1 Sirius Road, Lane Cove: Archaeological report

FINAL REPORT

Prepared for Greenbox Architecture

17 April 2019

Biosis offices

NEW SOUTH WALES

Newcastle
Phone: (02) 4911 4040
Email: newcastle@biosis.com.au

Sydney
Phone: (02) 9101 8700
Email: sydney@biosis.com.au

Wollongong
Phone: (02) 4201 1090
Email: wollongong@biosis.com.au

Albury
Phone: (02) 6069 9200
Email: albury@biosis.com.au

VICTORIA

Melbourne
Phone: (03) 8686 4800
Email: melbourne@biosis.com.au

Ballarat
Phone: (03) 5304 4250
Email: ballarat@biosis.com.au

Wangaratta
Phone: (03) 5718 6900
Email: wangaratta@biosis.com.au

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Prepared by:	Samantha Keats Anthea Vella
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LGA:	Lane Cove

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Glossary

ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
CBD	Central Business District
Consultation requirements	*Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*
DECCW	Department of Environment, Climate Change and Water (now OEH)
DP	Deposited Plan
EP&A Act	*Environmental Planning and Assessment Act 1979*
GPS	Global Positioning System
GSV	Ground Surface Visibility
ICOMOS	International Council on Monuments and Sites
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
MGA	Map Grid of Australia
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service
NSW	New South Wales
OEH	Office of Environment and Heritage
PAD	Potential Archaeological Deposit
Study area	Defined as Lot 1 DP 1151370
SEPP	State Environmental Planning Policy
SSD	State Significant Development
the Code	*Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*

Summary

Biosis Pty Ltd (Biosis) was commissioned by Greenbox Architecture to undertake an Aboriginal Cultural Heritage Assessment (ACHA) for the proposed construction of a data centre at 1 Sirius Avenue, Lane Cove New South Wales (NSW) (the study area). The study area is located approximately 3.5 kilometres west of Lane Cove and approximately 8.5 kilometres north west of the Sydney CBD central business district (CBD).

There are 115 Aboriginal cultural heritage sites registered with the Aboriginal Heritage Information Management System (AHIMS) register within the vicinity of the study area. No sites are located within the study area.

The Aboriginal community was consulted regarding the heritage management of the project throughout its lifespan. Consultation has been undertaken as per the process outlined in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a) (consultation requirements).

A field investigation of the study area consisting of an archaeological survey was conducted on 20 November 2018. The overall effectiveness of the survey for examining the ground for Aboriginal sites was deemed low. This was attributed to vegetation cover restricting ground surface visibility (GSV) combined with a low amount of exposures.

No previously unrecorded Aboriginal cultural heritage sites were identified during the field survey and no areas of (archaeological) sensitivity identified. Owing to the significant disturbances across the study area, there is no potential for development activities to impact Aboriginal sites or areas of (archaeological) sensitivity.

Strategies have been developed based on the archaeological (significance) of cultural heritage relevant to the study area. The strategies also take into consideration:

- Predicted impacts to Aboriginal cultural heritage
- The planning approvals framework
- Current best conservation practice, widely considered to include:
  - The ethos of the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter
  - The *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b) (the Code).

The recommendations that resulted from the consultation process are provided below.

Management recommendations

Prior to any development impacts occurring within the study area, the following is recommended:

Recommendation 1: No further archaeological assessment is required

No further archaeological work is required in the study area due to the entire study area being assessed as having low archaeological potential.

Recommendation 2: Landscape design to include Indigenous plants

After the completion of the construction of the proposed development, it is suggested that landscapes of native vegetation be planted and Gammerraygal names be used in any visual interpretation or signage within

the gardens. This will ensure the visual amenity of the area is retained and the acknowledgement of Aboriginal people as the original custodians of the area are recognised.

Recommendation 3: Discovery of Unanticipated Aboriginal Objects

All Aboriginal objects and Places are protected under the NPW Act. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the OEH. Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying the OEH and Aboriginal stakeholders.

Recommendation 4: Discovery of Aboriginal Ancestral Remains

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

1. Immediately cease all work at that location and not further move or disturb the remains.
2. Notify the NSW Police and OEH's Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location.
3. Not recommence work at that location unless authorised in writing by OEH.

1 Introduction

1.1 Project background

Biosis was commissioned by Greenbox Architecture to undertake an ACHA for a proposed development at 1 Sirius Road, Lane Cove NSW. The project is a State Significant Development (SSD 9741), which will consist of a data storage building, electrical substation, ancillary office area, loading docks, associated infrastructure, car parking and landscaping.

Biosis has previously conducted an archaeological survey and associated report for the study area (Biosis 2018). The assessment identified the study area as having low potential for Aboriginal sites to be present, owing primarily to the heavy disturbance and landscape modification across the study area, as well as the landforms within it, with large portions of the study area located across moderate slopes. Other landforms within the study area included ridges and flats; however, it was determined that these areas had been subject to disturbance in the form of cut and fill actions. The Metropolitan Local Aboriginal Land Council (LALC) attended the archaeological survey of the study area on 20 November 2018. Based on discussions held on site with the LALC's Site Officer, both the LALC and Biosis have assessed the study area as holding low potential to contain intact Aboriginal sites. However, the Secretary's Environmental Assessment Requirements (SEARs), along with consultation with OEH, have stipulated that an ACHA is required as part of the SSD application.

This investigation has been carried out under Part 6 of the *National Parks and Wildlife Act 1974* (NPW Act). It has been undertaken in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b) (the code). The code has been developed to support the process of investigating and assessing Aboriginal cultural heritage by specifying the minimum standards for archaeological investigation undertaken in NSW under the NPW Act. The archaeological investigation must be undertaken in accordance with the requirements of the code.

The *Environmental Planning and Assessment Act 1979* (EP&A Act) includes provisions for local government authorities to consider environmental impacts in land-use planning and decision making. Each Local Government Area (LGA) is required to create and maintain a Local Environmental Plan (LEP) that includes Aboriginal and historical heritage items. Local Councils identify items that are of significance within their LGA, and these items are listed on heritage schedules in the local LEP and are protected under the EP&A Act and *Heritage Act 1977.*

1.2 Study area

The study area is located within Lot 1 DP 1151370 and is approximately 3.5 kilometres west of Lane Cove and approximately 8.5 kilometres north west of the Sydney CBD (Figure 1). It encompasses approximately 4.5 hectares of private land.

The study area is within the:

- Lane Cove Local Government Area (LGA)
- Parish of Willoughby
- County of Cumberland

The study area is bounded by the Lane Cove River to the west, Stringybark Creek to the north, Apollo Place to the south, and Sirius Road to the east (Figure 2).

1.3 Planning approvals

The proposed development will be assessed against Part 5 of the EP&A Act. Other relevant legislation and planning instruments that will inform this assessment include:

- NPW Act
- *National Parks and Wildlife Amendment Act 2010*
- Lane Cove Local Environmental Plan 2009 (LEP)
- Lane Cove Development Control Plan 2010 (DCP)

1.4 Objectives of the investigation

The objectives of the investigation can be summarised as follows:

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

1.5 Investigators and contributors

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

Table 1 Investigators and contributors

Name and qualifications	Experience summary	Project role
Taryn Gooley	Taryn joined Biosis in 2017 and has over 8 years' experience	• Quality assurance

BASc (Hons - Archaeology)	as an archaeologist. She is currently the Heritage team leader for NSW. In this role Taryn has successfully completed numerous projects throughout the Newcastle, Port Stephens, Lake Macquarie, Hunter Valley, and North Western NSW regions. Taryn has extensive experience in undertaking remote archaeological surveys and large scale archaeological testing and salvage excavation programs. Taryn has participated in and managed a number of long term archaeological programs under Part 4 and Part 5 of the (EP&A Act). Taryn holds a Bachelor Arts and Science (Honours) and is a member of the Australian Archaeology Association and the Australian Institute for Maritime Archaeology.	
Samantha Keats BA (Hons)	Samantha is an archaeologist with Biosis Wollongong office. Samantha has two years' experience as an archaeologist, with a particular research focus on rock art assemblages and ochre in the north-west Kimberley region of Australia. Samantha has experience in conducting desktop assessments, archaeological survey and Aboriginal and historical excavation as well as consulting with Traditional Owners. She has participated in a number of European historical excavations and monitoring programs in NSW and has authored several Statement of Heritage Impact reports and Heritage Assessments.	• Project manager • Aboriginal groups consultation • Report author
Anthea Vella (BArch, MAHM)	Anthea graduated from Flinders University with a Bachelor of Archaeology and has also recently graduated from Flinders University with a Master of Archaeology and Heritage Management. She has experience with desktop assessments, project administration, collating internal and external research, and reporting. Anthea also has experience in Aboriginal test excavations, and Historical excavations.	• Background research

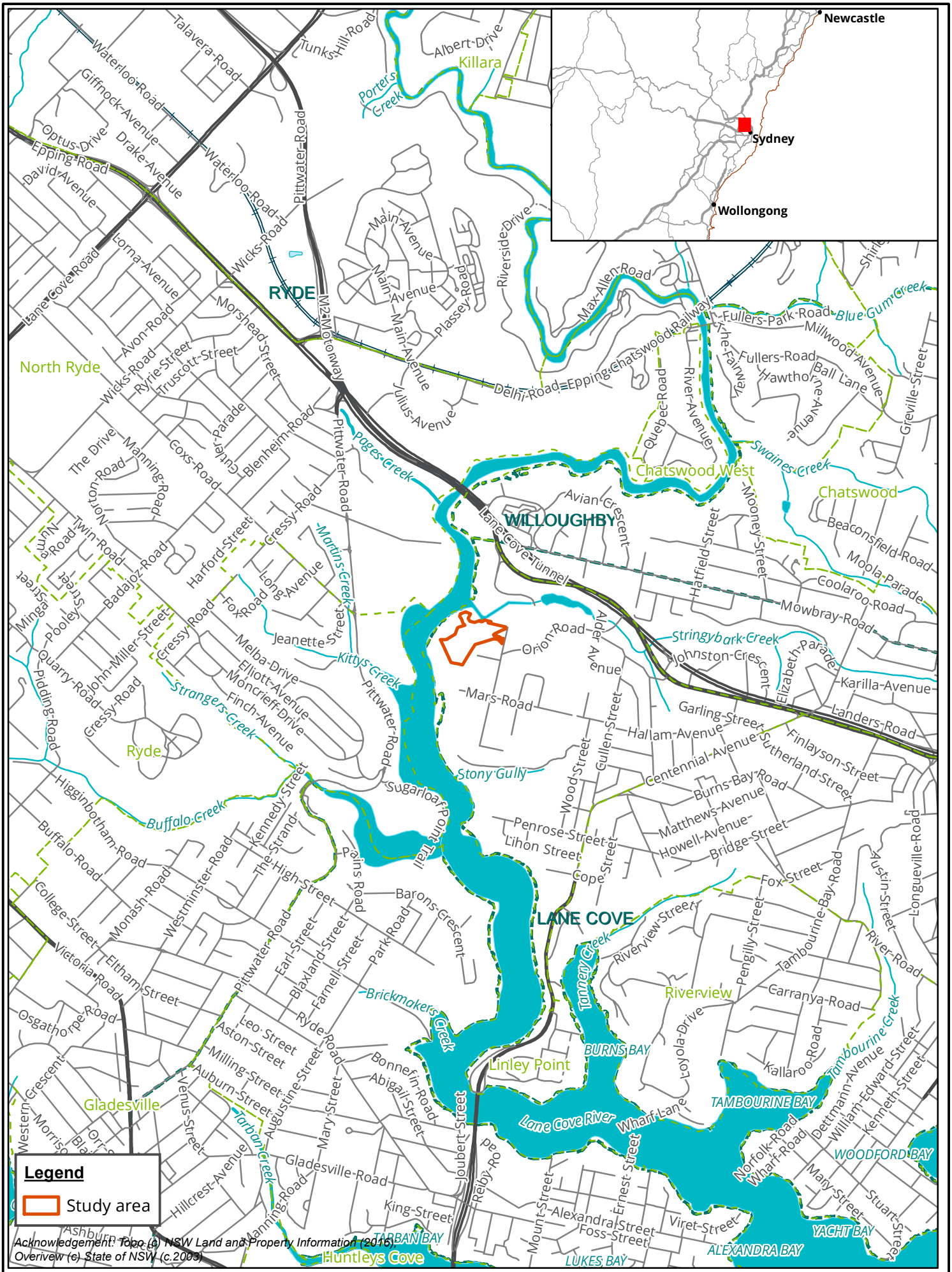

Figure 1 Location of the study area

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Albury, Ballarat, Melbourne,
Newcastle, Sydney, Wangaratta & Wollongong

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Date: 05 February 2019,
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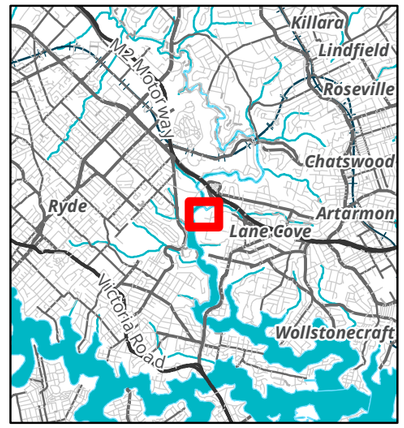

Legend

Study area

Figure 2: Study area detail

0 20 40 60 80 100

Metres

Scale: 1:2,000 @ A3

Coordinate System: GDA 1994 NSW Lambert

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Biosis Pty Ltd

Albury, Ballarat, Melbourne,
Newcastle, Sydney, Wangaratta & Wollongong

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Date: 05 February 2019,
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2 Proposed development

The proposed development within will consist of the construction and operation of the Lane Cove West Data Centre, comprising (Figure 3):

- A data storage building (approximately 35,144 m_2).
- An electrical substation.
- Ancillary office area and loading docks.
- Site-wide earthworks and vegetation clearing.
- Associated infrastructure, car parking and landscaping.

NOTE:
ROOF EQUIPMENT SHOWN IS INDICATIVE ONLY. FINAL SIZE AND CONFIGURATION TO BE UPDATED

LOT 1
DP 884454

LOT 7372
DP 1161897

LOT 955
DP 752067

LOT 22
DP 825400

LOT 2
DP 1151370

LOT 7
DP 241877

LOT 8
DP 241877

SP 80721

LOT 5
DP 241786

DP 732...

STRINGYBARK CREEK

WEST ST

PUBLIC RES

ROAD

SIRIUS

10M SETBACK

20m RIPARIAN CORRIDOR BUFFER

2.4m HIGH PALISADE SECURITY FENCE SHOWN DOTTED

2.4m HIGH PALISADE SECURITY FENCE SHOWN DOTTED

FIRE TRAIL

1:10 VEHICLE RAMP BELOW

1:10 VEHICLE RAMP

1:40 RAMP UP

UP

5 motorcycle parking 5 bicycle

CHILLER

CHILLER

2° Fall

2° Fall

ROOF RIDGE

SLIDING GATE

RL +27.00

RL +27.62

RL28.0

48 Parking

TRACK (AUSGRID ACCESS)

EXISTING AUSGRID TRACK

EXISTING DRIVEWAY TO RETAIN

Turning Circle

171926

24962

1 ROOF PLANT LAYOUT
1 : 500
A1

20-Aug-19 4:49:59 PM

Issue	Date	Description
1	12.12.18	ISSUE FOR APPROVAL
2	13.12.18	ISSUE FOR APPROVAL
3	14.12.18	ISSUE FOR SSD SUBMISSION
4	24.06.19	FOR REVIEW
5	28.06.19	ISSUED FOR RESUBMISSION
6	07.08.19	REVISED SSD
7	16.0819	REVISED SSD SUBMISSION
8	20.08.19	FOR REVIEW

Sc. 1:500 0 5 10 15 25m

Project Manager

Services Design

GREENBOX

+61 2 8069 8930

LEVEL 25
25 BLIGH STREET
SYDNEY NSW 2000 AUSTRALIA

GREENBOX ARCHITECTURE PTY LTD
ABN: 79 139 779 098

ISO 9001 CERTIFIED QUALITY SYSTEM

Client

Project
ATSYD2
1 SIRIUS ROAD LANE COVE WEST

Drawn By	Scale
PL_WG	1 : 500 @ A1
Checked By	Approved By
DW	AO
Date	Job Number
20.08.19	180095

Project Status
SSD

Drawing Title
ROOF PLAN

Drawing Number: **ATSYD2_SSD_DRG_ARC_0105** Issue: 8

3 Desktop assessment

The desktop assessment involves researching and reviewing existing archaeological studies and reports relevant to the study area and surrounding region. This information is combined to develop an Aboriginal site prediction model for the study area, and to identify known Aboriginal sites and/or places recorded in the study area. This desktop assessment has been prepared in accordance with requirements 1 to 4 of the Code.

3.1 Landscape context

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

3.1.1 Topography and hydrology

The study area is located within the Hawkesbury Sandstone formation and consists of friable medium to coarse grained quartz sandstone with some shale and laminate lenses. It weathers cavernously to form overhangs, which occur in a range of topographic locations. It also occurs as flat topped outcrops (platforms of varying sizes) and boulders, mainly on ridge tops but also along the sides of gullies and in valley bottoms (JMCHM 2008). The presence of sandstone cropping in areas of the Hawkesbury Sandstone formation gives rise to the potential for site types such as rock shelters and engraving sites. The topography consists of undulating to rolling low hills with a local relief of 20 to 80 metres and slopes of between 10% and 20%. Side slopes occur with narrow to wide outcropping of sandstone rock benches of 10 to 20 metres, often forming broken scarps of less than 5 metres (Chapman & Murphy 1989, p.64). The geological formations associated with the study area are identified within Figure 4.

Stream order is recognised as a factor which assists the development of predictive modelling in Sydney Basin Aboriginal archaeology, and has seen extensive use in the Sydney region, most notably by Jo McDonald Cultural Heritage Management (JMCHM 2000, JMCHM 2005a, JMCHM 2005b, JMCHM 2006, JMCHM 2008). Predictive models which have been developed for the region have a tendency to favour higher order streams as the locations of campsites, as they would have been more likely to provide a stable source of water, and by extension other resources which would have been used by Aboriginal groups.

The stream order system used for this assessment was originally developed by Strahler in 1952 (Strahler 1964). It functions by adding two streams of equal order at their confluence to form a higher order stream, as shown in Plate 1. As stream order increases, so does the likelihood that the stream would be a perennial source of water.

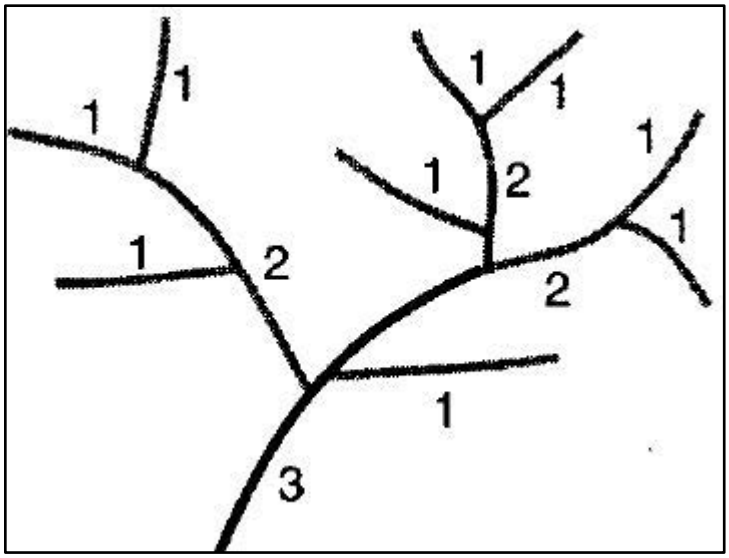


Plate 1 Diagram showing Strahler stream order (Ritter et al 1995, p. 151).

The nearest watercourse to the study area is Lane Cove River, a perennial watercourse located 31 metres away at its closest point. The river encompasses the western side of the study area. Stringybark Creek is also located adjacent to the study area along the northern boundary and is also a perennial watercourse but has been heavily modified where it meets the Lane Cove River (Figure 5). These watercourses would have provided excellent resources for Aboriginal people.

3.1.2 Soil landscapes

Soil landscapes have distinct morphological and topological characteristics that result in specific archaeological potential. They are defined by a combination of soils, topography, vegetation and weathering conditions. Soil landscapes are essentially terrain units that provide a useful way to summarise archaeological potential and exposure.

Two soil landscapes are present within the study area; the Gymea Soil Landscape and Disturbed Terrain. The Gymea soil landscape is characterised as an erosional soil landscape and consists of shallow uniform sands and earthy sands on ridges, and deeper sands, loamy sands and organic sands on wet benches. In hanging swamps, grey or yellow texture-contrast soils are present on shale benches. Accumulations of deeper sand and occasional podsols in depositional sites and along streams. As the soil landscape is characterised as highly erosional, the soil can be shallow and highly permeable, as well as producing low soil fertility. This would indicated that the presence of Aboriginal sites and objects is unlikely.

Disturbed terrain is present within the northern portion of the study area. It is characterised as landscapes extensively disturbed by human activity and development, including, but not limited to; complete disturbance, removal of top soil or burial of soil. The landscape includes soil, rock and building materials and usually occurs throughout areas near watercourses or within areas of previous swamps, estuaries or wetlands. Local relief is usually greater than 2 metres, up to 10 metres. Most areas have heavily disturbed ground and are often landscaped and artificially drained.

The soil landscapes associated with the study area are identified within Table 2, Table 3 and Figure 6.

Table 2 Gymea soil landscape characteristics (Chapman & Murphy 1989, p.65–66)

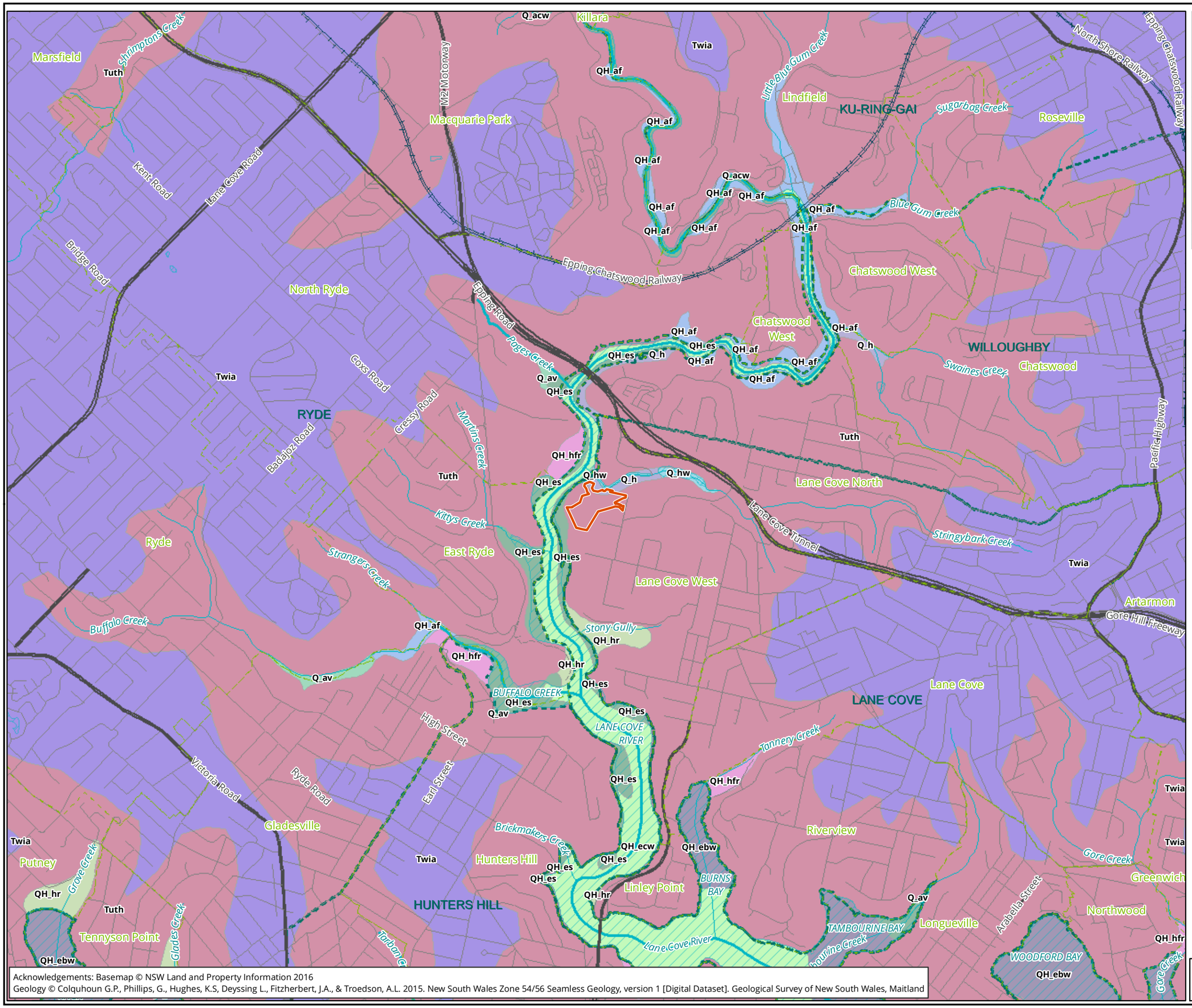
Soil material	Description
Gymea 1 (gy1)	Loamy sand to sandy loam with loose, apedal single-grained structure and porous

Soil material	Description
	sandy fabric. It generally occurs as topsoil (A1 horizon). The colour often becomes lighter with depth, ranging from brownish-black 1l0YR 2/2) to bleached dull yellow-orange (10YR 7/2). It is often water repellent under native vegetation. The pH ranges from strongly acidic to slightly acidic. Small sandstone and platy ironstone fragments, charcoal fragments and roots are common in this soil level.
Gymea 2 (gy2)	Consists of earthy, yellowish-brown clayey sand, with apedal massive structure and porous earthy fabric. It commonly occurs as subsoil over sandstone bedrock (B horizon). Exposure at the surface creates a hard setting topsoil. Potential to increase gradually to a light sandy clay loam with depth. Colour is commonly yellowish-brown (10YR 6/8), with orange mottles occasionally present with depth. The pH ranges from strongly acidic to slightly acidic. Sandstone and ironstone fragments are common and are often concentrated in stone lines in the upper parts of this material. Charcoal fragments are common, whilst roots are rare.
Gymea 3 (gy3)	Consists of earthy to weakly pedal, yellowish-brown sandy clay loam. Commonly a yellowish-brown sandy clay loam to sandy clay with an apedal massive structure and an earthy porous fabric. It usually occurs as subsoil (B or C horizon) on coarse sandstone. Texture may increase gradually with depth to sandy clay. Occasionally sub-angular blocky shaped peds are present. Peds are commonly rough-faced and porous and range in size from 5-20 millimetres. Colour is commonly yellowish brown (10YR 5/8, 6/6, 6/8; 2.SY5/6, 5/4). Orange mottles may occur with depth. The pH ranges from strongly acidic to slightly acidic. Strongly weathered sandstone fragments are common, with roots and charcoal fragments being rare.
Gymea 4 (gy4)	Moderately to strongly pedal, yellowish-brown clay. This is commonly a yellowish-brown sandy clay or light clay with a moderately to strongly pedal structure and either a smooth or rough-faced ped fabric. This material occurs as subsoil on shale bedrock (Band C horizons). Peds ranging in size from 5-50 millimetres, are either smooth or rough-faced and are polyhedral to sub-angular blocky. Colour is commonly yellow-brown (10YR 6/6), but can vary from dark reddish brown (2.SYR3/6) to light grey (7.5YR8/1). Red, orange and grey mottles are occasionally present at depth. The pH ranges from strongly acidic to slightly acidic. Shale and ironstone fragments are often present but charcoal fragments are absent and roots are rare.

Table 3 Disturbed Terrain soil landscape characteristics (Chapman & Murphy 1989, pp.132–134)

Soil material	Description
Disturbed Terrain 1 (xx1)	Loose black sandy loam. A black loamy sand to loam-fine-sandy with a loose apedal single-grained structure and sandy fabric. It is used for topsoiling turf and often corresponds to the lowland Nepean River alluvium or Elderslie soil series. Local sands have also been used for topdressing. This material occurs as topsoil (A1 horizon). The material is brittle when dry and crumbly when moist. The colour ranges from a dark brown to black (10YR 3/3-10YR 2/1) or brown (10YR 4/6). It is often water repellent and a surface crust may be present. The pH ranges from moderately acidic to neutral. Roots are common to abundant when turfed and ironstone nodules are occasionally present.
Disturbed Terrain 2 (xx2)	This is a mottled, compacted sandy clay loam to medium clay with an apedal massive to moderately pedal structure. It generally has been compacted to form an impermeable

Soil material	Description
	isolating cap over hazardous buried materials. Peds when present are often platy and smooth-faced. The pH and colour of the soil is highly variable, ranging from extremely acidic to slightly alkaline. Ironstones are occasionally present and roots are absent.
Disturbed Terrain 3 (xx3)	This material is commonly referred to as fill and may consist of any type of soil or regolith material. It often includes demolition rubble and industrial and household wastes. Identifiable features such as colour, pH, and structure vary markedly.
Disturbed Terrain 4 (xx4)	This material consists of dark dredged sands, sandy loams to silty clay loams and sandy clays with apedal single-grained to massive structure and sandy fabric. This material occurs as subsoil. Colour varies from black (10YR 2/1) to a yellowish-brown (2.5Y 5/2). Charcoal, shells or shell fragments are commonly present. This material swells, is highly saline and neutral to moderately alkaline when first dredged, but with drainage and oxidation the salinity levels drop and acidity may increase dramatically.



Legend

Study area

Geological Units

- Q_acw - Alluvial channel deposits-
- Q_av - Alluvial valley deposits
- Q_h - Anthropogenic deposits
- Q_hw - Anthropogenic stored water,
- QH_af - Alluvial floodplain deposits
- QH_ebw - Estuarine basin and bay (subaqueous)
- QH_ecw - Estuarine channel deposits (subaqueous)
- QH_es - Estuarine swamp
- QH_hfr - Anthropogenic deposits-Fill on Quaternary deposits
- QH_hr - Anthropogenic deposits-Reclaimed estuarine areas
- Tuth - Hawkesbury Sandstone
- Twia - Ashfield Shale

Figure 4 Geological formations in the vicinity of the study area

0 200 400 600 800 1,000

Metres
Scale: 1:20,000 @ A3
Coordinate System: GDA 1994 NSW Lambert

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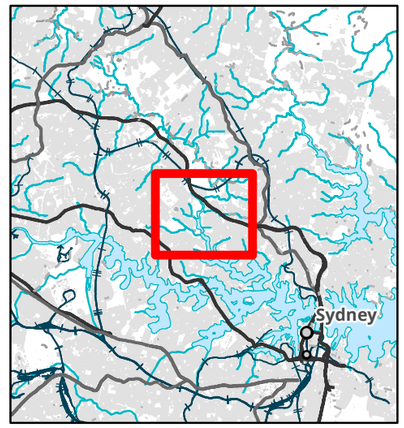

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Study area

Strahler Order

1

2

5

Figure 5 Hydrology and topography in the vicinity of the study area

0 150 300 450 600 750

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA 1994 NSW Lambert

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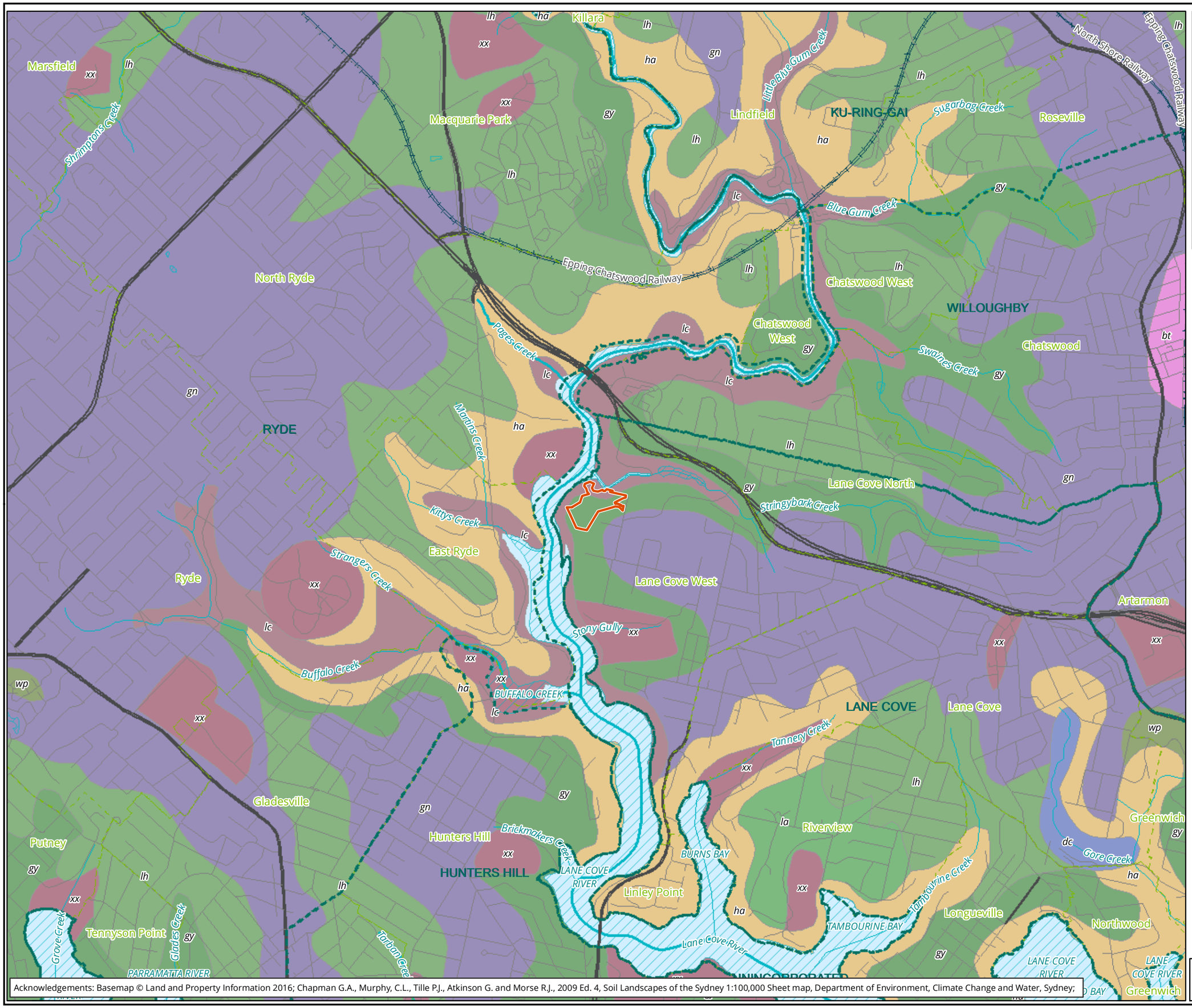

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Study area

Soil Landscape units

- bt - BLACKTOWN
- dc - DEEP CREEK
- gn - GLENORIE
- gy - GYMEA
- ha - HAWKESBURY
- la - LAMBERT
- lc - LANE COVE
- lh - LUCAS HEIGHTS
- WATER - WATER
- wp - WEST PENNANT HILLS
- xx - DISTURBED TERRAIN

Figure 6 Soil landscapes in the vicinity of the study area

0 200 400 600 800 1,000

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 NSW Lambert

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Acknowledgements: Basemap © Land and Property Information 2016; Chapman G.A., Murphy, C.L., Tille P.J., Atkinson G. and Morse R.J., 2009 Ed. 4, Soil Landscapes of the Sydney 1:100,000 Sheet map, Department of Environment, Climate Change and Water, Sydney;

3.1.3 Landscape resources

The Sydney Basin would have generally provided a number of resources utilised by Aboriginal people. The wider region possesses distinct ecological zones, including open forest and open woodland, with riparian vegetation extending along many of the watercourses. Each ecological zone hosts a different array of floral and faunal species, many of which would have been utilised according to seasonal availability. Aboriginal inhabitants of the region would have had access to a wide range of avian, terrestrial and aquatic fauna and repeated firing of the vegetation would have opened up the foliage allowing ease of access through and between different resource zones.

Many of the plants found within the Sydney Basin were important to Aboriginal people and could be used for numerous purposes. These include using the wood to make implements, berries, leaves and tubers for food and medicines as well as bark for shelters. One of the plants exploited may have been the eucalypt, whose leaves can be crushed and used for medicinal purposes, while the sap can be used as a sweet sugary food source and the bark could be used to make bowls and shelters (Rhodes & Dunnett 1985).

Within the study area, the landscape would have supported a dry sclerophyll woodland with an open forest, however this original landscape has been extensively cleared by European colonization and development throughout the years. The plants most typically found throughout the area include red bloodwood *Eucalyptus gummifera*, yellow blood wood *E. eximia*, scribbly gum *E. haemastoma*, brown stringybark *E. capitellata* and old man banksia *Banksia serrata*. Native fauna would have included the noisy minor *Manorina (Myzantha) melanocephala*, kookaburra *Dacelo (Dacelo) novaeguineae,* Australian brushtail possum *Trichosurus vulpecula*, grey-headed flying-fox *Pteropus poliocephalus*, eastern blue-tongue *Tiliqua scincoides*, water dragon *Intellagama lesueurii,* red-bellied black snake *Pseudechis porphyriacus* and red rockcod *Scorpaena cardinalis.*

The various fauna species historically present within the study area would have provided a range of resources for Aboriginal people. Terrestrial and avian resources were not only used for food, but also provided a significant contribution to the social and ceremonial aspects of Aboriginal life through their use as ritual implements or even simply through fashioning as personal adornments (Attenbrow 2010, pp.107–110). Mammals such as kangaroos and wallabies and arboreal mammals such as possums were used as a food source, and for tool making. Bones and teeth were also used as points or barbs for hunting spears and fishing spears. Tail sinews are known to have been used as a fastening cord, whilst 'bone points' frequently occur in rock shelters (Attenbrow 2010, p.109). Animal skin, fur and sinews were also used for personal adornment and in making cloaks. Animals such as Brush-tailed Possums were highly prized for their fur, with possum skin cloaks recorded by the first settlers in the area. The cloaks were worn fastened over one shoulder and under the other. Kangaroo teeth were incorporated into decorative items such as head bands and beads were made from reeds and teeth. Aquatic species such as freshwater crayfish, fish and eels would have been easily accessible in larger waterways, such as the Lane Cove River (Rosen 1995).

3.1.4 Land use history

The first written use of the name Lane Cove occurred on 2 February 1788, soon after the arrival of the First Fleet in Port Jackson. Several possibilities for the name have been suggested, although none have been supported by written evidence. One suggestion was that it was named after Lieutenant Michael Lane, a respected cartographer, who worked with Captain James Cook in Canadian waters. The other possibility is that the name was bestowed in honour of John Lane, son of the Lord Mayor of London, and a good friend of Governor Arthur Phillip.

Many of the first land grants in the area were never settled by the owners, being exchanged for land elsewhere, sold or cancelled. For those who attempted to settle, life was not easy. Much of the area was steep, heavily timbered, with poor, rocky soil and few roads. The settlers were plagued with bushrangers and bushfires. From the earliest days of settlement, Lane Cove was an important source of timber for house and ship building, of grass for animal feed, and of shells which were burnt to produce lime for building. A stockade

was erected in Woodford Bay, with a permanent garrison of soldiers to protect convict workers and settlers. Throughout the 19th century, farms, orchards dairies were the district's main rural industries, with river transport providing easy access to the city markets.

The study area is split over three original land grants. While part of the surrounding area was granted to privates and non-commissioned officers of the New South Wales Corp in 1794, the study area land was not purchased until later. The three original grants belonged to Thomas Moore (40 acres purchased in April 1832), Henry O'Brien (10 acres purchased in April 1834) and William Hamey (11 acres purchased in April 1855). These allotments can be seen on crown plans and parish maps (Plate 1, Plate 2, Plate 3).

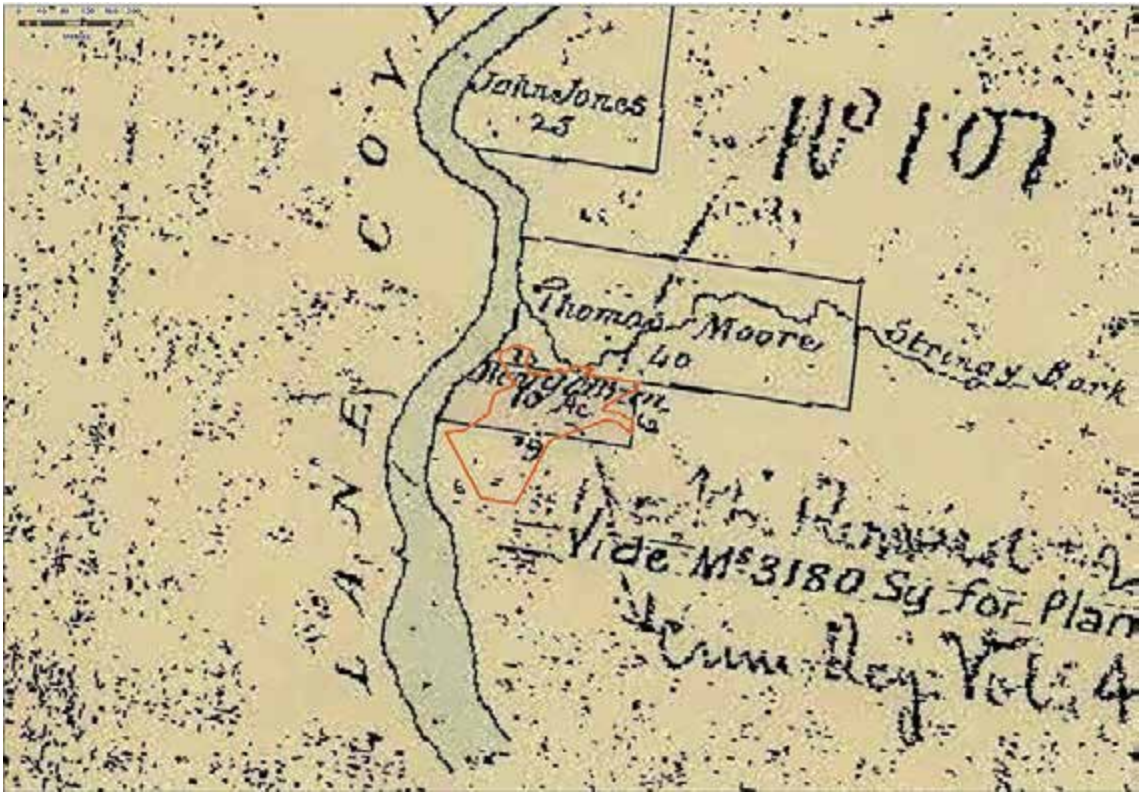

Plate 2 1833 Crown Plan showing Thomas Moore and Henry O'Briens grants (Source: NSW Land Registry Services, Crown Plan 138.690)

Plate 3 **1854 Crown Plan showing the three original grants (Source: NSW Land Registry Services, Crown Plan 627.690)**

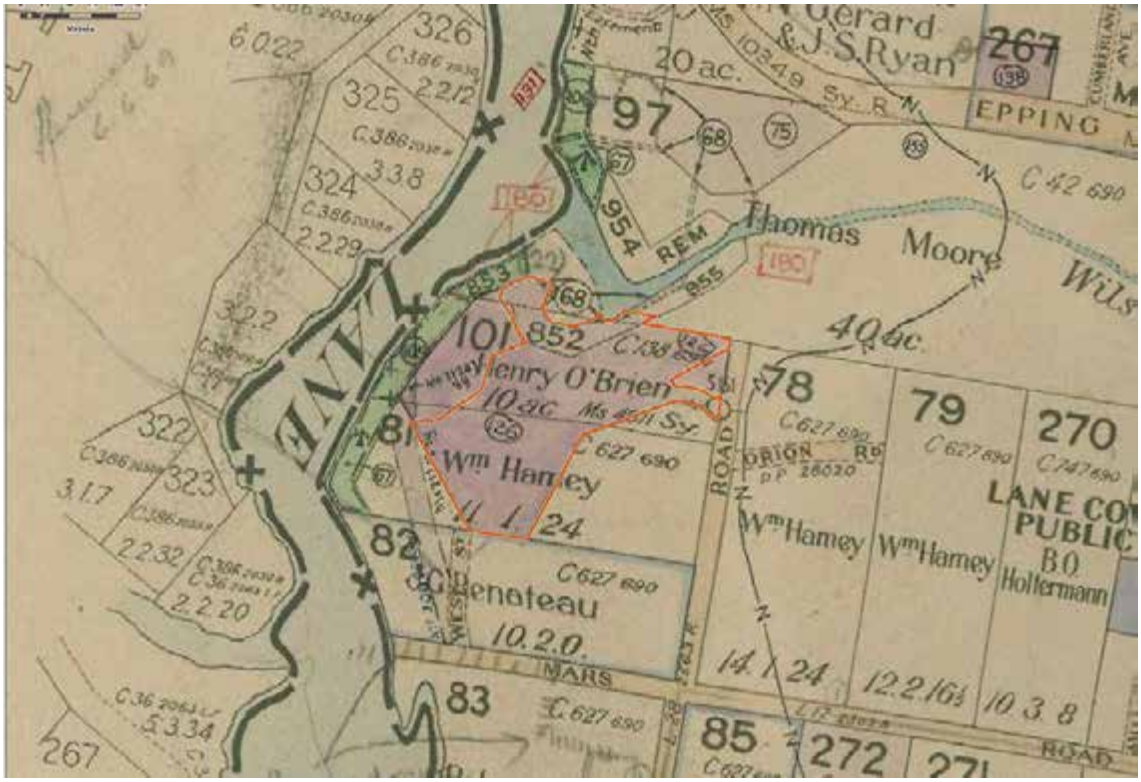

Plate 4 **Parish Map of Willoughby showing original grants (Source: NSW Land Registry Services, County of Cumberland Parish of Willoughby (sheet 1A))**

The land use of the study area didn't change for many years; however, the immediate surrounds did. The Chicago Cornflour Factory opened in 1894, followed by the Cumberland Paper Mill in 1912, both located to the north of the study area. The area surrounding Mars Road to the south of the study area was also developed by being heavily subdivided in the 20th century. The study area can be seen in a subdivision plan from 1920, still in the configuration of the original land grant. No structures appear and it had not been subdivided at this point (Plate 5). The Cumberland Mill can also be seen in this subdivision plan, outside of the study area. It appears that the grants that made up the study area were not used extensively for farming or development, as historical aerials illustrate much of the area was still heavily vegetated.

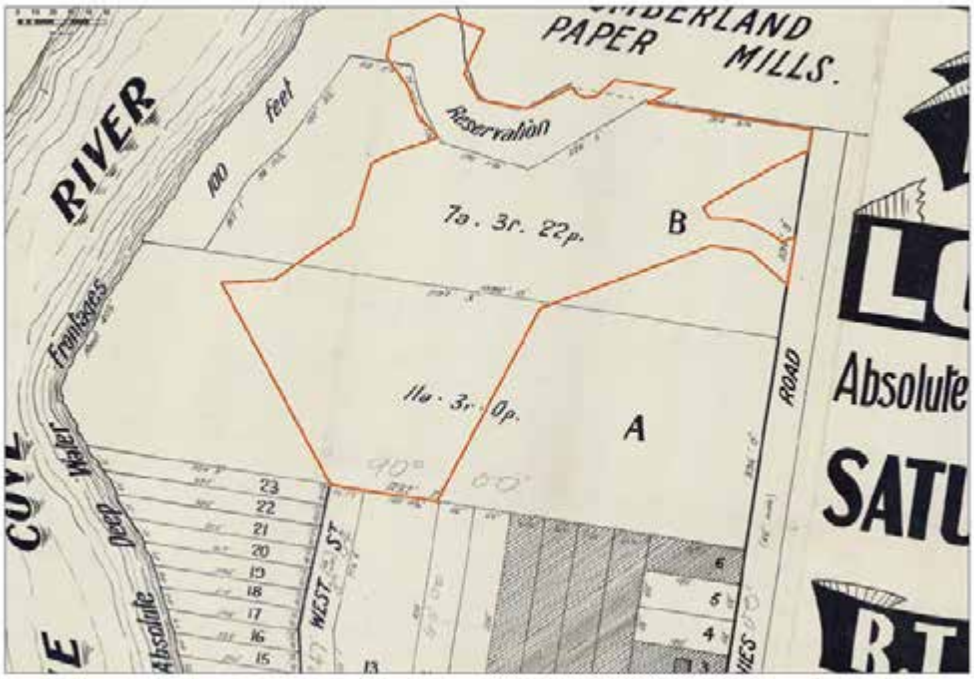

Plate 5 Subdivision plan from 1920 showing no development on the study area (Source: Lane Cove Library Local History LHM994.4139/1920/VIC)

A 1943 historical aerial (Plate 6) illustrates that majority of the study area had not yet been cleared or developed. In the northern portion of the study area, a large water tank, 85 metres in circumference, is present, with the land extending 80 metres to the south-east providing a small clearing with a track running throughout. As the tank is in the northern portion of the study area with no buildings directly adjacent to it, it is possible it could relate to the Cumberland Paper Mills. In the western portion of the study area, there is evidence of a building 14 metres in length. It is not known what the building was used for, however it is not present in current aerials, indicating that it has since been demolished. It is evident that the intensive clearing and industrial development of recent times had not yet occurred in 1943.

Plate 6 1943 aerial showing dense vegetation in the majority of the study area and two structures (Source: Land and Property Information)

Current aerials (Plate 10) illustrate that the study area has undergone massive vegetative clearing and industrial development, with the majority of the study area being highly disturbed. The structures present in the 1943 aerials are no longer present, with sparse vegetation surrounding the edges of the study area. Within the study area, there are large piles of rubble and fill objects, heavily concentrated towards the western side of the study area. Graded dirt roads appear throughout the study area, particularly towards the western side. In the southern portion there is an incised channel bank 20 metres east of the southern boundary. The eastern portion of the area backs onto to a highly developed light industrial area.

Plate 7 **Current aerial showing cleared land with no structures (Source: Land and Property Information)**

3.2 Previous archaeological work

A large number of cultural heritage investigations have been conducted throughout the Sydney Basin region in the past 30 years. There has been an increasing focus on cultural heritage assessments in NSW due to ever increasing development, along with the legislative requirements for this work and greater cultural awareness of Aboriginal cultural heritage.

3.2.1 Regional overview

Aboriginal occupation in the Sydney Basin region dates back well into the Pleistocene period (i.e. before 10,000 years ago). This evidence comes from radiocarbon dates retrieved from excavated sites such as Shaw's Creek K2 (14,700 years before present [BP]) (Attenbrow 2002, p.18) and George & Charles Street Parramatta (circa (c.) 25,000-30,000 BP) (Jo McDonald Cultural Heritage Management Pty Ltd 2005b).

Attenbrow (1990) undertook an investigation titled "The Port Jackson Archaeological Project" for the Australian Museum. The purpose of this report was to improve upon the existing literature about Aboriginal life as previous work had focused on historical accounts and not utilised the archaeological record. The report was broken into two stages; stage 1 involved site recording and survey, and stage 2 utilised excavation of selected sites. The project found that many middens and deposits were still able to be located within the Port Jackson landscape despite the development and expansion of Sydney and its surrounding suburbs. The survey relocated and recorded 112 sites with middens and deposits. The report concludes that there are more unregistered sites that had not been reported.

Convey (1990) conducted a comprehensive survey of the Lane Cove River State Recreation Area (SRA), now known as Lane Cove National Park. Approximately one third of the SRA was surveyed during a twelve day survey. Seven previously unrecorded Aboriginal sites were located, which included two engraving sites, two middens, and three rock shelters with deposit. Five potential habitation sites were also recorded along with three engraving sites which had previously been recorded.

Oakely (2000) completed a survey for a proposed sewerage upgrade within Lane Cove National Park. Two new Aboriginal sites were located in the southern portion of the National Park. Both new sites (LCRM1 and LCRM2) are shell midden scatters and associated areas of potential archaeological deposit (PAD). It was recommended that the sewer line should be redirected to avoid these sites, or if this was not possible that further archaeological work, such as a test excavation, should be conducted.

Irish (2004) undertook an assessment of Aboriginal scarred trees at Sydney Olympic Park as part of the Aboriginal History and Connections Program (AHCP), established by the Parklands Unit at Sydney Olympic Park. The purpose of the AHCP was to explore Aboriginal connections to the Homebush Bay area of Sydney from the earliest occupation until the present day. The ACHP found that the Sydney Olympic Park landscape had been heavily disturbed by historical land use practices such as land reclamation and industrial activities. The ACHP found that the only area within Sydney Olympic Park that had any potential to contain evidence of Aboriginal occupation and cultural activity was the relict Cumberland Woodland known as the Wanngal (Newington) Woodland, within the Newington Nature Reserve (Irish, P. 2004, p.59) A survey of the Woodland was conducted as part of this assessment in order to relocate a number of scarred trees recorded in the area. This assessment determined that none of the previously recorded scarred trees were Aboriginal in origin, as the characteristics associated with cultural scarring were not present and the trees were much too young to have been scarred by Aboriginal people. A number of previously unrecorded artefact scatters were however identified during the survey.

White and McDonald (2010) undertook a review of previous work in the Rouse Hill development area, discussing lithic artefact distribution in previous excavations carried out by JMCHM. The study considered a number of factors including stream order, distance from water, landform, aspect, and distance to silcrete sources. As a result of the assessment, the following statements were made:

- Stream Order: water supply was a significant factor influencing Aboriginal land use and habitation in the area. There was a correlation between increasing stream order and larger numbers and higher densities of artefacts (from a comparison of first, second, and fourth order streams).
- Distance from water: the results showed that an assumption that sites would be clustered within 50 metres of water sources was not entirely correct from the data available. In first order stream landscapes, there was no significant correlation between artefact distribution and distance to water. In second order landscapes, artefact density was highest within 50 metres of water, and then declined with increasing distance. In fourth order landscapes, density was highest between 51 to 100 metres from water.
- Landform: Artefact density was considered to be lowest on upper slopes and ridgetops, with density increasing on mid and lower slopes. Density was highest in terrace landforms, and lower on creek flats, likely due to repeated flooding events and the erosion the caused.
- Distance to silcrete sources: the results of the study showed no significant difference between sites located closer to or further away from silcrete sources. However, 6 kilometres was the maximum tested distance from silcrete sources, so the sample is only representative of a limited area.
- Aspect: only appeared to have an influence on sites in the lower parts of valleys may have been sited to take advantage of steady factors such as the rising/setting sun and wind direction. Sites in higher parts of valleys may have been influenced by weather and other factors.

The study concluded that landform and distance from water had an impact on site distribution, with the preference being for slightly elevated, well-drained areas in the lower parts of valleys.

Aboriginal Heritage Office (2011) completed a broad planning study for Aboriginal heritage in the City of Ryde Local Government Area (LGA). The purpose of the study was to identify, access, and re-record all Aboriginal sites located in the City of Ryde, to provide a planning document for conserving cultural values, and to provide a schedule for conservation works. It was concluded that 56 sites were recorded in the City of Ryde, most of which were rock shelters and middens. The LGA was divided into three Sections: Area 1 – Lane Cove River, Area 2 – Central Plateau, and Area 3 – Parramatta River. Area 1 was dominated by rock shelters, engravings, and grinding grooves. Area 2 contained a single artefact scatter. The report recommended a program for staff education take place to enable workers to identify and avoid Aboriginal sites, and regular monitoring of sites in the LGA was to be undertaken to ensure that Aboriginal sites were appropriately managed.

Biosis (2018) was commissioned by Ecove Group to conduct an Aboriginal archaeological assessment to support an Environmental Impact Statement (EIS) for a proposed development in Sydney Olympic Park. An archaeological survey of the area identified no Aboriginal sites, objects or areas of sensitivity. Due to the highly disturbed nature of the landscape, it was determined that low archaeological potential would be present throughout the entire site.

3.2.2 Local overview

A very small number of Aboriginal cultural heritage investigations have been conducted within ten kilometres of the study area. The few investigations undertaken were a part of development applications and included surface and sub-surface investigations. These investigations are summarised below.

HLA-Envirosciences (2003) undertook archaeological subsurface testing at Eden Gardens, Macquarie Park. The testing program consisted of nine test pits excavated along two transects, with the purpose of the excavations to establish the nature of soil profiles across the study area. The project also cleared some of the sandstone outcropping in a controlled manner to identify potential engravings. Test excavations encountered disturbance across all test pits. In one pit, a quartz artefact was identified along with one potential artefact. There was European material present at a greater depth in this pit however, suggesting that the artefact was

in a disturbed context. No other artefacts were identified, and no engravings were identified on the sandstone outcrop. It was recommended that a Consent to Destroy for the area be sought, with no requirement for further investigation.

Artefact Heritage (2011) conducted a survey of an area along the northern edge of Stringybark Creek in Lane Cove West. A previously recorded rock shelter with a charcoal drawing of two fish was relocated. Although the shelter had been disturbed by construction of a sewer pipe, the art remained in good condition. No new Aboriginal sites were located during the study.

Artefact Heritage (2017) was commissioned by Ausgrid to conduct a due diligence assessment for a cable replacement between Pittwater Road and Rene Street, East Ryde. A pedestrian survey of the study area was undertaken and no previously unrecorded Aboriginal sites or areas of archaeological sensitivity were identified within the study area. This was most likely due to the lack of archaeologically sensitive landforms, disturbance from road construction impacts and removal of vegetation.

3.2.3 AHIMS site analysis

A search of the AHIMS database (Client Service ID: 396636) identified 115 Aboriginal archaeological sites within a 2 by 2 kilometre search area, centred on the proposed study area (Table 4). None of these registered sites are located within the study area (Figure 7). AHIMS search results are provided in Appendix 1. Table 4 provides the frequencies of Aboriginal site types in the vicinity of the study area. The mapping coordinates recorded for these sites were checked for consistency with their descriptions and location on maps from Aboriginal heritage reports where available. These descriptions and maps were relied where notable discrepancies occurred.

It should be noted that the AHIMS database reflects Aboriginal sites that have been officially recorded and included on the list. Large areas of NSW have not been subject to systematic, archaeological survey; hence AHIMS listings may reflect previous survey patterns and should not be considered a complete list of Aboriginal sites within a given area. Some recorded sites consist of more than one element, for example artefacts and shell, however for the purposes of this breakdown and the predictive modelling, all individual site types will be studied and compared. This explains why there are 180 results presented here, compared to the 115 sites identified in AHIMS.

Table 4 AHIMS site type frequency

Site type	Number of occurrences	Frequency (%)
Artefact	72	40.00
Shell	60	33.33
Potential Archaeological Deposit (PAD)	20	11.11
Art (Pigment or Engraved)	18	10.00
Grinding Groove	8	4.45
Habitation Structure	2	1.11
Total	**180**	**100%**

A simple analysis of the Aboriginal cultural heritage sites registered within 2 kilometres of the study area indicates that the dominant site type is artefacts representing 40% (n=72,) and shell with 33.33% respectively (n=60), followed by PAD at 11.1% (n=20). Grinding grooves represent 4.45% (n=8), and habitation structures represent 1.11% (n=2) of total site types. All the sites were located within close proximity to the reliable

sources of water, were either exposed by the land clearing works (artefact scatters) or within areas of relevant sandstone outcrops for grinding grooves and overhang development (shelters with art/deposit).

Figure 7 Aboriginal sites located in the vicinity of the study area

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3.3 Discussion

Summarise and discuss the local and regional character of Aboriginal land use and its material traces.

3.3.1 Predictive statement

A series of statements have been formulated to broadly predict the type and character of Aboriginal cultural heritage sites likely to exist throughout the study area and where they are more likely to be located.

These statements are based on:

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

Table 6 below indicates the site types most likely to be encountered across the present study area (The definition of each site type is described firstly, followed by the predicted likelihood of this site type occurring within the study area.

Table 5 Aboriginal site prediction statements

Site type	Site description	Potential
Flaked stone artefact scatters and isolated artefacts	Artefact scatter sites can range from high-density concentrations of flaked stone and ground stone artefacts to sparse, low-density 'background' scatters and isolated finds.	High: Stone artefact sites have been previously recorded in the region on level, well-drained topographies in close proximity to reliable sources of fresh water. Due to the close proximity to the fresh water resources of the Lane Cove River, the potential for artefacts to be present within the study area is assessed as high.
Shell middens	Deposits of shells accumulated over either singular large resource gathering events or over longer periods of time.	High: Shell midden sites have been recorded within the vicinity of the study area. There is high potential for shell middens to be located in the study area due to the close proximity to the Lane Cove River and its resources.
Grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	High: Suitable horizontal sandstone rock outcrops could occur along drainage lines. Grinding grooves have been recorded in the vicinity of the study area; therefore, the potential for them to be present within the study area is high.
Rock shelters with art and / or deposit	Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground	Moderate: These sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space exist, which

Site type	Site description	Potential
	characterised by cliff lines and escarpments. These naturally formed features may contain rock art, stone artefacts or midden deposits and may also be associated with grinding grooves.	are present along the Lane Cove River adjacent to the study area.
Potential Archaeological Deposits (PADs)	Potential sub surface deposits of cultural material.	Moderate: PADs have been previously recorded in the region across a wide range of landforms. PADs are likely to be present within areas adjacent to water courses or on high points in undisturbed landforms.
Aboriginal Ceremony and Dreaming sites	Such sites are often intangible places and features and are identified through oral histories, ethnohistoric data, or Aboriginal informants.	Moderate: There are currently no recorded mythological stories for the study area; however, there are often songlines and stories connected to areas where rock paintings and engravings occur.
Quarries	Raw stone material procurement sites.	Low: There is no record of any quarries being within or surrounding the study area.
Scarred trees	Trees with cultural modifications	Low: Scarred trees have not been recorded within the vicinity of the study area. Due to extensive vegetation clearance only a small number of mature native trees have survived within southernmost part of the study area.
Burials	Aboriginal burial sites.	Low: Aboriginal burial sites are generally situated within deep, soft sediments, caves or hollow trees. Areas of deep sandy deposits will have the potential for Aboriginal burials. The soil profiles associated with the study area are not commonly associated with burials.
Post-contact sites	These are sites relating to the shared history of Aboriginal and non-Aboriginal people of an area and may include places such as missions, massacre sites, post-contact camp sites and buildings associated with post-contact Aboriginal use.	Low: There are no post-contact sites previously recorded in the study area and historical sources do not identify one.

Site type	Site description	Potential
Aboriginal places	Aboriginal places may not contain any 'archaeological' indicators of a site, but are nonetheless important to Aboriginal people. They may be places of cultural, spiritual or historic significance. Often they are places tied to community history and may include natural features (such as swimming and fishing holes), places where Aboriginal political events commenced or particular buildings.	Low: There are currently no recorded Aboriginal historical associations for the study area.

4 Field investigation

A field investigation of the study area consisting of an archaeological survey was undertaken on 20 November 2018 by James Cole. The field survey sampling strategy, methodology and a discussion of results are provided below.

4.1 Archaeological survey objectives

The objectives of the survey were to:

- Provide RAPs an opportunity to view the study area and to discuss previously identified Aboriginal object(s) and/or place(s) in or within close proximity to the study area.
- Undertake a systematic survey of the study area targeting areas with the potential for Aboriginal heritage.
- Identify and record Aboriginal archaeological sites visible on the ground surface.
- Identify and record areas of PADs.

4.2 Archaeological survey methodology

The survey methods were intended to assess and understand the landforms and to determine whether any archaeological material from Aboriginal occupation or land use exists within the study area.

4.2.1 Survey methods

The archaeological survey was conducted on foot with a field team of two members in a meandering transect. Recording during the survey followed the archaeological survey requirements of the Code and industry best practice methodology. Information recorded during the survey included:

- Aboriginal objects or sites present in the study area during the survey.
- Survey coverage.
- Any resources that may have potentially have been exploited by Aboriginal people.
- Landform.
- Photographs of the site indicating landform.
- Evidence of disturbance.
- Aboriginal artefacts, culturally modified trees or any other Aboriginal sites.

Where possible, identification of natural soil deposits within the study area was undertaken. Photographs and recording techniques were incorporated into the survey including representative photographs of survey units, landform, vegetation coverage, ground surface visibility (GSV) and the recording of soil information for each survey unit were possible. Any potential Aboriginal objects observed during the survey were documented and photographed. The location of Aboriginal cultural heritage and points marking the boundary of the landform elements were recorded using a hand-held Global Positioning System (GPS) and the Map Grid of Australia (MGA) (94) coordinate system.

4.3 Archaeological survey results

4.3.1 Constraints to the survey

With any archaeological survey there are several factors that influence the effectiveness (the likelihood of finding sites) of the survey. The factors that contributed most to the effectiveness of the survey within the study area were the dense grass cover (Plate 8) and fill covering large portions of the site (Plate 9).

Plate 8 View across site to the north-west, showing grass cover

Plate 9 Contaminated fill dumped on site, view south-east

4.3.2 Visibility

In most archaeological reports and guidelines visibility refers to GSV, and is usually a percentage estimate of the ground surface that is visible and allowing for the detection of (usually stone) artefacts that may be present on the ground surface (DECCW 2010b).

Visibility was variable across the study area, with the majority of the study area being covered with grass which would not allow for the detection of surface sites such as stone artefacts, and stone outcrops were often covered with plant litter or introduced material. Visibility was highest in areas of disturbance. A number of sandstone overhangs were identified on site, which were able to be inspected to determine if there were any Aboriginal sites associated with them.

Plate 10 Area of higher visibility associated with disturbance, view south

Plate 11 Sandstone overhang in the central portion of the study area, view south-east

4.4 Exposure

Exposure refers to the geomorphic conditions of the local landform being surveyed, and attempts to describe the relationship between those conditions and the likelihood the prevailing conditions provide for the exposure of (buried) archaeological materials. Whilst also usually expressed as a percentage estimate, exposure is different to visibility in that it is in part a summation of geomorphic processes, rather than a simple observation of the ground surface (Burke & Smith 2004, p.79, DECCW 2010b). Overall, the study area displayed moderate areas of exposure around disturbance associated with dumping and excavation, and erosion associated with tracks throughout it.

Plate 12 Area of exposure associated with drainage channel in the southern portion of the study area, view west

Plate 13 Area of exposure associated with a track in the central portion of the study area, view north-east

4.4.1 Disturbances

Disturbance in the study area is associated with natural and human agents. Natural agents generally affect small areas and include the burrowing and scratching in soil by animals, such as wombats, foxes, rabbits and wallabies, and sometimes exposure from slumping or scouring. Disturbances associated with human action can include residential development such as landscaping and construction of residential buildings; farming practices, such as initial vegetation clearance for creation of paddocks, fencing and stock grazing; agricultural practices such as fruit orchards; light industrial practices such as nursery and creation of artificial dams.

The study area has been subject to extensive disturbance, with both cut and fill actions identified during the survey, large amounts of illegal dumping of material, and the construction of both tracks and drainage features throughout the study area. Sandstone outcrops were identified which may have been suitable for rock engravings, however the marks identified on them were consistent with having been scraped by an excavator, likely to clear earth or loose material. There are a number of areas paved with gravel, and historical aerials indicate at least two previous structures within the study area.

Plate 14 Sandstone surface with gouge marks in the central portion of the study area, view north-west

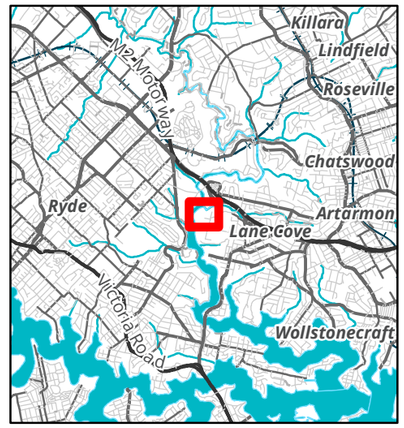
Plate 15 Paved area in the southern portion of the study area, view south

Table 6 Survey coverage

Survey unit	Landform	Survey unit area (m²)	Visibility (%)	Exposure (%)	Effective coverage area (m²)	Effective coverage (%)
1	Ridge	5677.57	40	30	681.31	12.0
2	Slope	12050.63	20	2	48.20	0.4
3	Ridge	2070.85	0	0	0.00	0.0
4	Flat	9913.73	10	5	49.57	0.5
5	Slope	9822.13	13	10	127.69	1.3

Table 7 Landform summary

Landform	Landform area (m²)	Area effectively surveyed (m²)	Landform effectively surveyed (%)	No. of Aboriginal sites	No. of artefacts or features
Ridge	7748.41	681.31	8.8	0	0
Flat	9913.73	49.57	0.5	0	0
Slope	21872.76	175.89	0.8	0	0



Legend

- Study area
- Transcript

Archaeological potential

- Low

Acknowledgements: Basemap © Land and Property Information 2016

Figure 7: Survey coverage and results

0 20 40 60 80 100

Metres

Scale: 1:2,000 @ A3

Coordinate System: GDA 1994 NSW Lambert

N

Biosis Pty Ltd

Albury, Ballarat, Melbourne,
Newcastle, Sydney, Wangaratta & Wollongong

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4.5 Discussion of archaeological survey results

The study area was divided between three landform units: ridges, slopes, and flats, all of which exhibited signs of landscape modification. Ridges were present in the eastern and south-eastern portions of the study area, around the existing access track and a paved area which is likely to have been a car park. The northern portion of the study area, closest to Stringybark Creek, consists of a flat, while the remainder of the study area consists of gentle to moderate slopes (Table 5 and Table 6).

The archaeological survey consisted of four transects walked across the study area in order to identify Aboriginal sites present within it. The background research for the project noted the potential for a number of site types to be present within it including:

- Artefact sites which have the potential to be present across the landscape in both disturbed and undisturbed contexts.
- shell middens which were noted to have the potential to be present, owing to the proximity of the study area to the Lane Cove River.
- rock shelters, which may exist where suitable sandstone overhangs are present.
- grinding grooves, which may exist where suitable sandstone surfaces are present.
- PADs which have the potential to be present in undisturbed landforms.
- Aboriginal Ceremony and Dreaming sites, which are commonly present in association with rock shelters and engravings.

A number of sandstone surfaces and overhangs were identified during the survey, which were inspected for Aboriginal sites including grinding grooves, engravings, art, and PAD, with no features identified during the survey. It was noted that a number of sandstone platforms did have gouge marks on them consistent with the toothed edge of a machine excavator bucket, which may have damaged or removed any grinding grooves or engravings which may have been present.

Owing to the levels of disturbance, there were no locations identified within the study area which were considered to have the potential to retain intact archaeological deposits of artefacts or shell. The majority of the study area has been subject to cut and fill actions, with much of the original ground surface having been visibly altered. It is considered that in lesser disturbed areas to the west of the study area, there is likey to be higher archaeological potential. Within the study area, disturbanced included the removal of topsoil, construction of buildings within the study area, and the dumping and removal of contaminated fill. Based on discussions with the client, it is understood that in the northern portion of the study area, there is a large amount of artificial fill capped with clay adjacent to Stringybark Creek.

Based on this archaeological survey, the study area has been assessed as holding low archaeological potential to contain intact Aboriginal sites.

5 Scientific values and significance assessment

The two main values addressed when assessing the significance of Aboriginal sites are cultural values to the Aboriginal community and archaeological (scientific) values. This report will assess scientific values while the ACHA report will detail the cultural values of Aboriginal sites in the study area.

5.1 Introduction to the assessment process

Heritage assessment criteria in NSW fall broadly within the significance values outlined in the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter (Australia ICOMOS 2013). This approach to heritage has been adopted by cultural heritage managers and government agencies as the set of guidelines for best practice heritage management in Australia. These values are provided as background and include:

- **Historical significance** (evolution and association) refers to historic values and encompasses the history of aesthetics, science and society, and therefore to a large extent underlies all of the terms set out in this section. A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the settings are substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of subsequent treatment.
- **Aesthetic significance** (Scenic/architectural qualities, creative accomplishment) refers to the sensory, scenic, architectural and creative aspects of the place. It is often closely linked with social values and may include consideration of form, scale, colour, texture, and material of the fabric or landscape, and the smell and sounds associated with the place and its use.
- **Social significance** (contemporary community esteem) refers to the spiritual, traditional, historical or contemporary associations and attachment that the place or area has for the present-day community. Places of social significance have associations with contemporary community identity. These places can have associations with tragic or warmly remembered experiences, periods or events. Communities can experience a sense of loss should a place of social significance be damaged or destroyed. These aspects of heritage significance can only be determined through consultative processes with local communities.
- **Scientific significance** (Archaeological, industrial, educational, research potential and scientific significance values) refers to the importance of a landscape, area, place or object because of its archaeological and/or other technical aspects. Assessment of scientific value is often based on the likely research potential of the area, place or object and will consider the importance of the data involved, its rarity, quality or representativeness, and the degree to which it may contribute further substantial information.

The cultural and archaeological significance of Aboriginal and historic sites and places is assessed on the basis of the significance values outlined above. As well as the ICOMOS Burra Charter significance values guidelines, various government agencies have developed formal criteria and guidelines that have application when assessing the significance of heritage places within NSW. Of primary interest are guidelines prepared by the Commonwealth Department of the Environment and Energy, OEH, NSW Department of Planning and Environment. The relevant sections of these guidelines are presented below.

These guidelines state that an area may contain evidence and associations which demonstrate one or any combination of the ICOMOS Burra Charter significance values outlined above in reference to Aboriginal heritage. Reference to each of the values should be made when evaluating archaeological and cultural significance for Aboriginal sites and places.

In addition to the previously outlined heritage values, the OEH Guidelines (OEH 2011) also specify the importance of considering cultural landscapes when determining and assessing Aboriginal heritage values. The principle behind a cultural landscape is that 'the significance of individual features is derived from their inter-relatedness within the cultural landscape'. This means that sites or places cannot be 'assessed in isolation' but must be considered as parts of the wider cultural landscape. Hence the site or place will possibly have values derived from its association with other sites and places. By investigating the associations between sites, places, and (for example) natural resources in the cultural landscape the stories behind the features can be told. The context of the cultural landscape can unlock 'better understanding of the cultural meaning and importance' of sites and places.

Although other values may be considered – such as educational or tourism values – the two principal values that are likely to be addressed in a consideration of Aboriginal sites and places are the cultural/social significance to Aboriginal people and their archaeological or scientific significance to archaeologists. The determinations of archaeological and cultural significance for sites and places should then be expressed as statements of significance that preface a concise discussion of the contributing factors to Aboriginal cultural heritage significance.

5.2 Archaeological (scientific significance) values

Archaeological significance (also called scientific significance, as per the ICOMOS Burra Charter) refers to the value of archaeological objects or sites as they relate to research questions that are of importance to the archaeological community, including indigenous communities, heritage managers and academic archaeologists. Generally the value of this type of significance is determined on the basis of the potential for sites and objects to provide information regarding the past life-ways of people (Burke & Smith 2004, p.249, NPWS 1997), For this reason, the NPWS summarises the situation as 'while various criteria for archaeological significance assessment have been advanced over the years, most of them fall under the heading of archaeological research potential' (NPWS 1997, p.26). The NPWS criteria for archaeological significance assessment are based largely on the ICOMOS Burra Charter.

Research potential

Research potential is assessed by examining site content and site condition. Site content refers to all cultural materials and organic remains associated with human activity at a site. Site content also refers to the site structure – the size of the site, the patterning of cultural materials within the site, the presence of any stratified deposits and the rarity of particular artefact types. As the site contents criterion is not applicable to scarred trees, the assessment of scarred trees is outlined separately below. Site condition refers to the degree of disturbance to the contents of a site at the time it was recorded.

The site contents ratings used for the study area are shown in Table 8, and the site condition ratings in Table 9.

Table 8 Site content ratings

Rating	Description
0	No cultural material remaining.

Rating	Description
1	Site contains a small number (e.g. 0–10 artefacts) or limited range of cultural materials with no evident stratification.
2	Site contains a larger number, but limited range of cultural materials; and/or some intact stratified deposit remains; and/or are or unusual example(s) of a particular artefact type.
3	Site contains a large number and diverse range of cultural materials; and/or largely intact stratified deposit; and/or surface spatial patterning of cultural materials that still reflect the way in which the cultural materials were deposited.

Table 9 Site condition ratings

Rating	Description
0	Site destroyed.
1	Site in a deteriorated condition with a high degree of disturbance; lack of stratified deposits; some cultural materials remaining.
2	Site in a fair to good condition, but with some disturbance.
3	Site in an excellent condition with little or no disturbance. For surface artefact scatters this may mean that the spatial patterning of cultural materials still reflects the way in which the cultural materials were laid down.

Pearson and Sullivan (1995, p.149) note that Aboriginal archaeological sites are generally of high research potential because 'they are the major source of information about Aboriginal prehistory'. Indeed, the often great time depth of Aboriginal archaeological sites gives them research value from a global perspective, as they are an important record of humanity's history. Research potential can also refer to specific local circumstances in space and time – a site may have particular characteristics (well preserved samples for absolute dating, or a series of refitting artefacts, for example) that mean it can provide information about certain aspects of Aboriginal life in the past that other less or alternatively valuable sites may not (Burke & Smith 2004, pp.247–8). When determining research potential value particular emphasis has been placed on the potential for absolute dating of sites.

The following sections provide statements of significance for the Aboriginal archaeological sites recorded during the sub-surface testing for the assessment. The significance of each site follows the assessment process outlined above. This includes a statement of significance based on the categories defined in the Burra Charter. These categories include social, historic, scientific, aesthetic and cultural (in this case archaeological) landscape values. Nomination of the level of value—high, moderate, low or not applicable—for each relevant category is also proposed. Where suitable the determination of cultural (archaeological) landscape value is applied to both individual sites and places (to explore their associations) and also, to the Study Area as a whole. The nomination levels for the archaeological significance of each site are summarised below.

Representativeness

Representativeness refers to the regional distribution of a particular site type. Representativeness is assessed by whether the site is common, occasional, or rare in a given region. Assessments of representativeness are subjectively biased by current knowledge of the distribution and number of archaeological sites in a region. This varies from place to place depending on the extent of archaeological research. Consequently, a site that is assigned low significance values for contents and condition, but a high significance value for

representativeness, can only be regarded as significant in terms of knowledge of the regional archaeology. Any such site should be subject to re-assessment as more archaeological research is undertaken.

Assessment of representativeness also takes into account the contents and condition of a site. For example, in any region there may only be a limited number of sites of any type that have suffered minimal disturbance. Such sites would therefore be given a high significance rating for representativeness, although they may occur commonly within the region.

The representativeness ratings used for the study area are shown in Table 10.

Table 10 Site representativeness ratings

Rating	Description
1	Common occurrence
2	Occasional occurrence
3	Rare occurrence

Overall scientific significance ratings for the study area, based on a cumulative score for site contents, site integrity and representativeness are shown in Table 11

Table 11 Scientific significance ratings

Rating	Description
1-3	Low scientific significance
4-6	Moderate scientific significance
7-9	High scientific significance

The study area was given a score on the basis of these criteria – the overall scientific significance is determined by the cumulative score.

5.2.1 Statements of archaeological significance

The following archaeological significance assessment is based on Requirement 11 of the code. Using the assessment criteria detailed in Scientific Values and Significance Assessment, an assessment of significance was determined and a rating for the study area was determined. The results of the archaeological significance assessment are given in Table 12 below.

Table 12 Scientific significance assessment of archaeological sites recorded within the study area.

Site name	Site content	Site condition	Representativeness	Scientific Significance
Lot 1 DP 1151370	0	1	1	1 - Low

Table 13 Statements of scientific significance for the study area

Site Name	Statement of Significance
Lot 1 DP 1151370	The study area has been subject to cut and fill actions, with much of the original ground surface having been visibly altered. Within the study area, disturbanced included the removal of topsoil, construction of buildings within the study area, and the dumping and removal of contaminated fill. Owing to the levels of disturbance, there were no locations identified within the study area which were considered to have the potential to retain intact archaeological deposits of artefacts or shell. The scientific significance of this site has been assessed as low.

6 Impact assessment

As previously outlined, the project proposes to construct a data storage building, electrical substation, ancillary office area, loading docks, associated infrastructure, car parking and landscaping.

6.1 Predicted physical impacts

The proposed works will consist of bulk earthworks and site infrastructure, followed by the construction of a road ways and landscaping. All of these activities will have the potential to impact Aboriginal sites. However, the study area has been subject to cut and fill actions, with much of the original ground surface having been visibly altered. Within the study area, disturbanced included the removal of topsoil, construction of buildings within the study area, and the dumping and removal of contaminated fill.

As there are no Aboriginal sites within the study area and the area is highly disturbed the proposed works will not impact on Aboriginal heritage values

6.2 Management and mitigation measures

Ideally, heritage management involves conservation of sites through the preservation and conservation of fabric and context within a framework of 'doing as much as necessary, as little as possible' (Marquis-Kyle & Walker 1994, p.13). In cases where conservation is not practical, several options for management are available. For sites, management often involves the salvage of features or artefacts, retrieval of information through excavation or collection (especially where impact cannot be avoided) and interpretation.

Avoidance of impact to archaeological and cultural heritage sites through design of the development is the primary mitigation and management strategy, and should be implemented where practicable. However, due to the levels of disturbance and absence of Aboriginal sites, there are no specific management and mitigation measures required. After the completion of the construction of the proposed development, MLALC suggests that landscapes of native vegetation be planted and Gammerraygal names be used in any visual interpretation or signage within the gardens.

7 Recommendations

Strategies have been developed based on the archaeological (significance) of cultural heritage relevant to the study area and influenced by:

- Predicted impacts to Aboriginal cultural heritage
- The planning approvals framework
- Current best conservation practise, widely considered to include:
  - Ethos of the Australia ICOMOS Burra Charter
  - The Code

Prior to any impacts occurring within the study area, the following is recommended:

Recommendation 1: No further archaeological assessment is required

No further archaeological work is required in the study area due to the entire study area being assessed as having low archaeological potential.

Recommendation 2: Landscape design to include Indigenous plants

After the completion of the construction of the proposed development, it is suggested that landscapes of native vegetation be planted and Gammerraygal names be used in any visual interpretation or signage within the gardens. This will ensure the visual amenity of the area is retained and the acknowledgement of Aboriginal people as the original custodians of the area are recognised.

Recommendation 3: Discovery of Unanticipated Aboriginal Objects

All Aboriginal objects and Places are protected under the NPW Act. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the OEH. Should any Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying the OEH and Aboriginal stakeholders.

Recommendation 4: Discovery of Aboriginal Ancestral Remains

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

4. Immediately cease all work at that location and not further move or disturb the remains.
5. Notify the NSW Police and OEH's Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location.
6. Not recommence work at that location unless authorised in writing by OEH.

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Appendices

Appendix 1 AHIMS results

THIS APPENDIX IS NOT TO BE MADE PUBLIC AND HAS BEEN REMOVED

Appendix 2 Survey photos