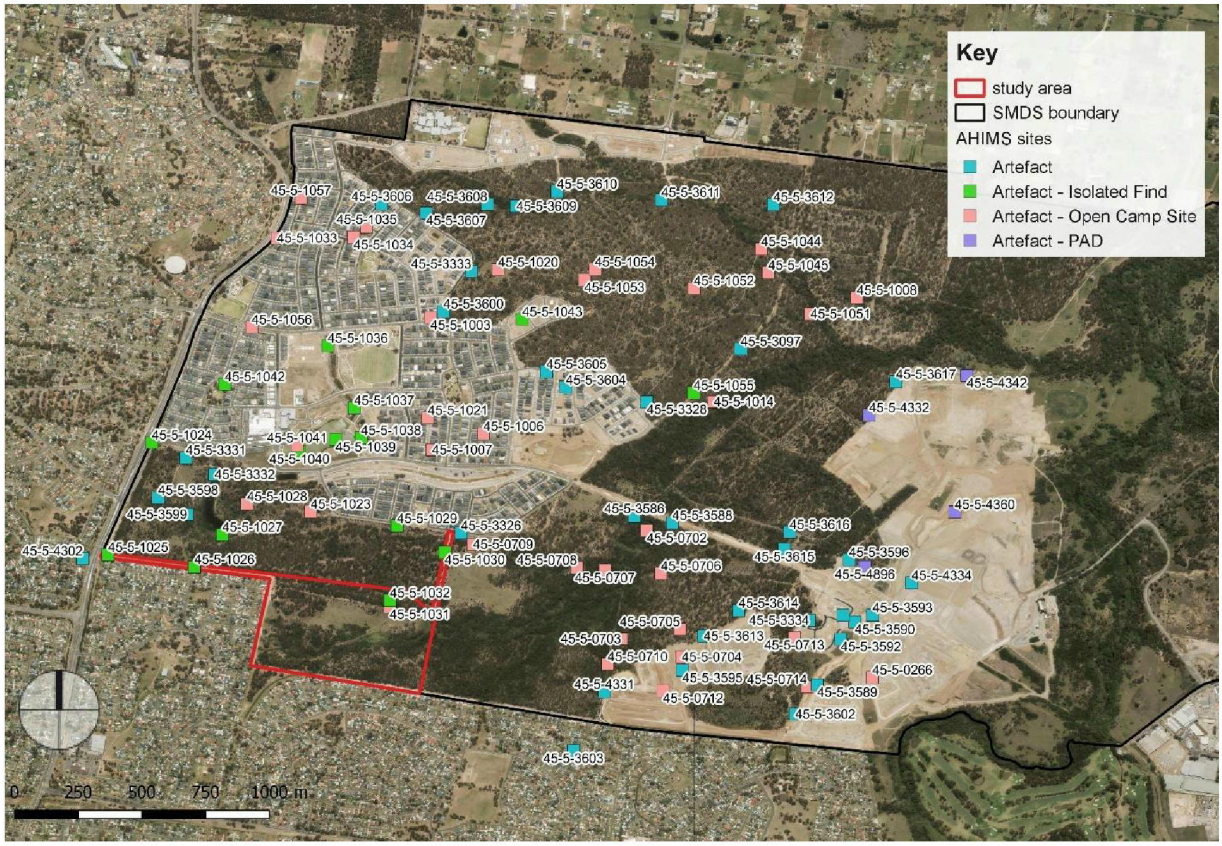

Figure 2.9 AHIMS sites identified within proximity to the study area. (Source: NSW LPI with GML overlay 2018)

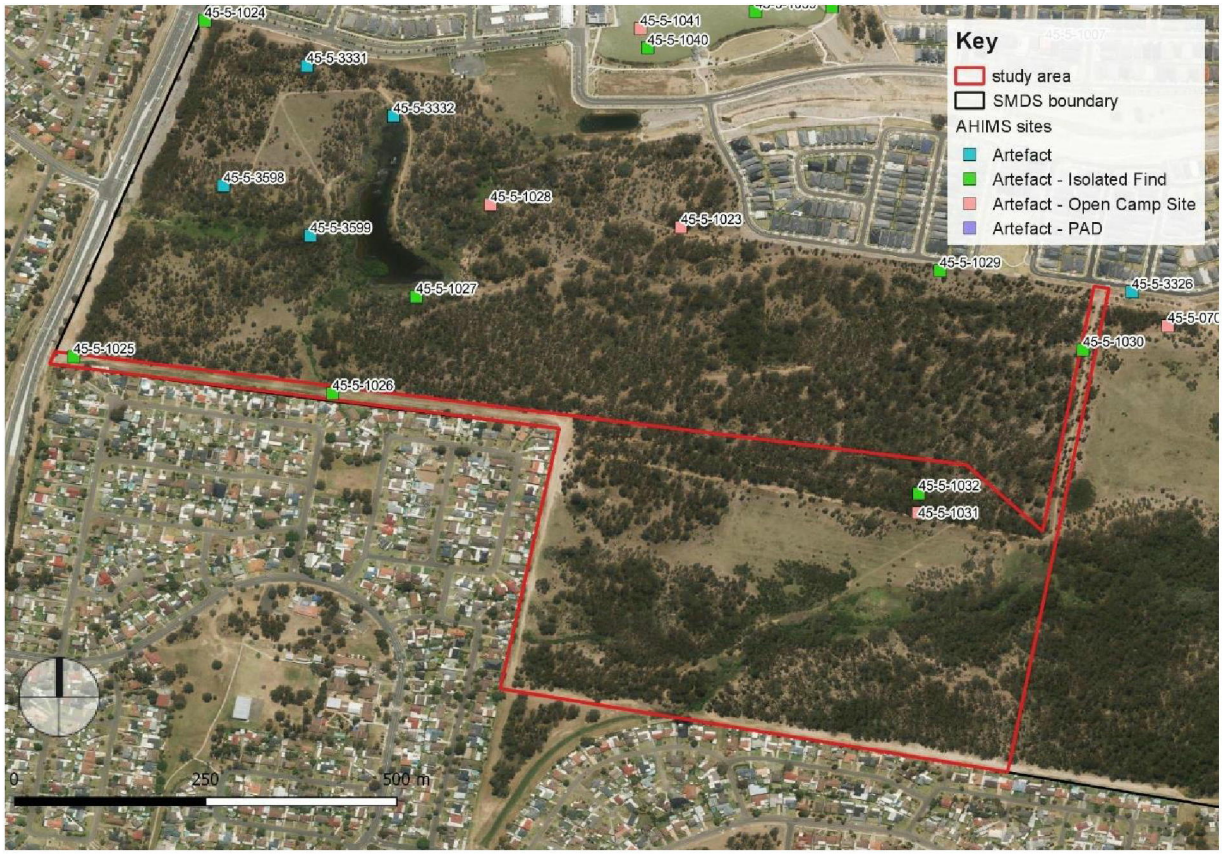

Figure 2.10 Detail showing AHIMS sites registered within the study area. (Source: NSW LPI with GML overlay 2018)

2.5 Aboriginal Heritage Predictive Site Modelling

Development of a predictive model for Basin I's archaeological landscape has applied two predictive models: stream order model and economic resource model.[16] The stream order model posits that artefact sites of higher density and complexity are more likely to occur in association with higher-order streams, on lower slopes and terraces with a north or northeast facing aspect. The economic resource model considers the interrelationship between areas containing economic resources (ie creeks), suitable landforms for occupation (ie terraces), and changes in the landform and/or vegetation community. Each element is ranked on its economic productivity or suitability for occupation, and then these are cross-referenced to identify areas within any landform that would be most likely to contain Aboriginal sites. The outcome of these models was contrasted with results of the preliminary field inspection to confirm site conditions.

The areas predicted to contain dense subsurface Aboriginal archaeological deposits based on these models are presented in Figure 2.11. These predictions form the basis of the research design for the archaeological test excavation, and will be used to contribute further understanding of past occupation of the SMDS within the overall Cumberland Plain landscape.

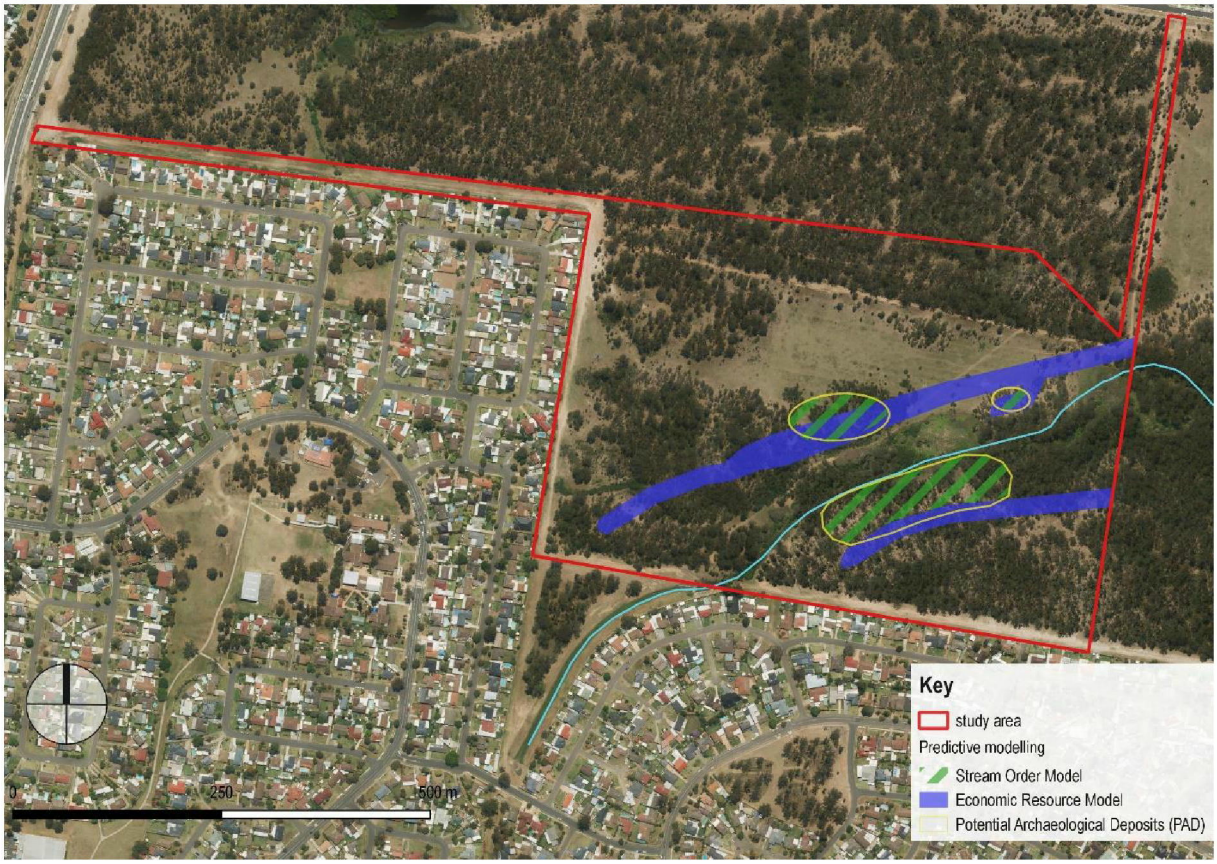

Figure 2.11 Archaeological potential using predictive modelling and results of an initial field inspection. (Source: NSW LPI with GML overlay 2018)

2.6 Preliminary Inspection

A preliminary inspection of the Basin I study area was undertaken to identify landforms to inform statutory management and identifying the appropriate Aboriginal heritage management process. Application of the predictive model and the inspection resulted in the identification of three areas with

archaeological potential within Basin I (Basin I PAD1, Basin I PAD 2 and Basin I PAD 3), one new artefact site (Basin I AFT 2) and one previously registered artefact site (Basin I AFT 1 [45-5-1031]). Historical impacts to an area in the north-east were identified. The areas with Aboriginal sites are described in detail below:

- Basin I PAD 1—a terraced flat located on the northern flat, adjacent to the second order tributary of South Creek. This area with PAD measured 120m by 55m, and has been subject to vegetation stripping and potential ploughing over part of the PAD. Any intact soils have the potential to yield stratified archaeological deposits. The terraced flat was spatially mapped and initially found to be located within the Luddenham soils landscape. However, field inspection identified that the PAD may more likely overlie South Creek alluvium.
- Basin I PAD 2—a terraced alluvial deposit (South Creek soils) located on the northern flat c130m east of Basin I PAD 1, and 20m north of the second order tributary of South Creek. This area with PAD measured 40m by 25m and has been subject to vegetation stripping; the northern half of this area may have undergone ploughing. Intact soils have the potential to yield stratified deposits.
- Basin I PAD 3—an alluvial flat (South Creek soils) located on the southern side of, and adjacent to, the second order tributary of South Creek. This area with PAD measures 230m NE/SW by 60m NW/SE, and has undergone vegetation stripping. Intact soils have the potential to yield stratified deposits.
- Basin I AFT 1—four artefacts were observed on the surface of a highly eroded 4WD track, on an undifferentiated middle slope. The artefacts were all mudstone, and included one medial fragment, one proximal fragment, a piece of debitage and a possible manuport. North of the track is open woodland with limited visibility (20%). No area of potential PAD was identified in the immediate vicinity of the artefacts, although the soils to the north of the track may contain archaeological deposits (albeit in a low density). It is likely that AFT1 is a continued expression of the site investigated by JMcDCHM (45-5-1031). This is based on the proximity and description of the nature and agent of erosion which exposed the isolated artefact as consistent with the location of the current artefacts found within a 4WD track.
- Basin I AFT 2—a single silcrete proximal fragment was observed on an eroded track, located c60m northeast of the second order tributary of South Creek. North of the track the vegetation comprises open woodland with limited visibility (20%); the area south of the track is open grassland, the result of historic vegetation clearing and topsoil stripping.

An area with significant soil impacts was observed. These impacts have arisen from top soil stripping and are shown in Figure 2.12.

Figure 2.12 Detail showing AHIMS sites registered and locations with Aboriginal archaeological potential within the study area. (Source: GML 2017, NSW LPI with GML overlay 2018)

2.7 Endnotes

1 Department of Environment, Climate Change and Water, *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (24 September 2010)*, pp 20–21.

2 Nanson, G, Young, R and Stockton, E 1987, 'Chronology and palaeoenvironment of the Cranebrook Terrace (near Sydney) containing artefacts more than 40,000 years old', *Archaeology in Oceania*, vol 22, No. 2, p 76; Nanson, GC and Young, RW 1988, 'Fluviatile evidence for a period of late-Quaternary pluvial climate in coastal southeastern Australia', *Palaeogeography, palaeoclimatology, palaeoecology*, vol 66, No. 1, pp 45–61; JMcDCHM, Interim Heritage Management Report, ADI Site St Marys, report prepared for the Lend Lease–ADI Joint Venture in Response to the Section 22 Committee Interim Report, April 1997.

3 Strahler, AN 1954, 'Quantitative geomorphology of erosional landscapes', *International Geologic Congress*, No. 19, pp 341–354; Summerfield, MA 1991, *Global Geomorphology*, Harlow, Pearson Prentice Hall.

4 Department of Environment, Climate Change and Water 2011, *Wianamatta Regional Park, Volume 2: Conservation Management Plan*, March 2011.

5 Department of Environment, Climate Change and Water 2011, *Wianamatta Regional Park, Volume 2: Conservation Management Plan*, March 2011, p 94.

6 Department of Environment, Climate Change and Water 2011, *Wianamatta Regional Park, Volume 2: Conservation Management Plan*, March 2011, p 94.

7 Department of Environment, Climate Change and Water 2011, *Wianamatta Regional Park, Volume 2: Conservation Management Plan*, March 2011, p 97.

8 Jo McDonald Cultural Heritage Management, St Marys Development Site, North Dunheved Precinct, Aboriginal Heritage Assessment Methodology, Draft Report to RAPs, report prepared for Maryland Development Company, 2005.

9 GML Heritage + JMcDCHM, St Marys Development Site, Central Precinct—Aboriginal Cultural Heritage Assessment, prepared for Marylands Development Company, November 2013.

10 GML Heritage Pty Ltd, SMDS Central Precinct Aboriginal Archaeological Salvage Excavation, Post-Excavation Report, prepared for Maryland Development Company Pty Ltd, April 2018.

[11] GML Heritage Pty Ltd, SMDS Central Precinct Aboriginal Archaeological Salvage Excavation, Post-Excavation Report, prepared for Maryland Development Company Pty Ltd, April 2018.

[12] JMcDCHM, Archaeological Subsurface Investigations at WP3 and WP4—Western Precinct, St Marys Development Site, report prepared for Maryland Development Company, December 2009, p 16.

[13] GML Heritage Pty Ltd, SMDS Central Precinct Aboriginal Archaeological Salvage Excavation, Post-Excavation Report Draft, prepared for Maryland Development Company Pty Ltd, p 42.

[14] GML Heritage Pty Ltd, SMDS Central Precinct Aboriginal Archaeological Salvage Excavation, Post-Excavation Report Draft, prepared for Maryland Development Company Pty Ltd.

[15] GML Heritage Pty Ltd, SMDS Central Precinct Aboriginal Archaeological Salvage Excavation, Post-Excavation Report Draft, prepared for Maryland Development Company Pty Ltd, p 43.

[16] Owen, T and Cowie, D 2017, 'Four predictive models to describe Aboriginal lithic artefact site patterning on the Cumberland Plain', *Journal of the Australian Association of Consulting Archaeologists*, vol 5, pp 1–13.

3.0 Aboriginal Community Consultation

3.1 Aboriginal Community Consultation to Date

Aboriginal community consultation was initiated in accordance with the DECCW, *Aboriginal cultural heritage consultation requirements for proponents* (Consultation Requirements).[1] Stage 1.1 letters to statutory bodies were sent on 28 February 2018, requesting contact details for Aboriginal people who may have an interest in the study area. These statutory bodies included:

- the OEH;
- Deerubbin Local Aboriginal Land Council;
- Office of The Registrar, Aboriginal Lands Right Act 1983;
- National Native Title Tribunal;
- Native Titles Service Corporation;
- Penrith City Council; and
- Greater Sydney Local Land Services.

Following the receipt of responses from Stage 1.1, a number of potential Aboriginal stakeholders were identified. Stage 1.2 letters were sent to the identified Aboriginal people on 26 March 2018, and an advertisement was placed in the *Mt Druitt–St Marys Standard* on 21 March 2018. Both the Stage 1.2 letters and the advertisement invited Aboriginal people with an interest in the St Marys ADI site area to register as a stakeholder in order to be involved in consultations. Registrations were accepted until 9 April 2018.

Following this process, a list of Aboriginal groups and/or individuals who registered an interest in the project has been compiled (Table 3.1). These groups and/or individuals, the RAPs, will be consulted throughout the preparation of the AHIP application.

Table 3.1 List of RAPs for Regional Detention Basin I, St Marys ADI Site Project.

Registered Aboriginal Party (RAP)	Representative
A1 Indigenous Services	Carolyn Hickey
Aboriginal Archaeology Service	Andrew Williams
Amanda Hickey Cultural Services	Amanda Hickey
Biamanga	Seli Storer
Butucarbin Aboriginal Corporation	Jennifer Beale
Cullendulla	Corey Smith
Darug Aboriginal Cultural Heritage Assessments (DACHA)	Celestine Everingham
Darug Aboriginal Land Care	Des Dyer and Ricky Field
Darug Custodian Aboriginal Corporation	Justine Coplin
Darug Land Observations Pty Ltd	Jamie Workman and Uncle Gordon Workman
Darug Tribal Aboriginal Corporation	Corina Marino

Registered Aboriginal Party (RAP)	Representative
Deerubbin Local Aboriginal Land Council	Steven Randall
DJMD Consultancy	Darren Duncan
DNC	Phil Boyd and Lily Carroll
Goobah Developments	Basil Smith
Gundungurra Tribal Technical Services	Christopher Payne
Gunjeewong Cultural Heritage Aboriginal Corporation	Cherie Carroll Turrise and Cheryl Lagerwey
Kamilaroi-Yankuntjatjara Working Group	Phillip Khan
Kawul Cultural Services	Vicki Slater
Murra Bidgee Mullangari	Ryan Johnson
Murramarang	Roxanne Smith
Wailwan Aboriginal Digging Group	Phil Boney
Warragil Cultural Services	Aaron Slater
Widescope Indigenous Group	Steven Hickey
Wurrumay Consultancy	Vicki Slater

3.2 Cultural Heritage Assessment Program

The OEH has defined a number of stages during the Aboriginal consultation process. The following table provides a synopsis of the process to date.

Table 3.2 Cultural Heritage Assessment Program Synopsis—Progress To Date.

Stage	Status
Write to statutory bodies to obtain contact details for Aboriginal people who may have an interest in the project.	Complete
Write to identified Aboriginal people, inviting them to register an interest in the project.	Complete
Place an advertisement in local print media, inviting Aboriginal people with cultural knowledge of the area to register an interest in the project.	Complete
Proponent records names of Aboriginal people who have registered an interest in the project.	Complete
Proponent advises Local Aboriginal Land Councils (LALC) and OEH of RAPs' details (subject to privacy requests).	Complete
Proponent presents information regarding proposed project to RAPs.	This document
Proponent provides methodology for the cultural heritage and archaeological assessment to RAPs.	This document
RAPs invited to provide input for the assessment methodology.	Pending response to this document
RAPs invited to identify: • whether any Aboriginal objects of cultural value are present within the study area; and • whether any places of cultural value are present within the study area.	Pending response to this document
RAPs invited to comment on potential management outcomes.	Forthcoming
Proponent prepares draft ACHAR and provides to RAPs for comment.	Forthcoming

Stage	Status
RAPs provide comment and proponent incorporates comments into final ACHAR.	Forthcoming
Final ACHAR (and AHIP application) provided to RAPs, LALC and OEH.	Forthcoming

3.3 Roles and Expectations

The DECCW[2] Consultation Requirements list a number of responsibilities and expectations for both the Aboriginal community and the proponent regarding the assessment of the study area's cultural heritage.

The Aboriginal community is responsible for determining who is authorised to speak for Country and its associated cultural heritage. If there is a dispute regarding who has the right to speak for Country, it is up to the Aboriginal community, not the proponent or OEH, to resolve the dispute in a timely manner.[3]

RAPs are also responsible for providing information relating to Aboriginal cultural heritage relevant to the study area to assist in managing its cultural significance in an appropriate manner.[4]

It is expected that:

- Aboriginal people providing knowledge regarding the cultural heritage of the study area are trusted and allowed by the rest of the Aboriginal community to speak for Country;[5]
- people speaking for Country hold knowledge about the cultural significance of their heritage and are able to provide input into appropriate management strategies;[6]
- RAPs have an understanding of the commercial environment in which the proponent is operating and the constraints associated with this environment;[7] and
- RAPs understand the Chief Executive of OEH is the final decision maker relating to the consideration of applications under Part 6 of the NPW Act, and that these decisions may not be consistent with the views of the RAPs.[8]

The proponent is responsible for consulting with the Aboriginal community and managing the consultation process in accordance with the Consultation Requirements.[9]

It is expected that:

- the proponent would develop and implement appropriate consultation methods, in accordance with the Consultation Requirements;[10]
- Aboriginal views are considered and appropriately incorporated into the assessment process;[11] and
- the consultation process is accurately documented, including both the consultation undertaken and the input from the RAPs.[12]

OEH is responsible for assessing any application under Part 6 of the NPW Act and is the decision maker regarding whether an AHIP application is refused or granted. OEH is responsible for ensuring any conditions attached to an AHIP are complied with by the AHIP holder.[13] Internal policies for assessing AHIP applications would be followed by OEH and all information provided as part of an AHIP application would be considered.

The proponent has a lengthy history of engaging with Aboriginal heritage and local Aboriginal people able to speak for Country in this area—this is demonstrated through the history of engagement detailed through the archaeological works described in Section 2.4. Notably the engagement with local Aboriginal people for development of the Wianamatta Regional Park CMP (Section 2.3) provided a context for the individuals with a long history and connection with this place, as required under OEH policy.

3.4 Endnotes

1 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, 2010.
2 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, 2010.
3 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, 2010, p 36.
4 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, 2010, p 15.
5 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, 2010, p 8.
6 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, 2010, p 8.
7 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, 2010, p 16.
8 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, 2010, p 15.
9 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, 2010, p 16.
10 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, 2010, p 6.
11 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, 2010, p 16.
12 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, 2010, p 16.
13 Department of Environment, Climate Change and Water, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, Department of Environment, Climate Change and Water, 2010, p 16.

4.0 Proposed Aboriginal Cultural Assessment Methodology

4.1 Aim of Consultation

The aim of consulting with Aboriginal people is to facilitate a process for RAPs to contribute to the approach taken to gathering culturally appropriate information, as well as to allow determination of the cultural significance of Aboriginal objects and/or places that may be present within the study area. Consultation also provides an opportunity for RAPs to have input into the development of cultural heritage management options within the project area.

This ARD also defines the methodology and research parameters for archaeological test excavation within Basin I. It has been prepared in response to the environmental background and desktop analysis of the study area. Field survey and consultation with RAPs following submission of this draft document may further refine the proposed test excavation methodology before it is finalised.

Therefore, this document presents the methodology to be followed in gathering cultural information relating to the Basin I subject site. RAPs have a minimum of 28 days to review and comment on the methodology; any comments would be addressed in the final methodology for the project. If a RAP has a concern with respect to protocols regarding cultural information, this should be raised and an appropriate management methodology will be developed.

4.2 Guidelines

This methodology fulfils the requirements of the Consultation Requirements.[1] It is guided by the requirements of:

- the Code of Practice;
- the OEH *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* 2011;
- the DECC *Guide to Determining and Issuing Aboriginal Heritage Impact Permits* 2009; and
- the OEH *Applying for an Aboriginal Heritage Impact Permit: Guide for Applicants.*

4.3 Background Research

Background research regarding previously recorded Aboriginal sites, the history of Aboriginal people living in the area and the physical landscape or setting, as undertaken in the due diligence and this report. This includes a review of previous archaeological reports covering the general vicinity of the study area, along with a search of the Aboriginal Heritage Information Management System (AHIMS) register for details of Aboriginal sites located in the general area.

The physical landscape of an area and resources present within it determines how Aboriginal people would have interacted with it in the past. An assessment of the physical landscape assists in predicting the types of activities Aboriginal people are likely to have undertaken within it, and therefore the types of material evidence which are likely to be present within an area.

4.4 Archaeological Survey

An archaeological survey will be undertaken with the aim of identifying, recording and assessing the condition of previously unrecorded Aboriginal sites within the study area.

The archaeological survey would be undertaken in accordance with the Code of Practice and the results would be recorded in an ATR, which would be an appendix to the ACHAR.

The study area is approximately 32ha. It is proposed to survey the area on foot, in a single team comprised of an archaeologist with experience in Aboriginal cultural heritage assessment and representatives from the RAPs. The site would be navigated using aerial maps and hand-held GPS. The study area would be systematically surveyed with parallel transects where possible. Opportunistic inspection would be undertaken of areas and features that have been identified as having potential to be associated with Aboriginal cultural heritage, or which are identified by the RAPs as requiring investigation. Notes will be made regarding the soil condition and evidence of disturbance.

Newly identified sites would have their location recorded and their extent mapped on the aerial and/or topographic maps. They would be photographed and AHIMS cards completed—these will be submitted to the OEH. The landscape of the study area will be characterised and areas with Potential Archaeological Deposit (PAD) will be designated.

Any areas which cannot be inspected due to occupational health and safety concerns would be visually assessed (as far as possible) and the limitation recorded.

4.5 Mechanism for Archaeological Test Excavation

Archaeological test excavation is permitted under the Code[2] without the need for a Section 90 permit (ie excluded from the definition of harm under the NPW Act), provided that the subsurface investigations are not carried out in the following areas:

- in or within 50m of an area where burial sites are known or are likely to exist;
- in or within 50m of a declared Aboriginal place;
- in or within 50m of a rock shelter, shell midden or earth mound; and/or
- in areas known or suspected to be Aboriginal missions or previous Aboriginal reserves or institutes.

As described by OEH the purpose of test excavation is to:

> *collect information about the nature and extent of sub-surface Aboriginal objects, based on a sample derived from sub-surface investigations. Test excavations contribute to the understanding of site characteristics and local and regional prehistory and they can be used to inform conservation goals and harm mitigation measures for the proposed activity.*[3]

The methodology for archaeological test excavation described in this chapter has been developed in accordance with OEH *Code of Practice for Archaeological Investigation*.[4] This chapter provides details of the proposed test excavation in accordance with Requirements 14–17 of the Code, including:

- the test excavation sampling strategy;
- the methodology for test excavation; and
- details of OEH notification.

Aboriginal community consultation is being undertaken in accordance with NPW Regulation, subclause 80C(6), and was commenced prior to this proposed methodology being prepared and will continue throughout the project.

4.6 Test Excavation Sampling Strategy

An appropriate methodology for archaeological test excavation has been defined by the OEH.[5] However, the sampling strategy for undertaking test excavation should be developed in accordance with the needs of each project and be subject to the specific requirements of its study area.

An understanding of previous archaeological work and AHIMS data provides a context for previously identified Aboriginal objects. Acknowledging the data and recording limitations of the AHIMS system, there is a basic correlation between densities of previously recorded Aboriginal features and zoning identified as having a potential for archaeological deposits.

In an ideal situation, where no post Aboriginal occupation impacts have occurred, all the zones identified as possessing archaeological potential would be sampled. However, in order to develop a strategic sampling model, consideration needs to be given to natural and historical processes that have impacted, and/or removed, archaeological deposits associated with the study area. Therefore, areas known to have been impacted by the construction will not be tested. The primary locations requiring archaeological testing are defined in Figure 2.12.

4.6.1 Archaeological Sampling Strategy

Existing knowledge has been gathered for this project in terms of registered site data, prior reports, the landscape context and the known impacts to the study area (Section 2.0 of this report). The combination of these aspects defines the zones within the study area that are suitable for archaeological testing. A substantial body of work exists for previous archaeological excavations undertaken within the SMDS that has provided a good overall understanding of the nature and likely extent of archaeological deposits across the site in areas of good soil integrity and archaeological potential. This includes the recent excavations undertaken at the Central Precinct that utilised new techniques and approaches to test excavations. The results of this work have been used to further refine possible locations for test excavation, with additional techniques proposed to be utilised during the test excavations (such as magnetic survey).

The following sections outline the objectives or purpose of the test excavation and how these objectives will be met through the sampling of the study area.

Objectives (and Research Questions)

The first objective of the archaeological test excavation for Basin I is to identify and subsequently excavate an archaeological deposit located on alluvial soils, with the primary aim of recovering stratigraphically intact archaeological deposits. The results of the archaeological excavations at the Central Precinct were either inconclusive or demonstrated an absence of intact stratified archaeological deposits. Such testing of alluvial deposits at Basin I has the potential to identify intact stratified archaeological deposits, contribute additional data that may assist in identifying parameters where intact deposits are likely to be present, and further the archaeological understanding of alluvial terraces across the region.

The archaeological deposits of Basin I may contain scientifically important stratified archaeological deposits, either by soil horizon, or potentially through geo-chronofied archaeological sequences. If

present, excavation of these landscapes has the potential to contribute additional information on Aboriginal resource use of the wider SMDS and in comparison with results of previous work in this area, in particular at the Central Precinct. This information can also help to refine regional archaeological modelling and patterns developed for the Cumberland Plain and associated with theoretical Aboriginal archaeological matters, such as social and economic regimes, over the past 10,000 years.

The second objective is to undertake an assessment of the archaeological materials retrieved from excavation, and to place this data within a regional context. The results of the Central Precinct archaeological excavations indicate that while the predictions of the Cumberland Plain Predictive Model (CPPM) were upheld, the evidence to support this prediction was not consistent with the model (ie site complexity was identified through non-lithic features, an aspect not traditionally included within the CPPM). Therefore, in conjunction with objective three (below), the results of excavations at Basin I have the potential to expand and refine current archaeological predictive models for the region to ensure their continued applicability.

The third objective is to undertake further testing of alternative archaeological techniques trialled during the Central Precinct excavations, including the use of geomorphological analysis, optically-stimulated luminescence (OSL) dating, and magnetic survey. The results of using these techniques at the Central Precinct were not necessarily conclusive, and the collection of additional data would assist with confirming, refining and/or refuting the contribution that these additional techniques make to the outcomes of archaeological excavations.

In order to achieve these main objectives, research themes and questions have been established to guide the archaeological process and provide the basis for questioning the data collected. The main research themes for this project are:

1. Investigation of archaeology located in alluvial soil profiles (eg South Creek Soil Landscape), in comparison with archaeology in residual soil profiles (eg Luddenham Soil Landscape).

2. Chronological interpretation of archaeology on the Cumberland Plain. This would involve the recovery of chrono-stratified deposits from alluvial soils (where present), as well as undertaking various dating techniques in an attempt to acquire chronological dates for soils and archaeological deposits within the study area.

3. Technological evolution of the production and use of Aboriginal stone artefacts within the study area.

4. 'Time' and spatial interpretation of stratified and non-stratified archaeological deposits and the implications of this for Aboriginal use of the Holocene landscape of the study area.

5. Further testing of the use and applicability of a range of scientific methods of investigation including lithic sampling sizes, geophysical techniques for geomorphological investigation, pollen analysis, and OSL dating, and comparison with results from the Central Precinct salvage excavations.

Following from these research themes, specific research questions have been developed to guide the archaeological test excavation. These research questions include:

1. What are the characteristics of the alluvial deposits at each location present?

a. How deep is the alluvium? And what are its characteristics?

b. At each location, is the deposit consistent? Or does it possess characteristics that tell of different depositional events?

c. What is the condition and integrity of the alluvial deposit? How has the deposit been affected by recent activities?

d. How does the alluvial deposit differ between locations tested?

e. How do the alluvial and residual soils interface? Does the archaeological resource on each soil landscape differ? Can information derived from the stratified deposits be used to enhance interpretation and understanding of un-stratified deposits?

f. How does this compare to the results of the Central Precinct salvage excavations?

2. Are the alluvial deposits chronologically stratified?

   a. Is there archaeological evidence that can be dated (through scientific methods, carbon dating, OSL, and/or relative dating)?

   b. Do the alluvial deposits possess clear evidence for repeated occupation over time at the same location within the landscape? Are deposits associated with a particular flood event(s)? Does the deposit have different degrees of archaeological potential with depth?

3. What is the nature of the archaeological deposit and how can it be interpreted?

   a. What are the physical attributes of the deposit (stone, carbon, clay or other)?

   b. What, if any, evidence other than stone is present for Aboriginal occupation of this region?

   c. For stone deposits, what are the physical characteristics and do they indicate a specialised use? Is there a difference in stone tool types between the different locations tested?

   d. For other deposits (ie burning features), what are the physical characteristics and how do they compare to features identified at the Central Precinct? Is it possible to identify relationships with concentrations of stone deposits?

   e. What are the spatial characteristics of the archaeological deposit at each location? Is the archaeological deposit consistent with depth? Were Aboriginal people utilising the same locations for thousands of years or was there considerable variation in landscape use and selection strategies? How does the archaeological deposit vary spatially within one site? Is there evidence for domiciliary areas within the deposit?

4. Can the archaeology be interpreted in a regional context?

   a. Where did raw stone materials originate from? Have they been brought into the study area? From how far away has the stone been brought?

   b. Is there evidence of trade in connection to stone deposits? Within a single context, does one stone material exhibit a higher degree of 'working' than another? Does the level of working or percentages of stone change over time (ie across stratigraphical layers)? How

do these differences relate to stone procurement strategies? What are the implications for regional Aboriginal economy and possibly local tribal boundaries?

c. How does the archaeological evidence compare with the results of the Central Precinct, which did not wholly conform to the Cumberland Plain Predictive Model in terms of the distance-decay to stream order model? Do the results support any of the alternative hypotheses suggested for the observed differences at the Central Precinct sites along South Creek?

5. How is the archaeological deposit significant?

   a. What is the heritage value of the deposit, both scientifically and culturally?

   b. How does the Aboriginal community view and value the deposit identified?

   c. Does the deposit conform to the standard stream order model? Can the combined evidence from all the excavations across the SMDS be used to refine or describe a new model for Aboriginal occupation?

   d. Within a stratified sequence, how important is the stone resource? Is it the primary archaeological interpretation tool? Or does it merely supplement other archaeological evidence and become a representative component of each site excavated?

6. Is there a deposit worthy of conservation or of future research? Is there a high scientific value archaeological deposit(s) worthy of extensive salvage excavation?

   a. Are chrono-stratified deposits (if present) located in a position that lends itself well to large scale open area excavation under an AHIP?

   b. What new research questions should be asked of open excavation? Are there benefits to undertaking larger scale investigations? Will we learn new information from bigger excavations? Or would it be better to 'window sample' very large landscape areas to obtain representative pockets of archaeological deposit?

7. Does the use of additional scientific techniques contribute new methods for identifying/locating archaeological deposits and/or additional knowledge through alternative analysis?

   a. Is the use of magnetic survey a useful method of identifying non-lithic archaeological deposits (such as burning features)? Can the interpretation of the results be refined through comparison with existing archaeological excavation results such as at the Central Precinct?

   b. Does the use of geomorphological assessment, including particle size analysis and OSL dating, contribute additional information that cannot be gained from archaeological excavation only?

Population

The targeted population is defined by the extent of the study area boundary. Archaeological sampling will be focused towards to those areas that have archaeological potential (those zones that are likely to contain a residual deposit) and are not highly disturbed (ie areas of previous impact identified through historic aerial photos) and/or posing a danger to the fieldworkers.

Test units (TUs) are to be placed extending away from landforms that have a good to moderate level of archaeological potential, towards areas that have a low archaeological potential, or are possibly highly disturbed. Such TUs will be placed to test a 'null hypothesis' and will be excavated to prove that archaeological deposits can be scientifically classified according to landform and level of disturbance.

Data to be Collected

Data will be collected for each TU during the test excavation on a specific TU context sheet. Data collected will include: TU number, location, landform, aspect, depth of each spit as excavated, number of stone objects (or other feature) per spit, total number of objects, the identification of any features or inclusion (such as carbon), taphonomic factors (disturbance, bioturbation etc), soil characteristics, section and plan diagrams (especially where features are present), and a recommendation as to whether the TU should be expanded (in accordance with OEH guidelines), or further TUs should be located surrounding the one excavated.

The excavation director will supervise all TU recording and determine whether further TUs should be opened (in addition to those defined by the sample grid), or whether a TU should be expanded.

A running total of features and Aboriginal objects will be kept, so as to determine an in-the-field comparison between sample areas.

Degree of Precision Required

The location of each sample transect has been established using GIS software based upon landforms, disturbance factors and archaeological potential. For every sample transect, TUs were positioned using GIS software on an offset 20m by 20m grid. The accuracy of this initial layout is high. All TU locations will be set out by a surveyor, based upon the sample pattern developed in GIS software (with minor variation only where physical features on the ground necessitate this). Additional TUs, when required, will be set out in the field by hand, using standard surveying techniques. Excavation of each spit will be determined by an archaeologist using a hand tape; the vertical control for excavating should be around 10mm.

Spatial control of TU locations and vertical excavation will be sufficiently precise to define the location of Aboriginal deposits across the study area and to allow the research questions to be addressed.

Method of Measure

The natural background density of Aboriginal objects across the wider region is virtually nil. All Aboriginal material present at a site has been brought into the area from an external source. Therefore, all objects would be related to an occupation activity undertaken by Aboriginal people over the Holocene.

There are some locations which appear to have been used intensively by Aboriginal people, where denser deposits of stone artefacts, earth mounds, burials, hearths, oven/fire pits, heat retaining stone, etc can be found. Such locations appear to be related to long term subsistence strategies by Aboriginal people and may provide new information relating to their economy, demography and society.

The Frame for Sampling

With reference to the units of sampling, Orton states that:

> *… surveys does not have to be based on grid squares or transects: other shapes (even ones without straight lines) are statistically permitted …*[6]

Orton[7] has examined the relationship between site diameter to grid interval and the probability of discovering a site. He contrasted a square grid against a staggered square grid and found that 'a staggered grid is considerably more efficient than a square grid…'[8] with an increased probability of discovering sites using the staggered grid. Thus, a staggered grid pattern has been applied to the relationship of TUs on parallel transects.

OEH's requirements for sampling are basic—the sampling framework for the test excavation has been based upon 20m grids, where TUs will be excavated in transects, with 20m spacing between TUs. Each sample transect has been defined according to soil landscape, landform within that landscape, and avoiding all known limitations. These are positioned to intersect known surface expressions of archaeology and to sample potential areas that have been identified as potentially associated with Aboriginal traditions.

The locations of the transects have been positioned to target areas of PAD identified during the preliminary field inspection and extended to ensure coverage of all landforms and soil profiles within the study area. Transects are orientated roughly perpendicular to the alignment of the creek to ensure that the samples provide optimum coverage of the zones that have the greatest potential for containing a dense archaeological deposit. The offset between transects is 20m, thus allowing for a regular pattern of sample TUs. Along each transect the arrangement of TUs is a straight line.

The layout of the sample transects across the study area, and the TUs on each transect, is shown in Figure 4.1. Three locations have been chosen to target areas of archaeological potential based on the predictive modelling (PAD 1, PAD 2 and PAD 3). At this stage, construction impacts arising from the proposed regional detention basin have not been finalised. As such, two areas within the study area (Access Route Options 1 and 2) have been identified for testing, the results of which would be used to inform the location of an access road that would be constructed as part of this development. At this stage the location of the test units has not yet been formalised to allow a degree of flexibility to respond to the requirements of the proponent's design, responses from the RAPs to this methodology and the results of the field survey.

In total, it is proposed to excavate approximately 137 TUs, across 15 transects. The testing is proposed to be undertaken in two stages. The first stage would comprise excavation of the TUs identified in Table 4.1. Following completion of this initial testing, it is proposed to complete geophysical survey targeting TUs in areas of PAD that contain Aboriginal objects. Approximately 30 additional TUs could be excavated for the purpose of testing the results of the geophysical survey. The proposed methodology for geophysical testing is outlined in Section 4.6.2.

A breakdown of the initial TUs and transects to be sampled, by landform and soil landscape, is presented in Tables 4.1 and 4.2. A wide variety of landforms and locations will be test excavated. This will provide evidence on the nature and extent of the archaeological deposit, confirm the history of use and impact, as well as the condition and integrity of the deposit.

Table 4.1 Number of Transects and TUs, by Soil Landscape and Landform.

Area	Soil Type	Landform	Number of Transects	Number of TUs (approx.)
PAD 1	Luddenham	Terrace and creek bank flats	2	13
PAD 2	South Creek	Creek bank flats	3	3
PAD 3	South Creek	Creek bank flats	4	34

Area	Soil Type	Landform	Number of Transects	Number of TUs (approx.)
Access Route Option 1	Luddenham	Lower and mid-slopes	2	25
Access Route Option 2	Luddenham	Lower and mid-slopes	2	30
Perimeter Access Route	Luddenham	Mid-slopes	2	32

Table 4.2 Number of Transects and TUs, by Soil Landscape and Landform.

Soil Landscape	Landforms	Number of Transects	Number of TUs (approx.)
South Creek	Creek bank flats and associated lower slopes	5	37
Luddenham	Mid-slopes	6	87
	Creek bank flats and associated lower slopes	4	13
Totals		15	137

Figure 4.1 Offset grid spaced at 20m intervals targeting areas of archaeological potential (PADs), and watercourses or landform definitions of relevance. (Source: NSW LPI with GML overlay 2018)

The Pre-Test or Pilot Survey

Orton notes that the best survey designs can be made when the survey is over and that a pilot survey can serve to remove some of the 'bugs' from the sampling process.[9] The current survey design has

been based upon a recent field inspection, with GPS-based identification of areas that are suitable for subsurface sampling.

It is intended that during the test excavation, the Aboriginal representatives and field archaeologists will be able to respond to the initial results of excavation and determine whether further transects should be sampled.

Should a sample transect yield no cultural evidence, then excavation of the transect may be terminated prior to the completion of all TUs on that transect, or TUs skipped to a location that may yield results, provided both archaeologists and Aboriginal stakeholders agree on this course of action.

Organisation

The test excavation will be undertaken by a team which will include an archaeological Excavation Director, two field archaeologists and six Aboriginal representatives (from the RAPs). Excavation teams of two people will hand excavate sequential TUs along sample transects. Wet sieving of deposits would be undertaken using 5mm mesh hand sieves. Following recording by the director, each TU will be backfilled with excavated spoil. All information relating to each TU will be recorded on a context sheet.

Running totals of artefacts and features will be kept in order to keep track of yields on a sample transect, so that a logical progression to expanding a sample transect can be made if required.

Summary and Analysis

Following test excavation, all recovered Aboriginal stone objects will be subject to analysis by an appropriately qualified Aboriginal lithic specialist. The specialist will undertake recording of all relevant attributes in a comparable manner to other regional lithic studies and in accordance with Holdaway and Stern (2004) and OEH (2010) Requirement 19. A technical report will be prepared that contrasts the stone materials against other recent excavations in the region, in particular the Central Precinct excavation results.

Following test excavation, objects will be reburied in accordance with OEH (2010) Requirements 16b and 26. The precise mechanism for this reburial will be discussed with you and determined during the cultural heritage assessment.

If required, faunal analysis will be undertaken by Dr Tim Owen. Should shell material and/or human skeletal material be identified during the test excavation, work will cease in the immediate area and the OEH (and in the case of the latter) the NSW Police Department will be notified. Dr Owen will be responsible for the positive identification of such materials.

Landscape analysis and all other reporting will be undertaken by Dr Tim Owen, assisted by the field archaeologists present during the test excavation. All results will be assessed with the assistance of GIS software, and consequential mapping of sites, places, landscapes and heritage values will be GIS based.

The test excavation report will be provided to the RAP for review and comment. Following Aboriginal review the report will be forwarded to the OEH.

Information Gained for Future Survey

The information derived from test excavation will be used to expand the heritage values assessment of the study area. The report will provide direction for conservation of Aboriginal heritage and an impact

analysis for all known objects, sites, places and values within the study area. The report will detail sites and places that would require further study, and possibly excavation if they cannot be conserved during any future development process.

The report will also contrast and compare the study area within the wider region and provide direction for future studies.

4.6.2 Geophysical Sampling Strategy

Geophysical methods have been utilised internationally to greatly improve the identification and configuration of archaeological sites prior to excavation, although ephemeral sites common to mobile human populations pose particular problems. In Australian settings, including at the Central Precinct within the SMDS, such sites are composed largely of open scatters of stone objects, which are invariably geophysically indistinguishable from the mineral matrices that support them. However, features closely associated with ephemeral sites have been shown to be detectable using magnetic methods. The heat produced by hearths and ovens may cause magnetic domains in the surrounding mineral matrix to reorient in line with the earth's magnetic field, producing an associated thermo-remnant magnetic field. That magnetic field may subsequently be detectable using a magnetometer. Prior to commencement of salvage excavation at the Central Precinct, magnetic survey was used to target excavation towards potential archaeological features with signatures of burning events that may occur in association with the artefact densities identified during the testing phase of excavation.

Approach to Non-stone Based Cultural Features

A number of non-stone based cultural features have now been identified on the Cumberland Plain during archaeological excavations. Geophysical testing at the Central Precinct identified that this was generally successful for investigating such features.

A geophysical survey will be undertaken within the eastern half of the detention basin footprint. A gradiometer will be deployed to collect magnetic signatures in order to further guide test excavations towards possible locations of hearths, ovens or baked clay balls (BCBs). This section of the project area has been selected as it presents soil horizons with the greatest potential for the retention of 'burnt' archaeological features.

A selection of locations which present a positive geophysical signature will be subject to archaeological test excavation, concurrently with the program of test excavation.

Existing Knowledge

Existing knowledge derives from similar surveys conducted by GML at East Leppington 2013 (in southwest Sydney), McPhails (Dapto) in 2014 and the Central Precinct in 2016. Magnetic surveys were conducted prior to salvage excavation to target excavation towards potential archaeological features with signatures of burning events that may occur in association with artefact densities identified during the test excavation. Prominent and/or unique signatures observed in the processed magnetic maps were identified spatially and explored archaeologically.

Approximately 50% of magnetic features could be related to observable inclusions within the regolith, or to contrasts of the regolith characteristics. The method was thereby demonstrated as an effective means to target archaeological excavations which would otherwise have missed the features using either a random or systematic sampling strategy.

Objectives and Research Questions

1. Do magnetic signatures exist at the surveyed areas that contrast with the background?
    a. Do the observed magnetic signatures correspond to identifiable subsurface features?
    b. Are any corresponding subsurface features related to past burning events?
    c. Can any identified burning feature be attributed to human activity?
    d. Are human-attributable burning signatures unique in relation to other magnetic signatures?
2. What is the spatial accuracy between the location of signatures observed in a magnetic map and contributing features identified by excavation?
    a. Do point-source excavations at re-located magnetic signatures more often fail to identify the contributing subsurface features?
    b. Does an expansive excavation strategy improve the identification of contributing subsurface features?

Method

TUs containing higher densities of Aboriginal objects within those areas of PAD identified in Figure 4.1 will be targeted for geophysical survey.

The corners of rectangular survey areas generated in a GIS and spanning selected archaeological sample transects will define individual sampling grids for measurement. An FM256 gradiometer in dual configuration will be deployed over the grids in a zig-zag pattern at a transect spacing of no less than 1m. Collected magnetic data will be uploaded to a PC and processed using Geoplot 3.0 software for the production of magnetic maps. Each map will be georeferenced and incorporated into a GIS. A range of signatures will be marked for excavation and located on the ground for excavation.

Organisation

The field component of the geophysical survey will be undertaken over approximately two to three days by a specialist geomorphologist following completion of the Aboriginal archaeological test excavation units identified in Figure 4.1.

Information Gained for Future Work

The numerical information derived from geophysical survey will be analysed to assess whether cultural burning can be differentiated from non-cultural burning signatures. Excavation methodology will also be assessed in regard to the successful identification of subsurface features causing magnetic signatures.

4.7 Significance Assessment

Management of Aboriginal cultural heritage within the study area is largely based on an assessment of its significance.[10] Generally, an assessment of the significance of Aboriginal cultural heritage considers two factors—archaeological (or scientific) values, and the cultural values identified by the RAPs.

Consideration of these two values would allow an assessment of the significance of cultural heritage within the study area. An assessment of the cultural significance of any objects or places identified

within the study area will be sought from the RAPs prior to the finalisation of the ACHAR. Should any restrictions apply to the cultural knowledge supplied (for example, male-only information), these will be strictly adhered to by the proponent.

The archaeological significance of any Aboriginal objects or places identified within the study area would be assessed in accordance with the Burra Charter.[11] Any archaeological potential would be mapped and zoned as high, moderate or low, based on consideration of the predictive model for the study area and the assessed archaeological significance criteria.

4.8 Impact Assessment and Management Strategies

The potential of the development to impact identified Aboriginal cultural values within the study area would be assessed. Statements of impact would be provided and recorded in the ACHAR.

Based on the proposed impact and the assessed significance (both cultural and archaeological) of the site, management strategies would be produced in consultation with the RAPs. Input from the RAPs would be considered and documented in the final ACHAR and an explanation of how suggestions were considered and/or implemented in the final management recommendations for the site would be provided.

4.9 Reporting

A report detailing the results of the archaeological assessment would be produced in accordance with the Consultation Requirements, the OEH *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW,*[12] and the Code of Practice. The draft of this report would be provided to the RAPs for their review and comment prior to the finalisation of this report. The ATR will be an expanded iteration of this initial document, to include the outcomes of the survey, test excavation, significance assessment and impact assessment.

4.10 Community Input

This methodology has been provided to all RAPs for their review and comment. Any input from the RAPs will be considered in the final methodology for the project.

GML is currently planning the archaeological survey component of this project. We will soon contact all RAPs to discuss their involvement in this work. The archaeological survey will occur following the 28-day review period for this methodology.

In accordance with OEH guidelines, please provide written and/or oral comments by <DATE>. Please advise when commenting if you wish to be involved in the physical archaeological site inspection and test excavation phases of this project. All participants will be required to have a good level of physical fitness and be able to walk up to 10 kilometres per day.

4.11 Endnotes

1 Department of Environment, Climate Change and Water (NSW), *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, April 2010.

2 Department of Environment, Climate Change and Water (NSW), *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (24 September 2010),* pp 24–28.

3 (Department of Environment, Climate Change and Water (NSW), *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (24 September 2010),* p 24.

4 Department of Environment, Climate Change and Water (NSW), *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (24 September 2010)*.

5 Department of Environment, Climate Change and Water (NSW) 2010, *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*, requirement 16 a, pp 26–27.

6 Orton, C 2000, *Sampling in Archaeology*, Cambridge University Press, Cambridge, p 29.

7 Orton, C 2000, *Sampling in Archaeology*, Cambridge University Press, Cambridge, Figure 4.7, 4.8, pp 90–92.

8 Orton, C 2000, *Sampling in Archaeology*, Cambridge University Press, Cambridge, p 90.

9 Orton, C 2000, *Sampling in Archaeology*, Cambridge University Press, Cambridge, p 29.

10 Department of Environment, Climate Change and Water (NSW), *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, April 2010.

11 Marquis-Kyle, P and Walker, M 2004, *The Illustrated Burra Charter*, third revision, Australia ICOMOS Inc.

12 Office of Environment and Heritage, *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*, Sydney, Office of Environment and Heritage, April 2011.

5.0 Appendices

Appendix A

AHIMS Search

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : St Marys ADI

Client Service ID : 276066

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-1026	ADI-25;	AGD	56	288880	6264930	Open site	Valid	Artefact : -	Isolated Find	102155,102450,102573
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1027	ADI-26	AGD	56	288986	6265084	Open site	Valid	Artefact : -	Isolated Find	99635,102155,102450,102573,102577
	Contact	Recorders	Doctor.Jo McDonald,Jo McDonald Cultural Heritage Management					Permits		
45-5-1028	ADI-27	AGD	56	289080	6265230	Open site	Valid	Artefact : -	Open Camp Site	102155,102450,102577
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1029	ADI-28;	AGD	56	289670	6265140	Open site	Valid	Artefact : -	Isolated Find	102450,102573,102577,103618
	Contact	Recorders	Doctor.Jo McDonald					Permits	3057	
45-5-1030	ADI-29;	AGD	56	289860	6265020	Open site	Valid	Artefact : -	Isolated Find	102450,102577
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1031	ADI-30;	AGD	56	289650	6264760	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1032	ADI-31;	AGD	56	289650	6264790	Open site	Valid	Artefact : -	Isolated Find	102450
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1033	ADI-32;	AGD	56	289170	6266480	Open site	Valid	Artefact : -	Open Camp Site	102155,102450,102573,103618
	Contact	Recorders	Doctor.Jo McDonald					Permits	3057	
45-5-1034	ADI-33;	AGD	56	289470	6266490	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1035	ADI-34;	AGD	56	289520	6266540	Open site	Valid	Artefact : -	Open Camp Site	102450,103618
	Contact	Recorders	Doctor.Jo McDonald					Permits	3057	
45-5-1036	ADI-35;	AGD	56	289380	6265980	Open site	Valid	Artefact : -	Isolated Find	102450
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1037	ADI-36;	AGD	56	289490	6265690	Open site	Valid	Artefact : -	Isolated Find	102450
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1038	ADI-37;	AGD	56	289520	6265550	Open site	Valid	Artefact : -	Isolated Find	102450
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1039	ADI-38;	AGD	56	289420	6265540	Open site	Valid	Artefact : -	Isolated Find	102450
	Contact	Recorders	Doctor.Jo McDonald					Permits		

Report generated by AHIMS Web Service on 10/04/2017 for Shezani Nasoordeen for the following area at Lat, Long From : -33.7409, 150.7167 - Lat, Long To : -33.7167, 150.7551 with a Buffer of 0 meters. Additional Info : ATR/ ACHAR. Number of Aboriginal sites and Aboriginal objects found is 96

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-1040	ADI-39;	AGD	56	289280	6265480	Open site	Valid	Artefact : -	Isolated Find	102155,102450,102573
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1041	ADI-40;	AGD	56	289270	6265510	Open site	Valid	Artefact : -	Open Camp Site	102155,102450,102573
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1042	ADI-41;	AGD	56	288980	6265790	Open site	Valid	Artefact : -	Isolated Find	102155,102450,102573,103618
	Contact	Recorders	Doctor.Jo McDonald					Permits	3057	
45-5-1043	ADI-42;	AGD	56	290140	6266120	Open site	Valid	Artefact : -	Isolated Find	102450,102577
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1044	ADI-43;	AGD	56	291070	6266470	Open site	Valid	Artefact : -	Open Camp Site	102577
	Contact	Recorders	Doctor.Jo McDonald					Permits	873	
45-5-1045	ADI-44;	AGD	56	291100	6266360	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1051	ADI-50;	AGD	56	291270	6266170	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1052	ADI-51;	AGD	56	290810	6266280	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1053	ADI-52;	AGD	56	290380	6266310	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1054	ADI-53;	AGD	56	290420	6266360	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1055	ADI-54;	AGD	56	290820	6265790	Open site	Valid	Artefact : -	Isolated Find	102450,102577,103618
	Contact	Recorders	Doctor.Jo McDonald					Permits	3057	
45-5-1056	ADI-55;	AGD	56	289080	6266060	Open site	Valid	Artefact : -	Open Camp Site	102155,102450,102573
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-1057	ADI-56;	AGD	56	289260	6266670	Open site	Valid	Artefact : -	Open Camp Site	102155,102450,102573,103618
	Contact	Recorders	Doctor.Jo McDonald					Permits	3057	
45-5-1003	ADI-13;	AGD	56	289780	6266120	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	Recorders	Margrit Koettig,Rex Silcox,Miss.Marjorie Sullivan,Phil Hughes					Permits		
45-5-1006	ADI-16;	AGD	56	290000	6265580	Open site	Valid	Artefact : -	Open Camp Site	102450

Report generated by AHIMS Web Service on 10/04/2017 for Shezani Nasoordeen for the following area at Lat, Long From : -33.7409, 150.7167 - Lat, Long To : -33.7167, 150.7551 with a Buffer of 0 meters. Additional Info : ATR/ ACHAR. Number of Aboriginal sites and Aboriginal objects found is 96

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Margrit Koettig,Rex Silcox,Miss.Marjorie Sullivan,Phil Hughes					Permits		
45-5-1007	ADI-15	AGD	56	289800	6265500	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	Recorders	Margrit Koettig,Rex Silcox,Miss.Marjorie Sullivan,Phil Hughes					Permits		
45-5-1008	ADI-18;	AGD	56	291450	6266250	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Margrit Koettig,Rex Silcox,Miss.Marjorie Sullivan,Phil Hughes					Permits		
45-5-0266	South Creek	AGD	56	291550	6264470	Open site	Valid	Artefact : -	Open Camp Site	260,1018
	Contact	Recorders	Margrit Koettig					Permits	3647	
45-5-1014	ADI-7;	AGD	56	290900	6265750	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	Recorders	Margrit Koettig,Rex Silcox,Miss.Marjorie Sullivan,Phil Hughes					Permits		
45-5-1020	ADI-12	AGD	56	290040	6266350	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	Recorders	Margrit Koettig,Rex Silcox,Miss.Marjorie Sullivan,Phil Hughes					Permits		
45-5-1021	ADI-14;	AGD	56	289780	6265650	Open site	Valid	Artefact : -	Open Camp Site	102450
	Contact	Recorders	Margrit Koettig,Rex Silcox,Miss.Marjorie Sullivan,Phil Hughes					Permits		
45-5-1023	ADI-22;	AGD	56	289330	6265200	Open site	Valid	Artefact : -	Open Camp Site	102155,102573,102577,103618
	Contact	Recorders	Doctor.Jo McDonald					Permits	3057	
45-5-1024	ADI-23	AGD	56	288700	6265510	Open site	Valid	Artefact : -	Isolated Find	102155,102450,102573
	Contact	Recorders	Doctor.Jo McDonald,Ms.Jenni Bate					Permits		
45-5-0702	WD63	AGD	56	290650	6265140	Open site	Valid	Artefact : -	Open Camp Site	1380,102450,102577
	Contact	Recorders	Laura-Jane Smith					Permits	873	
45-5-0703	WD64	AGD	56	290560	6264630	Open site	Valid	Artefact : -	Open Camp Site	1380
	Contact	Recorders	Laura-Jane Smith					Permits		
45-5-0704	WD65	GDA	56	290905	6264740	Open site	Destroyed	Artefact : -	Open Camp Site	1380,102577
	Contact	Recorders	Laura-Jane Smith,GML Heritage Pty Ltd,Ms.Erin Mein					Permits	3647	
45-5-0705	WD66	AGD	56	290790	6264680	Open site	Valid	Artefact : -	Open Camp Site	1380,102450
	Contact	Recorders	Laura-Jane Smith					Permits		
45-5-0708	WD69	AGD	56	290380	6264960	Open site	Valid	Artefact : -	Open Camp Site	1380,102450
	Contact	Recorders	Laura-Jane Smith					Permits		
45-5-0709	WD70	AGD	56	289970	6265060	Open site	Valid	Artefact : -	Open Camp Site	1380,102450
	Contact	Recorders	Laura-Jane Smith					Permits		
45-5-0710	WD71	AGD	56	290510	6264510	Open site	Valid	Artefact : -	Open Camp Site	1380
	Contact	Recorders	Laura-Jane Smith					Permits		
45-5-0711	WD-72	GDA	56	290490	6264290	Open site	Destroyed	Artefact : -	Open Camp Site	1380,102577

Report generated by AHIMS Web Service on 10/04/2017 for Shezani Nasoordeen for the following area at Lat, Long From : -33.7409, 150.7167 - Lat, Long To : -33.7167, 150.7551 with a Buffer of 0 meters. Additional Info : ATR/ ACHAR. Number of Aboriginal sites and Aboriginal objects found is 96

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Laura-Jane Smith,GML Heritage Pty Ltd,Ms.Erin Mein					Permits	3647	
45-5-0712	WD73	GDA	56	290835	6264580	Open site	Destroyed	Artefact : -	Open Camp Site	1380,102577
	Contact	Recorders	Laura-Jane Smith,GML Heritage Pty Ltd,Ms.Erin Mein					Permits	3647	
45-5-0713	WD74	AGD	56	291240	6264650	Open site	Valid	Artefact : -	Open Camp Site	1380,102577
	Contact	Recorders	Laura-Jane Smith					Permits	3647	
45-5-0714	WD75;	GDA	56	291400	6264610	Open site	Destroyed	Artefact : -	Open Camp Site	1380
	Contact	Recorders	Laura-Jane Smith,GML Heritage Pty Ltd,Ms.Erin Mein					Permits	3647	
45-5-3097	ADI Site	AGD	56	291000	6266000	Open site	Valid	Artefact : -		
	Contact T Russell	Recorders	Doctor.Jo McDonald					Permits		
45-5-3326	ADI/FF-1	AGD	56	289922	6265112	Open site	Valid	Artefact : 1		99635,102450
	Contact T Russell	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3328	ADI/FF-3	AGD	56	290637	6265743	Open site	Valid	Artefact : 5		99635,102450, 103618
	Contact T Russell	Recorders	Jo McDonald Cultural Heritage Management					Permits	3057	
45-5-3331	ADI/FF-30	AGD	56	288835	6265442	Open site	Valid	Artefact : 1		99635,102155, 102450,10257 3,103618
	Contact T Russell	Recorders	Jo McDonald Cultural Heritage Management					Permits	3057	
45-5-3332	ADI/FF-31	AGD	56	288950	6265366	Open site	Valid	Artefact : 19		99635,102155, 102573
	Contact T Russell	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3333	ADI/FF-32	AGD	56	289935	6266340	Open site	Valid	Artefact : 1		102450
	Contact T Russell	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3334	ADI/FF-33	GDA	56	291401	6264923	Open site	Destroyed	Artefact : 7		99635
	Contact T Russell	Recorders	Jo McDonald Cultural Heritage Management ,GML Heritage Pty Ltd,GML Heritage P					Permits	3647	
45-5-3335	ADI/FF-34	GDA	56	291356	6264481	Open site	Destroyed	Artefact : 3		99635
	Contact T Russell	Recorders	Jo McDonald Cultural Heritage Management ,GML Heritage Pty Ltd,GML Heritage P					Permits	3647	
45-5-1025	ADI-24;	AGD	56	288540	6264980	Open site	Valid	Artefact : -	Isolated Find	102155,10245 0
	Contact	Recorders	Doctor.Jo McDonald					Permits		
45-5-3586	ADI-FF21	AGD	56	290600	6265206	Open site	Valid	Artefact : 7		102450,10361 8
	Contact	Recorders	Mr.Mark Rawson					Permits	3057	
45-5-3588	ADI-FF20	GDA	56	290854	6265368	Open site	Destroyed	Artefact : 1		102450,10361 8
	Contact	Recorders	Mr.Mark Rawson,GML Heritage Pty Ltd,GML Heritage Pty Ltd,Ms.Erin Mein,Ms.Erin					Permits	3057,3647	
45-5-3595	ADI-CP9 (Springwood)	GDA	56	290909	6264677	Open site	Destroyed	Artefact : 2		

Report generated by AHIMS Web Service on 10/04/2017 for Shezani Nasoordeen for the following area at Lat, Long From : -33.7409, 150.7167 - Lat, Long To : -33.7167, 150.7551 with a Buffer of 0 meters. Additional Info : ATR/ ACHAR. Number of Aboriginal sites and Aboriginal objects found is 96

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Jo McDonald Cultural Heritage Management ,GML Heritage Pty Ltd,Ms.Erin Mein					Permits	3647	
45-5-3596	ADI-CP7 (Springwood)	GDA	56	291551	6265210	Open site	Destroyed	Artefact : 18		
	Contact	Recorders	Jo McDonald Cultural Heritage Management ,GML Heritage Pty Ltd,Ms.Erin Mein					Permits	3647	
45-5-3598	ADI: FF/30 (Springwood)	GDA	56	288835	6265442	Open site	Valid	Artefact : 1		102155,102450
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3599	ADI: FF/31 (Springwood)	GDA	56	288950	6265366	Open site	Valid	Artefact : 19		102450
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3600	ADI: FF/32 (Springwood)	GDA	56	289935	6266340	Open site	Valid	Artefact : 2		102450
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3601	ADI: FF/33	GDA	56	291401	6264923	Open site	Destroyed	Artefact : 7		
	Contact	Recorders	Jo McDonald Cultural Heritage Management ,GML Heritage Pty Ltd,Ms.Erin Mein					Permits	3647	
45-5-3602	ADI: FF/34	GDA	56	291356	6264481	Open site	Destroyed	Artefact : 3		
	Contact	Recorders	Jo McDonald Cultural Heritage Management ,GML Heritage Pty Ltd,Ms.Erin Mein					Permits	3647	
45-5-3603	ADI-FF2 (Springwood)	GDA	56	290490	6264290	Open site	Valid	Artefact : 7		
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3604	ADI-FF4 (Springwood)	GDA	56	290423	6265994	Open site	Valid	Artefact : 1		102450
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3605	ADI-FF5 (Springwood)	GDA	56	290345	6266066	Open site	Valid	Artefact : 2		102450
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3606	ADI-FF6 (Springwood)	GDA	56	289681	6266839	Open site	Valid	Artefact : 27		102450
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3607	ADI-FF7 (Springwood)	GDA	56	289857	6266800	Open site	Valid	Artefact : 2		102450
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3608	ADI-FF8 (Springwood)	GDA	56	290096	6266847	Open site	Valid	Artefact : 1		102450
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3609	ADI-FF9 (Springwood)	GDA	56	290210	6266840	Open site	Valid	Artefact : 2		102450
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3610	ADI-FF10 (Springwood)	GDA	56	290368	6266912	Open site	Valid	Artefact : 8		102450
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3611	ADI-FF12 (Springwood)	GDA	56	290778	6266882	Open site	Valid	Artefact : 6		102450
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3612	ADI-FF13 (Springwood)	GDA	56	291218	6266870	Open site	Valid	Artefact : 1		
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3613	ADI-FF14 (Springwood)	GDA	56	290989	6264840	Open site	Destroyed	Artefact : 2		

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Jo McDonald Cultural Heritage Management ,GML Heritage Pty Ltd,Ms.Erin Mein					Permits	3647	
45-5-3614	ADI-FF15	GDA	56	291123	6264962	Open site	Destroyed	Artefact : 20		102450
	Contact	Recorders	Jo McDonald Cultural Heritage Management ,GML Heritage Pty Ltd,Ms.Erin Mein					Permits	3647	
45-5-3615	ADI-FF16 (Springwood)	GDA	56	291296	6265254	Open site	Valid	Artefact : 1		
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3616	ADI-FF17 (Springwood)	GDA	56	291315	6265335	Open site	Valid	Artefact : 1		
	Contact	Recorders	Jo McDonald Cultural Heritage Management					Permits		
45-5-3617	ADI-FF18 (Springwood)	GDA	56	291717	6266049	Open site	Destroyed	Artefact : 8		
	Contact	Recorders	Jo McDonald Cultural Heritage Management ,GML Heritage Pty Ltd,Ms.Erin Mein					Permits	3647	
45-5-0706	WD67	AGD	56	290710	6264940	Open site	Valid	Artefact : -	Open Camp Site	1380,102450
	Contact	Recorders	Laura-Jane Smith					Permits		
45-5-0707	WD68	AGD	56	290490	6264950	Open site	Valid	Artefact : -	Open Camp Site	1380,102450
	Contact	Recorders	Laura-Jane Smith					Permits		
45-5-3589	ADI-CP1 (Springwood)	GDA	56	291439	6264621	Open site	Destroyed	Artefact : 44		
	Contact	Recorders	Jo McDonald Cultural Heritage Management ,GML Heritage Pty Ltd,GML Heritage P					Permits	3647	
45-5-3590	ADI-CP3 (Springwood)	GDA	56	291580	6264919	Open site	Destroyed	Artefact : 25		
	Contact	Recorders	Jo McDonald Cultural Heritage Management ,GML Heritage Pty Ltd,GML Heritage P					Permits	3647	
45-5-3591	ADI-CP4 (Springwood)	GDA	56	291533	6264949	Open site	Destroyed	Artefact : 46		
	Contact	Recorders	Jo McDonald Cultural Heritage Management ,GML Heritage Pty Ltd,GML Heritage P					Permits	3647	
45-5-3592	ADI-CP5 (Springwood)	GDA	56	291527	6264837	Open site	Destroyed	Artefact : 46		
	Contact	Recorders	GML Heritage Pty Ltd,GML Heritage Pty Ltd,Ms.Erin Mein					Permits	3647	
45-5-3593	ADI-CP6 (Springwood)	GDA	56	291649	6264952	Open site	Destroyed	Artefact : 21		
	Contact	Recorders	Jo McDonald Cultural Heritage Management ,GML Heritage Pty Ltd,Ms.Erin Mein					Permits	3647	
45-5-4302	TNR-3	GDA	56	288545	6265150	Open site	Valid	Artefact : 1		
	Contact	Recorders	Doctor.Jo McDonald					Permits	3619	
45-5-4331	IF-25-1	GDA	56	290605	6264570	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	GML Heritage Pty Ltd,Miss.Sam Cooling,Ms.Erin Mein					Permits	3647	
45-5-4332	PAD FF2	GDA	56	291615	6265890	Open site	Destroyed	Artefact : 1, Potential Archaeological Deposit (PAD) : 1		
	Contact	Recorders	GML Heritage Pty Ltd,Miss.Sam Cooling,Ms.Erin Mein					Permits	3647	
45-5-4334	ADI-CP10	GDA	56	291799	6265107	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	GML Heritage Pty Ltd,Miss.Sam Cooling,Ms.Erin Mein					Permits	3647	
45-5-4342	SMDS-CP6	GDA	56	291994	6266084	Open site	Destroyed	Artefact : 1, Potential Archaeological Deposit (PAD) : 1		

Report generated by AHIMS Web Service on 10/04/2017 for Shezani Nasoordeen for the following area at Lat, Long From : -33.7409, 150.7167 - Lat, Long To : -33.7167, 150.7551 with a Buffer of 0 meters. Additional Info : ATR/ ACHAR. Number of Aboriginal sites and Aboriginal objects found is 96

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : St Marys ADI

Client Service ID : 276066

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	GML Heritage Pty Ltd,Miss.Sam Cooling,Ms.Erin Mein					Permits	3647	
45-5-4343	SMDS-CP6-1	GDA	56	291994	6266084	Open site	Valid	Artefact : 1, Potential Archaeological Deposit (PAD) : 1		
	Contact	Recorders	Miss.Sam Cooling					Permits		
45-5-4360	SMDS-CP2	GDA	56	291961	6265443	Open site	Destroyed	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	GML Heritage Pty Ltd,Miss.Sam Cooling,Ms.Erin Mein					Permits	3647	
45-5-4896	Site 1D IF	GDA	56	291614	6265178	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	GML Heritage Pty Ltd,GML Heritage Pty Ltd,Doctor.Tim Owen,Doctor.Tim Owen					Permits		

Report generated by AHIMS Web Service on 10/04/2017 for Shezani Nasoordeen for the following area at Lat, Long From : -33.7409, 150.7167 - Lat, Long To : -33.7167, 150.7551 with a Buffer of 0 meters. Additional Info : ATR/ ACHAR. Number of Aboriginal sites and Aboriginal objects found is 96

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : St Marys ADI

Client Service ID : 276066

GML Heritage Pty Ltd

Level 6 372 Elizabeth Street
Surry Hills New South Wales 2010

Attention: Shezani Nasoordeen

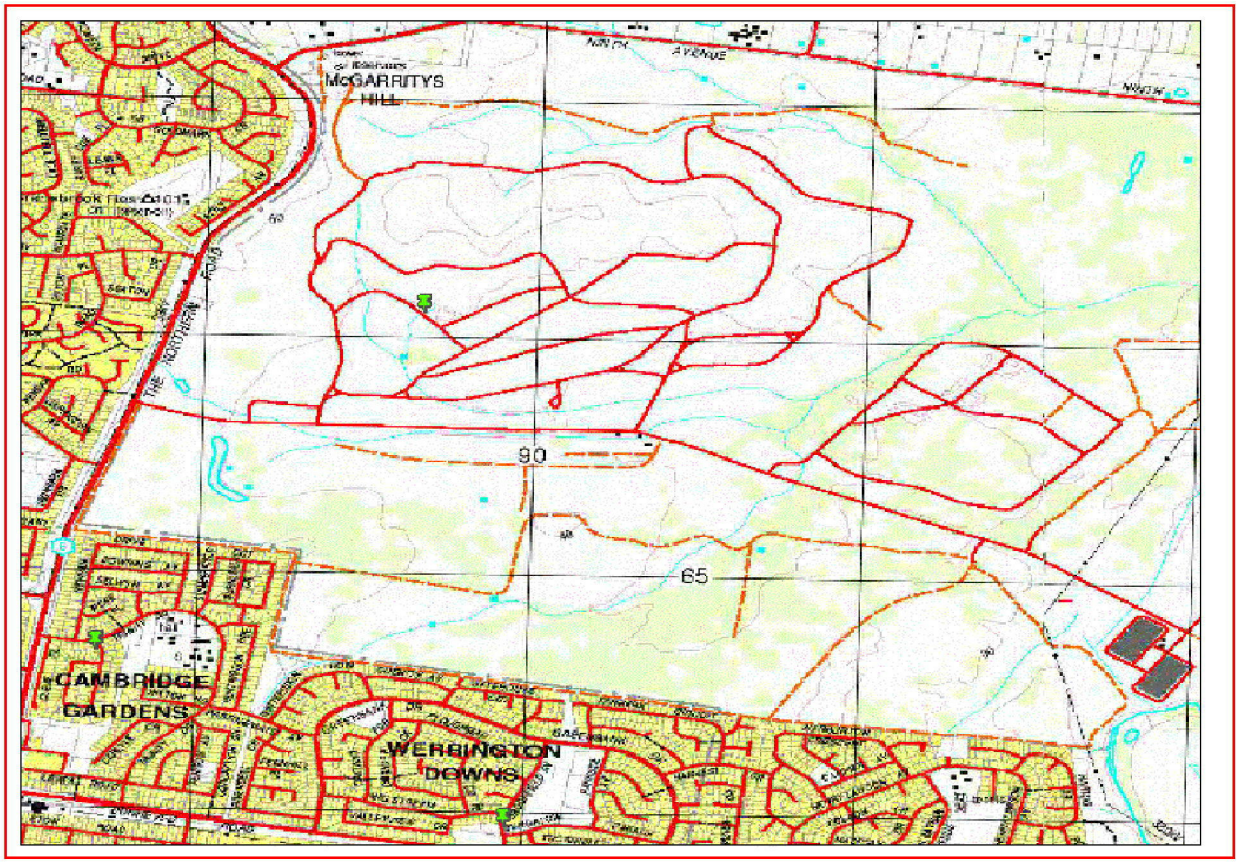
Email: shezanin@gml.com.au

Date: 10 April 2017

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -33.7409, 150.7167 - Lat, Long To : -33.7167, 150.7551 with a Buffer of 0 meters, conducted by Shezani Nasoordeen on 10 April 2017.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

96	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

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Web: www.environment.nsw.gov.au