Windsor Bridge over the Hawkesbury River
Preliminary Aboriginal archaeological and cultural heritage baseline investigations
PUBLISHED AUGUST 2011
Windsor Bridge Upgrade,
Windsor NSW
PRELIMINARY
ABORIGINAL ARCHAEOLOGICAL
& CULTURAL BASELINE INVESTIGATION

FINAL DRAFT REPORT
THIS VERSION SUITABLE FOR PUBLIC ACCESS AND EXHIBITION

Prepared by
Austral Archaeology Pty Ltd
Archaeological & Cultural Heritage Consultants
For
Roads and Traffic Authority NSW
July 2009
Job No: N9016

AUSTRAL ARCHAEOLOGY PTY. LTD.
SHOP 1, 92-96 PERCIVAL ROAD,
STANMORE NEW SOUTH WALES 2048
T 02 9568 6701
F 02 9568 6702
AUSTRAL ARCHAEOLOGY PTY LTD ABN 25008 174 829
INCORPORATED IN SOUTH AUSTRALIA

NOTE: SOME INFORMATION OF CULTURAL SENSITIVITY TO THE ABORIGINAL COMMUNITY
HAS BEEN REMOVED FROM THIS VERSION OF THE REPORT
EXECUTIVE SUMMARY

The NSW Roads and Traffic Authority (RTA) is proposing the construction of a new two lane traffic bridge across the Hawkesbury River at Windsor, NSW. This would replace the existing structure currently in use. Eight new potential development options are currently being considered. Austral Archaeology was therefore commissioned to undertake an Aboriginal archaeological and cultural heritage baseline report upon each of the proposed options.

The aim of this baseline study is to conduct a desktop analysis of each of the potential development options from the perspective of Aboriginal archaeological and cultural heritage. Known Aboriginal archaeological and cultural sites have been identified and likely areas of Aboriginal archaeological sensitivity highlighted.

In addition to the desktop analysis a limited degree of Aboriginal community consultation was also undertaken. This is in keeping with Stage 2 of the RTA’s Procedure for Aboriginal Cultural Heritage Consultation and Investigation as required by the project brief. The purpose of this initial Aboriginal community consultation was to contact the relevant Local Aboriginal Land Council and Native Title Claimant(s) in the region to elicit details as to the Aboriginal cultural heritage values of the area and to identify potential development constraints. To that end the Deerubbin Local Aboriginal Land Council (DLALC) and the Darug Tribal Aboriginal Corporation (DTAC) were contacted, invited to inspect the eight options and offer advice on any impacts each option may have upon Aboriginal cultural heritage values.

Desktop assessment and site inspection of the eight development options being proposed by the RTA for the Windsor Bridge Road upgrade was undertaken by Austral Archaeology in June and July of 2009. Through desktop and database research a total of twelve known and likely Aboriginal archaeological heritage constraints were noted. Of the eight options only two (options 6 and 7) are without known Aboriginal archaeological constraints.

In addition to known Aboriginal archaeological heritage constraints, investigation of the local Aboriginal archaeological context as well as application of quantifiable regional archaeological site prediction models identified that each of the eight options has the likelihood of impacting upon previously unrecorded Aboriginal archaeological sites and areas of potential archaeological deposit (PAD). This is especially the case in proximity to the major waterway that each option must cross (i.e. the Hawkesbury River) thereby impacting upon its southern and northern banks.

Worthy of consideration is the historically recorded episode of Governor Phillip and a party from Sydney exploring the area and meeting with local Aboriginal people in the vicinity of Option 8 in Pitt Town Bottoms. This episode involving an extremely important historical figure would certainly require further assessment as there remains a low possibility that evidence of this encounter (as well as any contact era archaeological material created as a result) is extant in the archaeological record in the vicinity of the proposed development envelope.

It has been shown in many previous studies that urban and historical disturbance of the landscape do not necessarily destroy or remove the integrity and/or significance of remnant Aboriginal archaeological deposits. Several Aboriginal archaeological sub surface investigations (e.g. JMCHM Pty Ltd 1998 & Austral Archaeology in draft – b) have revealed considerable site complexity and deposit depth within the township of Windsor itself. This has implications for several of the proposed development routes.

The Aboriginal stakeholders consulted for this project did not identify specific cultural sites, issues or concerns. Although no specific concerns were raised both the DLALC and DTAC representatives wished it noted that those areas closest to the Hawkesbury River and to a lesser extent South Creek hold intrinsic Aboriginal cultural value. Although no specific examples in the region of this study were given the DLALC representative wished it recorded that it is felt that where intact sand dunes are located there remains a good chance for burials to be located. This would be of considerable cultural significance to the Aboriginal community as well as possessing a high level of research value.

In terms of the development options presented, the stakeholders were unanimous in their opinion that Options 1 and 2 are the most preferable from a cultural perspective. They felt that as the Aboriginal archaeological and cultural assessment had already been conducted they were aware of the archaeological and cultural values of the area and were confident in the mitigation and management strategies proposed as a result (i.e. subsurface investigation).
They also felt that these options involved the least amount of new disturbance to potential Aboriginal archaeological and cultural deposits.

The Aboriginal stakeholders expressed a lesser preference for Options 6 and 7 and held no strong preference on all but one of the remainder of the options presented. They were expressly unfavourable towards Option 8 as they felt it would have a considerable impact upon the Aboriginal cultural values of that stretch of the River and its banks.

Detailed discussion of each of the eight options is covered in the following report. To précis, Options 1, 2, 3, 4, 5 and 8 have been determined in this baseline report to impact upon known Aboriginal archaeological values. In addition, Options 3 through 8 have also been determined to impact upon areas not previously assessed for archaeological sensitivity and potential. Selection of any of these options would therefore require the undertaking of an Aboriginal archaeological and cultural assessment involving full consultation with the Aboriginal stakeholders. The purpose of such an assessment would be to formally identify any specific areas of Aboriginal archaeological and cultural value or potential and consult with Aboriginal stakeholders as to appropriate management and mitigation strategies.

Taking the background Aboriginal archaeological contextual data and site inspection into account it is the consultant's opinion that Options 1 and 2 and to a lesser extent Option 3 represent the preferred options for the Windsor Bridge upgrade programme regarding Aboriginal archaeological and cultural heritage. These three options will involve the least amount of disturbance to known and potential Aboriginal archaeological and cultural values as well as involve the least amount of further assessment, investigation and mitigation. Options 1 and 2 in particular have already been subject to Aboriginal archaeological and cultural assessment (Heritage Concepts 2008a). Artefacts and areas of potential have been identified along these options and management and mitigation advice offered as a result. Selection of either Options 1 and/or 2 would therefore progress the RTA's project to the next stage of development without the necessity for additional assessment.

Please note: Descriptions and locational data relating to Aboriginal archaeological and cultural material and sites have been removed from this version of the report. This is in accordance with the legislative protection afforded to Aboriginal archaeological and cultural materials sites by Section 90 of the National Parks and Wildlife Act 1974 (amended). Furthermore this information is considered sensitive and of great importance to the Aboriginal community and therefore not suitable for public display. This redacted version of the document has been prepared by Austral Archaeology Pty Ltd specifically for the purposes of public exhibition.
TABLE OF CONTENTS

EXECUTIVE SUMMARY .......................................................................................................................... II
TABLE OF CONTENTS .............................................................................................................................. IV
INTRODUCTION ........................................................................................................................................ 1
1.1 PROJECT DESCRIPTION ..................................................................................................................... 1
1.2 PROJECT BACKGROUND .................................................................................................................... 1
1.3 REPORT LIMITATIONS ....................................................................................................................... 2
1.4 DEVELOPMENT OPTIONS .................................................................................................................. 2
1.5 REPORT OBJECTIVES ......................................................................................................................... 9
1.6 ABORIGINAL STAKEHOLDER CONSULTATION .................................................................................. 10
1.7 PROJECT TEAM AND ACKNOWLEDGEMENTS ............................................................................... 10
1.8 ABBREVIATIONS ............................................................................................................................... 10

2.0 LEGISLATIVE FRAMEWORK ......................................................................................................... 12
2.1 ABORIGINAL HERITAGE LEGISLATIVE FRAMEWORK .................................................................. 12
2.1.1 Community Consultation Guidelines .......................................................................................... 12
2.1.2 Federal Acts ................................................................................................................................ 12
2.1.3 State Acts ................................................................................................................................... 12
2.2 SECTION SUMMARY ....................................................................................................................... 13

3.0 ENVIRONMENTAL BACKGROUND ............................................................................................. 14
3.1 CLIMATE ....................................................................................................................................... 14
3.2 GEOLOGICAL CONTEXT AND SOIL LANDSCAPES .................................................................... 14
3.3 HYDROLOGY ................................................................................................................................... 14
3.4 PLANT, ANIMAL AND LITHIC RESOURCES .................................................................................... 17
3.5 HISTORIC LAND USE ....................................................................................................................... 19
3.5.1 Historic Land Use ....................................................................................................................... 19
3.6 SECTION SUMMARY ....................................................................................................................... 24

4.0 REGIONAL ABORIGINAL HISTORY ............................................................................................... 25
4.1 ABORIGINAL GROUPS ....................................................................................................................... 25
4.2 SOCIAL STRUCTURE .......................................................................................................................... 26
4.3 PAST RESOURCE USE AND MATERIAL CULTURE ....................................................................... 26
4.3.1 Aboriginal People and the Archaeological Record ...................................................................... 26
4.3.2 Non-Lithic Material Culture ...................................................................................................... 27
4.3.3 Lithic Material Culture ............................................................................................................... 27
4.3.4 Hunting and Fire Use ............................................................................................................... 28
4.3.5 Plant Use ................................................................................................................................... 28
4.4 SECTION SUMMARY ....................................................................................................................... 29

5.0 ARCHAEOLOGICAL BACKGROUND ............................................................................................ 30
5.1 HERITAGE DATABASE SEARCH RESULTS ................................................................................... 30
5.1.1 Aboriginal Heritage Information Management System Search Results .................................. 30
5.1.2 Other Heritage Register Search Results .................................................................................... 30
5.2 THE CUMBERLAND PLAIN ARCHAEOLOGICAL CONTEXT ............................................................ 30
5.3 PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS IN THE REGION .............................................. 33
5.3.1 Introduction .................................................................................................................................. 33
5.3.2 WFER Findings ............................................................................................................................ 34
5.3.3 Pitt Town Local Environmental Study ....................................................................................... 34
5.3.4 Archaeological Background to the Project: Option 1 ................................................................ 35
5.3.5 Previous Archaeological Assessments in the Vicinity of Windsor ............................................ 37
5.3.6 Past Archaeological Assessments in the Vicinity of Pitt Town ..................................................... 40
5.3.7 Previously Recorded Sites/Areas of Potential Within a 200 m Buffer Around the Centre Line of the Proposed RTA Options. .................................................................................. 44
5.4 SECTION SUMMARY ....................................................................................................................... 45
6.0 PREDICTIVE MODELLING ................................................................................................................. 46
  6.1 DEGREE OF DISTURBANCE ............................................................................................................. 46
  6.2 PREDICTIVE MODEL ......................................................................................................................... 46
    6.2.1 Site Location ............................................................................................................................... 47
    6.2.2 Site Types ................................................................................................................................. 47
    6.2.3 Artefact Characteristics .............................................................................................................. 48
    6.2.4 Site Preservation ....................................................................................................................... 48
  6.3 SECTION SUMMARY ......................................................................................................................... 48
7.0 SITE VISIT AND OPTIONS ANALYSIS .......................................................................................... 50
  7.1 INTRODUCTION .............................................................................................................................. 50
  7.2 SITE VISIT ..................................................................................................................................... 50
  7.3 OPTIONS ANALYSIS CRITERIA ...................................................................................................... 50
  7.4 OPTIONS ANALYSIS ...................................................................................................................... 50
8.0 CONCLUSION ................................................................................................................................... 68
  8.1 DISCUSSION .................................................................................................................................. 68
  8.2 CONCLUSION ................................................................................................................................ 70
9.0 REFERENCES .................................................................................................................................. 71
APPENDIX A NNTT SEARCH RESULTS .............................................................................................. 74
APPENDIX B STAKEHOLDER RESPONSES ........................................................................................... 76
APPENDIX C DEVELOPMENT OPTIONS MAPS ..................................................................................... 77
APPENDIX D AHIMS SEARCH RESULTS .............................................................................................. 84
APPENDIX E CONSULTATION LOG ...................................................................................................... 94
INTRODUCTION

1.1 PROJECT DESCRIPTION

The NSW Roads and Traffic Authority (RTA) is proposing the construction of a new two lane traffic bridge across the Hawkesbury River at Windsor, NSW (Figures 1.1 and 1.2). This would replace the existing structure currently in use. Eight new potential development options are currently being considered.

Development impacts are expected to consist of:

- Construction of a new concrete bridge over the Hawkesbury River at Windsor;
- Realignment of approaches on both sides of the bridge;
- Relocation of utilities and services;
- Deep excavation, stockpiling and associated activities.

As part of the RTA’s Preliminary Environment Investigation (PEI) process Austral Archaeology was commissioned to prepare an Aboriginal cultural heritage baseline report (i.e. the current document). The purpose of this baseline report was to identify known and likely Aboriginal heritage and inform the PEI process of Aboriginal heritage constraints associated with each of the eight proposed development routes.

![Figure 1.1: Location of Windsor study area (circled in red). Base map source Geology.com © 2007.](image)

1.2 PROJECT BACKGROUND

Heritage Concepts (2008a) prepared a baseline Aboriginal assessment report for the replacement of the Hawkesbury River Bridge at Windsor. Prior to the progression of the project beyond the preliminary baseline reporting stage the RTA revised the number and extent of potential bridge design options. As a result additional baseline assessment inclusive of all eight potential development options was required necessitating the current document. Reference will be made to the earlier baseline report prepared by Heritage Concepts where potential development options coincide.
Figure 1.2: Location of existing bridge (outlined in red) in relation to the Town of Windsor. Base map source Google Earth © 2009.

1.3 REPORT LIMITATIONS

This baseline report details the results of desktop research and analysis coupled with a familiarisation site visit with the participation of the Local Aboriginal Land Council and Native Title Claimant organisation. This report does not fulfill the requirements of full Aboriginal archaeological and cultural assessment, as one is not required at this stage of the project. Following the completion of the PEI and based on a number of factors inclusive of Aboriginal heritage, a most preferred option(s) is to be selected for full Aboriginal archaeological and cultural assessment.

1.4 DEVELOPMENT OPTIONS

All Options are shown in Figures 1.3 – 1.5 and each of the proposed eight options is described below (Figures 1.6 – 1.12):

Options 1 and 2

These options involve the construction of a new two lane bridge between 20m and 50m to the east of the existing Windsor Bridge. The approaches on the southern side would use an existing stretch of Bridge Street before veering north east to cross the river. The northern approaches will involve a considerably larger impact footprint with the construction of a roundabout proposed allowing vehicle traffic to rejoin Wilberforce and Freemans Reach Roads.

Option 3

The southern approaches of the proposed new two lane bridge will follow Bridge Street, deviating from its existing course to cross the river just west of the existing Windsor Bridge. The northern end of the proposed bridge will be located just west of the existing bridge before linking up, for the most part, with the existing Wilberforce and Freemans Reach Roads. A new roundabout is also proposed at the intersection of Wilberforce and Freemans Reach Roads.
Figure 1.3: All eight options being considered for the Windsor Bridge Upgrade. Source: generated by Austral Archaeology, using the 1:25 000 Scale Wilberforce 90301-N Topographic Map © Department of Lands 2006.
Figure 1.4: Close-up of Windsor township showing the seven options being considered for the Windsor Bridge Upgrade. Source: generated by Austral Archaeology, using the 1:25 000 Scale Wilberforce 90301-N Topographic Map © Department of Lands 2006.
Figure 1.5: Close-up of Pitt Town Bottoms showing the eighth option being considered for the Windsor Bridge Upgrade. Source: generated by Austral Archaeology, using the 1:25 000 Scale Wilberforce 90301-N Topographic Map © Department of Lands 2006.
Option 4

This option proposes use and alteration of Macquarie and Baker Streets within the township of Windsor intersecting George Street and The Terrace on the southern bank and the crossing of the Hawkesbury River with a new two lane bridge 70m west of the existing Windsor Bridge. Upon reaching the north bank a new roadway will turn to the north east where a proposed seven lane roundabout will link the existing Wilberforce and Freemans Reach Roads.
**Option 5**

Option 5 also utilises existing roads through the Windsor township. The proposed route follows Macquarie Street turning northwest onto Kable Street. Development of this option would require widening of Kable Street to accommodate the carriageway. The proposed option would cross The Terrace and span the Hawkesbury River some 240m west of the existing Windsor Bridge. A new road would be constructed on the northern bank running north east to a proposed seven lane roundabout at the intersection of Wilberforce and Freemans Reach Roads. From this point traffic would flow onto the existing carriageways afforded by these two roads.

---

**Figure 1.8:** Option 4. Base map source RTA © 2009.

**Figure 1.9:** Option 5. Base map source RTA © 2009.
Option 6
This option proposes that a new two lane bridge be constructed approximately 380m east of the existing Windsor Bridge. A new road is proposed leaving Windsor Road to join with Palmer Road some 310m to the east. Following Palmer Street the proposed route would pass Pitt and North and Old Bridge/George Streets to cross the Hawkesbury River. On the northern bank a new road would link with the existing Wilberforce Road through a new seven lane roundabout. Vehicle traffic would then flow onto Wilberforce Road as per normal.

![Figure 1.10: Option 6. Base map source RTA © 2009.](image)

Option 7
This option would require the widening of Windsor Road leading up and away from its intersection with North Street south east of the township of Windsor. The route would then follow North Street as far as Palmer Street before crossing the river and linking up with Wilberforce Road as reported for Option 6.

![Figure 1.11: Option 7. Base map source RTA © 2009.](image)

Option 8
The final option would entail utilising the existing Windsor, Pitt Town, Bathurst and Punt Roads to the east of Windsor. The southern approaches of a new two lane bridge would leave Punt Road crossing undeveloped land crossing the river approximately 640 m to the west of where Punt Road meets the water. On the northern bank another new road through
undeveloped land will wind approximately 1 km to the north to join with a seven lane roundabout directing vehicle traffic onto the existing King Road.

![Figure 1.12: Option 8. Base map source RTA © 2009.](image)

### 1.5 REPORT OBJECTIVES

The main objectives of the baseline assessment project as outlined in this report are to:

- Consult with the relevant Aboriginal stakeholders in accordance with Stage 2 of the RTA Procedure for Aboriginal Cultural Heritage Consultation and Investigation;
- Determine the RTA’s statutory and non-statutory heritage obligations in regards to Aboriginal archaeology;
- Document and map the search results of the appropriate heritage registers including a search of the Aboriginal Heritage Information Management System (AHIMS) database for known Aboriginal archaeological and cultural sites both within the study area and in its vicinity;
- Revise all available literature associated with the Aboriginal cultural heritage of the study area with the aim to address the known Aboriginal cultural heritage issues and constraints within each of the eight development options;
- Undertake a site visit, with representatives of the relevant Aboriginal stakeholder groups, to assess current conditions of the study area and identify any identifiable or potential Aboriginal heritage constraints within each of the eight development options.
- Develop an archaeological predictive model for the study area based on previous research, environmental data and historic land use and disturbance. This model aims to identify, with a degree of certainty, the likelihood of the study area to contain Aboriginal archaeological material;
- Produce recommendations that respond to the Aboriginal archaeological values of the study area identifying the type of further work that may be required. The aim of these recommendations is to inform the RTA’s PEI process in the selection of preferred development options for further, in-depth assessment.
1.6 ABORIGINAL STAKEHOLDER CONSULTATION

Aboriginal stakeholder consultation for this baseline report was conducted in accordance with protocols associated with Stage 2 of the RTA Procedure for Aboriginal Cultural Heritage Consultation and Investigation. These protocols called for consultation with the appropriate Local Aboriginal Land Council and Native Title Claimant/Holder only at this preliminary stage of the project. To this end the Deerubbin Local Aboriginal Land Council (DLALC) and Darug Tribal Aboriginal Corporation (DTAC) were approached and their participation and assistance in identifying Aboriginal cultural heritage values sought. Search results from the Native Title Tribunal identifying DTAC as Native Title Claimants in the area are attached as Appendix A.

All consultation with the Aboriginal stakeholders was undertaken with the knowledge and input of the RTA’s Aboriginal Culture and Heritage Advisor, Barry Gunther. A draft copy of this report has been provided to the Aboriginal stakeholders for comment and review. Each has been requested to provide a written submission which has been attached to the final draft of this report. Received submissions can be viewed in Appendix B.

1.7 PROJECT TEAM AND ACKNOWLEDGEMENTS

This project was overseen by Pamela Kottaras (NSW Manager, Austral Archaeology Pty Ltd) and Justin McCarthy (Managing Director, Austral Archaeology Pty Ltd). The baseline assessment was coordinated and written by Evan Raper (Senior Archaeologist) and Krissy Moore (Archaeologist). Elements of Chapter 3 of this report discussing local historical land use were reproduced from works, commissioned by Austral Archaeology, prepared by historian Nick Jackson. Pamela Kottaras reviewed the draft report.

Austral Archaeology would like to acknowledge the participation of the following people who have contributed to the preparation of this report:

Lyndall Thornhill   NSW Roads and Traffic Authority
Barry Gunther      NSW Roads and Traffic Authority
Phil Khan          Deerubbin Local Aboriginal Land Council (DLALC)
Sandra Lee         Darug Tribal Aboriginal Corporation (DTAC)

1.8 ABBREVIATIONS

AHD   Australian Height Datum
AHIP  Aboriginal Heritage Impact Permit
AHPI  Australian Heritage Places Inventory
Burra Charter, the ICOMOS Australia Burra Charter 1999
DA    Development Application
DECC  Department of Environment and Climate Change (also NSW DECC)
DECC Guidelines DECC Interim Community Consultation Guidelines 2005
DLALC Deerubbin Local Aboriginal Land Council
DoP   Department of Planning
DTAC  Darug Tribal Aboriginal Corporation
EIS   Environmental Impact Statement
EP&A Act Environmental Planning and Assessment Act 1979
EPBC Act Environmental Planning and Biodiversity Conservation Act 1979
GDA94  Geocentric Datum of Australia 1994
LGA   Local Government Area
LEP   Local Environmental Plan
REP   Regional Environmental Plan
NSW DECC NSW Department of Environment and Climate Change
PAD   Potential Archaeological Deposit
Part 3A Part 3A of the EP&A Act
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEI</td>
<td>Preliminary Environmental Investigation</td>
</tr>
<tr>
<td>REF</td>
<td>Review of Environmental Factors</td>
</tr>
<tr>
<td>RNE</td>
<td>Register of the National Estate</td>
</tr>
<tr>
<td>SHR</td>
<td>New South Wales Heritage Office State Heritage Register</td>
</tr>
<tr>
<td>S87</td>
<td>Section 87 of the NP&amp;W Act</td>
</tr>
<tr>
<td>S90</td>
<td>Section 90 of the NP&amp;W Act</td>
</tr>
<tr>
<td>S91</td>
<td>Section 91 of the NP&amp;W Act</td>
</tr>
</tbody>
</table>
2.0 LEGISLATIVE FRAMEWORK

2.1 ABORIGINAL HERITAGE LEGISLATIVE FRAMEWORK

Aboriginal archaeological and cultural heritage assessments in NSW are carried out under the auspices of a range of state and Federal Acts and Guidelines. The Acts allow for the management and protection of Aboriginal places and objects, and the Guidelines set out best practice for community consultation in accordance with the requirements of the Acts.

2.1.1 Community Consultation Guidelines

The DECC Interim Community Consultation Guidelines 2005 (DECC Guidelines), published in December 2004 and brought into action on 1 January 2005, set out a code of practice regarding community consultation. They detail timeframes, procedures and processes regarding how to consult widely with the Aboriginal community and other interested stakeholder groups.

2.1.2 Federal Acts

Aboriginal cultural heritage in Australia is protected and managed under the following Federal Acts:

- The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), which places the protection of items listed on the National Heritage List and the Register of the National Estate (RNE) as a new matter of National Environmental Significance, and;
- The Aboriginal and Torres Strait Islander Heritage Protection Amendment Act 1987, which provides blanket protection for Aboriginal heritage in circumstances where such protection is not available at a State level. The Act may also override state and territory provisions.

Principles for assessment and conservation management are provided by the non-statutory ICOMOS Australia Burra Charter 1999 (the Burra Charter).

2.1.3 State Acts

In New South Wales, the following Acts also apply:

  - Part 6 (Approvals) of the Act lists the responsibilities and powers of the DECC as the administrator of the Act.
  - Section 87 (S87) of the Act requires the application for an Aboriginal Heritage Impact Permit (AHIP) should the Proponent seek to disturb, move, and/or take possession of an Aboriginal object or disturb land for the purpose of discovering an Aboriginal object, as would occur during a programme of Aboriginal archaeological test excavation.
  - Section 90 (S90) of the Act provides blanket protection to all Aboriginal objects and places, known and unknown, and requires an application for an AHIP should the Proponent seek to destroy, damage or deface an Aboriginal object or Aboriginal place, as would apply when no additional archaeological investigation beyond the initial assessment is deemed necessary, or where test excavation is considered to have sufficiently characterised a site, or where Aboriginal objects are to be moved (relocation).
  - Section 91 (S91) requires that any person who locates an Aboriginal object or place must notify the DECC within a reasonable time, as the DECC also administers previously unknown or unrecorded objects and places as part of its Part 6 (Approvals) role.
• The *Environmental Planning and Assessment Act 1979* (EP&A Act).
  
  o The Act requires that impacts upon the environment and cultural heritage be considered prior to development approval being granted.
  
  o Local Environmental Plans (LEPs) prepared in accordance with the Act provide guidance on the level of environmental assessment required. They determine the manner in which consent authorities may approve development applications by ensuring that consideration of potential impacts on the environment, inclusive of Aboriginal heritage, are addressed. This usually involves the preparation of a Review of Environmental Factors (REF) or an Environmental Impact Statement (EIS) including a full archaeological assessment.
  
  o Under *Part 3A* of the Act, in the case of a Development Application (DA) constituting a ‘Major Infrastructure’ under the Act, the Proponent would not require the usual consents as per S87 and S90 of the NP&W Act. The Planning Minister is under no obligation to accept the DECC’s advice however an Aboriginal archaeological and cultural assessment would still be required and appropriate levels of stakeholder consultation undertaken as per the *Part 3A Guidelines*.

2.2 SECTION SUMMARY

Aboriginal Places and Objects, both known and unknown, are protected in New South Wales by State and Federal legislation. The aim of the present baseline assessment is to determine whether Aboriginal archaeological objects or cultural heritage values are to be impacted by the proposed development options. Should this be the case then Aboriginal stakeholder consultation is to be undertaken under the *DECC Guidelines* under Part 6 of the NP&W Act in respects to the identification of Aboriginal stakeholders. As the work is not classified as a Major Infrastructure, the *Part 3A Guidelines* are inapplicable.

Searches of the Australian Heritage Places Inventory (AHPI), the Register of the National Estate (RNE), the National Heritage List and the NSW Heritage Office State Heritage Register (SHR) websites did not identify any recorded Aboriginal objects or places in or around the study area, and therefore the EPBC Act does not apply. All works fall under the protection of the *Aboriginal and Torres Strait Islander Heritage Protection Amendment Act 1987*.

At the state level, the works are to be undertaken under the NP&W Act and the EP&A Act. The relevant sections of the NP&W Act are Section 87, Section 90 and Section 91.

The Hawkesbury LEP 1989, produced in accordance with the EP&A Act, makes provision for the protection of Aboriginal heritage, archaeological sites and potential archaeological sites. A single reference to Aboriginal heritage is listed in the Hawkesbury LEP’s Heritage items:

- ‘*Monument to Aborigines in the public recreational reserve off Holmes Drive*’ in Sackville.

Holmes Drive, Sackville lies some 16 km to the north east of Windsor, is outside the RTA’s proposed development area and is not to be impacted.

No other places or objects are recorded.
3.0 ENVIRONMENTAL BACKGROUND

3.1 CLIMATE

Windsor has a temperate climate. Based on summary statistics from the Richmond RAAF climate monitoring station, approximately 4 km west of Windsor Bridge, the mean maximum temperatures for January and June are 30°C and 18°C respectively, with minimum temperatures of 17.4°C and 4.8°C. Mean rainfall for these two months is 73.9 mm and 49.4 mm (Bureau of Meteorology 2009).

3.2 GEOLOGICAL CONTEXT AND SOIL LANDSCAPES

Geologically, the area is situated on the Cumberland Lowlands, on the banks of the Hawkesbury section of the Hawkesbury-Nepean River. The Cumberland Lowlands consist of low-lying, gently undulating plains and low hills on Wianamatta Group shales and sandstones (Bannerman & Hazelton 1990: 2). Quaternary alluvium occurs along the major watercourses, such as the Hawkesbury, though the nature of the alluvium varies considerably depending on the source material and distance transported (Bannerman & Hazelton 1990: 3).

The study area passes over or very near to five soil landscapes: Berkshire Park (bp), Freemans Reach (fr), Bakers Lagoon (ba), Agnes Banks (ab), and Woodlands (wl), as shown in Figure 3.1 on the following page. Their erosion characteristics and soil profiles have been described in detail in Table 3.1.

In general, the study area is characterised by flat terraces, drainage channels, levees and backwater swamps on the active floodplain, with local relief of <10 m, and up to 20 m. Gentle rises overlooking the Hawkesbury River are also visible on topographic maps of the area. On the Berkshire Park and Woodlands soil landscapes, erosion is confined to sand quarries and unpaved roads, however erosion and deposition are constant on stream banks, and scour or sheet and rill erosion is found on floodplains, as is alluvial deposition of varying depths after flooding.

3.3 HYDROLOGY

The Cumberland Lowlands are also characterised by a dense drainage net of predominantly north flowing channels (Bannerman & Hazelton 1990: 2). The study area is located within the Hawkesbury-Nepean catchment, and the major watercourse is the Hawkesbury stretch of the Hawkesbury-Nepean River. A number of significant creek systems run in towards the Hawkesbury within approximately 10 km² of Windsor Bridge: Bushells Lagoon and Bullsworth Creek to the north; to the east, Bardenarang Gully and Pitt Town Lagoon; to the southeast, McKenzies Creek and Killarney Chain of Ponds Creek; to the south, the confluence of South Creek and the Hawkesbury; to the southwest, Rickaby’s Creek; and to the west, Colley Creek and Bakers Lagoon.

Leslie & Douglas (AHMS 2005: 12) note that the 1 in 100 year flood level in the Pitt Town area, where Option 8 for the proposed development crosses the York Reach of the Hawkesbury River near Punt Road, is 17.3 m above AHD. The elevated southern terrace immediately to the east of Punt Road sits approximately 20 – 24 m ASL (Mitchell 2004); therefore the terrace would have formed a large temporary island during flood periods (AHMS 2005).

The hydrology and stream order analysis of the study area has been illustrated in Figure 3.2.
Figure 3.1: Soil landscapes within the present study area. Source: generated by Austral Archaeology from Soil Landscapes of the Penrith 1:100 000 sheet (Bannerman & Hazelton 1990), and Windsor Bridge upgrade options provided by the client © 2009. Map under layer generated by Austral Archaeology, using the 1:25 000 Scale Wilberforce 90301-N Topographic Map © Department of Lands 2006.
<table>
<thead>
<tr>
<th>Soil Landscape</th>
<th>Erosion</th>
<th>A Horizon</th>
<th>B Horizon</th>
<th>C Horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berkshire Park (bp), on the Tertiary terraces of the Hawkesbury Nepean River System:</td>
<td>• Existing erosion is confined to sand quarries and unsealed roads</td>
<td>Dark brown sandy loam (A)</td>
<td>Brown sandy clay with up to 20% ironstone nodules (B)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>• Sheet and rill erosion</td>
<td>• Brown to brownish black, or bright reddish brown</td>
<td>• Sandy or silty clay</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Some wind erosion</td>
<td>• Texture sometimes increases with depth</td>
<td>• Bright brown to dark brown</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brown apedal sandy clay loam (A)</td>
<td>Brown apedal sandy clay loam (B)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reddish brown to yellowish brown</td>
<td>• Silty loam or sandy clay loam</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>fine sandy clay loam</td>
<td>• Greyish brown to brown</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Brown massive sandy clay (B)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Bright brown to dull yellowish brown</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freemans Reach (fr), on alluvium derived from Narrabeen Group, Hawkesbury Sandstone and Wianamatta Group materials.</td>
<td>Stream banks:</td>
<td>Brownish black apedal sandy loam (A)</td>
<td>Brown apedal sandy clay loam (B)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>• Erosion and deposition occur constantly</td>
<td>• In some locations, found layered with other soil materials</td>
<td>• Silty loam or sandy clay loam</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Floodplains:</td>
<td>• Brown to brownish black</td>
<td>• Greyish brown to brown</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Scour or sheet and rill erosion</td>
<td>Reddish to yellowish brown apedal sand (A)</td>
<td>Brown massive sandy clay (B)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• May be covered by sediment to varying depths after floods recede</td>
<td>• Occurs as stratified bands up to 3.7m thick</td>
<td>• Bright brown to dull yellowish brown</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bakers Lagoon (ba), on peaty sediments of Quaternary age.</td>
<td>No erosion.</td>
<td>Peaty loam (A)</td>
<td>Brown mottled clay loam (B)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Dark brown apedal massive to silty loam</td>
<td>• Apedal massive brown clay loam to fine sandy clay loam</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Brownish black mottled plastic clay (B)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Apedal massive brownish black light to light medium clay with porous earthy fabric</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agnes Banks (ab), on quartz sands derived from sandstones of the upper Hawkesbury and Nepean catchment, being low parallel sand dunes deposited on a flat Tertiary terrace.</td>
<td>Low water erodibility as composed of a high percentage of coarse sands. Therefore the erosion hazard is low to very low for non concentrated flows, but very high for concentrated flows and wind erosion.</td>
<td>Brownish grey sand (A), moderately to slightly acid</td>
<td>&quot;Coffee rock&quot; pan, dark brown loamy sand (B)</td>
<td>Uniform pale yellow sand (B or C)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Brownish grey to greyish brown, lightening with depth</td>
<td>• Apedal massive dark brown indurated loamy sand</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Light grey sand (A2), slightly acid to neutral</td>
<td>faintly mottled greyish yellow sand (B)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Slowly porous sandy fabric</td>
<td>Uniform pale yellow sand (B or C)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woodlands (wl), on the Mittagong Foundation, which occurs stratigraphically between the Ashfield Shale and Hawkesbury Sandstone.</td>
<td>Generally low.</td>
<td>Loose dark sandy loamy clay</td>
<td>Pedal, yellowish brown clay</td>
<td>Pedal, yellowish brown clay</td>
</tr>
<tr>
<td></td>
<td>• Minor to moderate gully erosion on unpaved roads.</td>
<td>• Loose apedal single-grained loam; Often absent</td>
<td>• Subsoil (B and C horizons) on fine-grained sandstone</td>
<td>• Subsoil (B and C horizons) on fine-grained sandstone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loose brown light sandy clay (A1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Brown, dark reddish brown to brown</td>
<td>Earthy dull brown fine sandy loam (A2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.1: Soil Landscapes (collated from Bannerman & Hazelton 1990)
3.4 Plant, Animal and Lithic Resources

European land-use practices over the last 160 years have severely impacted on the native vegetation of the Cumberland Plain. When European settlers arrived over 200 years ago, the Plain was covered with iron and stringy barks, box, blue and other gums and thick grasslands (Benson & Howell 1990: 19). It should be noted that these woodlands were exploited and modified for thousands of years by Aboriginal people before the arrival of European settlers. Specific to the study area, yam beds along the banks of the Hawkesbury River were also an...
important food source (Kohen 1993 in JMCHM Pty Ltd 1998). The flatter topography of the Cumberland Plain would have provided a considerable range of resources for Aboriginal people.

Soil-landscape-specific vegetation types for the study area are described in Table 3.2.

<table>
<thead>
<tr>
<th>Soil Landscape</th>
<th>Characteristic upper storey vegetation</th>
<th>Characteristic lower storey vegetation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berkshire Park (bp)</td>
<td>Very little native vegetation remains:</td>
<td>Shrub understorey species are dominated by:</td>
</tr>
<tr>
<td></td>
<td>• Broad-leaved ironbank (<em>Eucalyptus fibrosa</em>)</td>
<td>• Fabaceae</td>
</tr>
<tr>
<td></td>
<td>• Narrow-leaved apple (<em>Angophora bakeri</em>)</td>
<td>• Papilionaceae</td>
</tr>
<tr>
<td></td>
<td>• Scribbly gum (<em>E. sclerophylla</em>)</td>
<td>• Sapindaceae</td>
</tr>
<tr>
<td></td>
<td>As a small tree layer:</td>
<td>• Proteaceae</td>
</tr>
<tr>
<td></td>
<td>• Paperbarks (<em>Melaleuca decora</em> and <em>M. nodosa</em>)</td>
<td>• Myrtaceae</td>
</tr>
<tr>
<td>Freemans Reach (fr)</td>
<td>Extensively cleared open-forest (dry sclerophyll):</td>
<td>In regrowth areas:</td>
</tr>
<tr>
<td></td>
<td>• Broad-leaved apple (<em>Angophora subvelutina</em>)</td>
<td>• Grass</td>
</tr>
<tr>
<td></td>
<td>• Cabbage gum (<em>E. amplifolia</em>)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Forest red gum (<em>E. tereticornis</em>)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Regrowth species:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Paperbarks (<em>Melaleuca spp.</em>)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• River oak (<em>Casuarina cunninghamiana</em>)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Wattles (<em>Acacia spp.</em>)</td>
<td></td>
</tr>
<tr>
<td>Bakers Lagoon (ba)</td>
<td>Very little of the native open sedgeland remains.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Remnant species in areas of frequent inundation include:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tall spike rush (<em>Eleocharis spacelata</em>)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Rushes (<em>Juncus</em> spp. and <em>Polygonum</em> spp.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tall shrubland is found in areas where inundation is rarer:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Paperbarks (<em>Melaleuca spp.</em>)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Swamp oak (<em>Casuarina glauca</em>)</td>
<td></td>
</tr>
<tr>
<td>Agnes Banks (ab)</td>
<td>Where vegetation has not been cleared for sand mining:</td>
<td>Dominant small tree species:</td>
</tr>
<tr>
<td></td>
<td>• Woodland or low woodland community</td>
<td>• Old man Banksia (<em>Banksia serrata</em>)</td>
</tr>
<tr>
<td></td>
<td>• Parramatta red gu. (<em>E. parramattensis</em>)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Scribbly gum (<em>E. sclerophylla</em>)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Narrow-leaved apple (<em>Angophora bakeri</em>)</td>
<td></td>
</tr>
<tr>
<td>Woodlands (wl)</td>
<td>Extensively to completely cleared low eucalypt open-forest and low eucalypt woodland:</td>
<td>Shrub understorey</td>
</tr>
<tr>
<td></td>
<td>• Turpentine (<em>Syncarpia glomulifera</em>)</td>
<td>• Sclerophyll</td>
</tr>
<tr>
<td></td>
<td>• Smooth-barked apple (<em>Angophora costata</em>)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <em>Acacia</em> spp.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Broad-leaved ironbark (<em>Eucalyptus genioides</em>)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Tea-tree (<em>Leptospermum</em> spp.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Paperbark (<em>Melaleuca spp.</em>)</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.2: Characteristic vegetation (collated from Bannerman & Hazelton 1990).

Kangaroos, wallabies, possums, wombats, koalas and echidnas, sugar and squirrel gliders, flying foxes as well as native rats and mice are known from the Cumberland Plain (Attenbrow 2002: 70). The mutton bird and brush turkey, other birds, and their eggs were also a food source (Attenbrow 2002: 74-76). Numerous amphibians and reptiles would have been found in the area. Frog species would have included a number of tree frogs (such as the eastern banjo, brown-striped, spotted grass, bleating, and broad-palmed tree frogs), as well as brown toadlets. Mullets and eels would have been a major resource found in the river systems along the Plain. Native bees would also have been present within the area providing honey and wax.

Rocks with particular flaking properties, such as silcrete, basalt, quartz, quartzite, tuff and chert were used for stone tool production, Attenbrow outlines that the main sources that these
dominant raw materials come from are usually gravel beds, palaeo-channels associated with the Nepean-Hawkesbury and precursor tributaries, and conglomerate pebbles in the Hawkesbury sandstone (Attenbrow 2002: 43). More specifically Kohen found that the Nepean riverbed gravels were considered the principal source of igneous rock (such as basalt) and siliceous rock (such as chert/tuff) and South and Eastern Creek the principal source of silcrete (Kohen 1988 cited in Attenbrow 2002: 50; Stockton et al. 1993: 23).

Silcrete was the most common raw material utilised by Aboriginal people for stone artefact production on the Cumberland Plain. Silcrete generally occurs as pebbles and cobbles, and infrequently as boulders. Attenbrow states that silcrete occurs in a formation called the St Mary’s Formations. This formation has been mapped in the South and Eastern Creek systems (Attenbrow 2002: 44), directly to the south of the study area. Silcrete sources within the general vicinity of Eastern Creek, to the southeast, include Plumpton Ridge (AMBS 2005) and also St Mary’s, Blacktown, Riverstone and Marsden Park, as well as the Rickaby’s Creek gravel formations directly to the southwest, and the Cranebrook Formation outcrops (DSCA 2003a, b).

3.5 HISTORIC LAND USE

The current Windsor Bridge upgrade study area is located near a number of Macquarie’s “Five Towns”. The historical outline of the development of these towns has been described in more detail in the historical baseline assessment that is being prepared for this project (Austral Archaeology in draft – a). What follows is a summary of historic land use as a guide to land disturbance and potential impacts on the Aboriginal archaeological record in the study area.

3.5.1 Historic Land Use

Four major land surface disruption types can be observed in reading the history of European settlement in the study area: clearing for residential and agricultural use; construction of infrastructure and industry; mining; and flooding. Of these, flooding of course is not unique to the period of European settlement; however historical records allow an understanding of the height and extent of flood damage which can be projected into prehistory.

The earliest land clearance around Windsor involved agriculture; in 1793 – 1794, two clusters of allotments for a farming community were settled on the stretch of the Hawkesbury River between South Creek and Canning Reach. The settlers cleared the land, built huts, and prepared the ground for planting using hoes. In 1804, grazing commons were established at Pitt Town, Richmond and Wilberforce. Dairy farms at Windsor, Wilberforce, Pitt Town and McGraths Hill were established by the Late 19th century. In 1806, Governor Bligh established his Model Farm, known as Blighton, south of Canning Reach in Pitt Town alongside Bathurst and Punt Road in the study area (Figure 3.3).
From 1806 – 1807 a number of residences, outbuildings and fences were constructed over the 270 acres of Blighton. This included the planting of English oaks in 1807, five of which survived in 1939 but were removed in 1947. By 1828, 32,000 acres were cleared and more than half of this area was under cultivation. By the late 19\textsuperscript{th} to early 20\textsuperscript{th} century, the Hawkesbury had shifted from a focus on producing grain to becoming a source of fruit and vegetables, particularly citrus.

The Pitt Town portion of the study area, to the north of Hall Street, changed from a pastoral enterprise to orcharding in the 1930s. The flood of 1956 destroyed many orchard properties; however the orchards located on higher ground sand deposits at Pitt Town were in use until the 1980s when they were opened for sand mining. The area has since been used for market gardening. Turf farming was introduced into the Hawkesbury lowlands in the 1970s and continues as a major primary industry in the area due to its ability to cope with flooding.

The study area retains a fairly rural atmosphere today, with buildings in Pitt town, Windsor, Richmond, Wilberforce and Castlereagh clustered into approximately the same areas as outlined by Macquarie for his Town Reserves in 1810/1811. These Town Reserves were all established at least 16 m above the floodplain, on the ridge closest to the lowland farming communities, with reserves provided for a school, church, burial ground and town square. Subsequent development has also spread out from these original reserves. Windsor remains on its original location (please see the accompanying historical report for a description of the phases of development), and extends to the north from Arndell Street to South Creek from 1842, and to the south towards Bligh Park in the 1980s. As for Pitt Town, new development not located within the original 60 acre grant has generally been sited to the south along Bathurst Street and Wellesley Street, probably starting from the early 1820s. A limited amount of subdivision occurred along Hall Street but did not appear to be taken up by many.

Infrastructure was necessary to transport agricultural products and other industrial products from the study area throughout the colony, and was established early. Old Windsor Road, originally a track called Hawkesbury road, was marked out and completed from 1792 to 1794; it was upgraded to a width of six feet in 1797 and to 32 feet in 1813. By 1807, a wharf had been constructed at Windsor; another wharf at Windsor was under construction but destroyed by floods in 1816. King's Wharf was built in 1820, close to the location of the present-day Windsor Bridge (also known as Hawkesbury River Bridge), which was completed in 1874 (and repaired in 1922). The railway line to Windsor was officially opened in 1864.

The construction and maintenance of this bridge, as well as the wharfs and access roads, has involved several earth cutting works along the southern bank of the Hawkesbury River in the vicinity of Thompso Square – these works have significantly altered the original landscape (Heritage Concepts 2008b). Note the depth of erosion on the river bank (Figures 3.4 – 3.8).
Figure 3.5: Windsor Bridge and the western bank of the Hawkesbury River, not dated. Source: State Library of NSW (Work and Play – 04404)

Figure 3.6: The Pitt Town Ferry, Hawkesbury River, not dated (attributed Kerry & Co. postcard of 1932). Source: State Library NSW (Government Printing Office Disk 1 – 07462)
In addition to agricultural and pastoral industries, a number of factories were constructed in the vicinity of the study area. A three-storey brick brewery was by John Odell and Thomas Cadell. Cadell’s brewery was completed in 1844 within a site bounded by The Terrace, Fitzgerald and Kable Streets that lays in direct proximity to the current study area (Option 5). Another brewery operated on the west bank of South Creek to the north of the bridge crossing from 1806, another on The Terrace in 1844; a tanning industry was established at West Hill Farm between south Creek and McGraths Hill in 1808; the first steam driven mill for grinding
flour was erected at Wilberforce in 1835; the Noon Cordial Factory was built at the corner of Kable and Macquarie Streets in 1910; and milk and butter factories were established at Windsor and Pitt Town, at the same time as the dairy farms, from the early 1890s.

Floods have been regularly recorded since the initial European settlement of the study area. In addition to influencing the use of the area by past Aboriginal people, and the preservation and distribution of any archaeological traces, these floods influenced European land use. As mentioned above, the Town Reserves established by Macquarie were located above the then-known highest flood extent; more recently, flooding has prompted agriculturalists to move away from the area, change to turf farming, or convert their properties to non-agricultural uses. Flood events have impacted on the integrity of river bank deposits, particularly through the creation of erosion scours (Heritage Concepts 2008b). The northern bank of the river has undergone significantly less historical land use, however bank deposits would have been altered by flood events over time (Heritage Concepts 2008b: Figure 3.5 – 3.7).

Therefore, past land disturbances resulting from European land use, flooding, and the European response to flooding, can be summarised as follows:

- the fertile lowlands would likely have been impacted by clearing, ploughing and agriculture, as well as repeated flood scour, inundation and sediment deposition;
- on the south bank of the Hawkesbury River, higher ground on terraces overlooking the river has been preferentially selected for construction of houses, public buildings and industrial buildings, with the exception of noxious trades such as tanning which were located on the river, away from townships;
- the limited amount of higher ground on the south bank has resulted in townships staying on their original locations, and extending away from these areas;
- the need to regularly repair and replace the wharf and bridge over the Hawkesbury River at Windsor has resulted in repeated cuttings into the banks on either side, further disturbing the bank deposits in these areas;
- repeated flooding has also impacted on the integrity of river bank deposits, through erosion and redeposition of sediment;
- the land on the north bank of the Hawkesbury River, including the Wilberforce area, has undergone less disturbance from building, but has still been cleared and used for agriculture and grazing.
3.6 SECTION SUMMARY

The study area is located in a resource-rich area. It is surrounded by the confluences of a number of major stream systems, including Rickabys Creek, the Killarney Chain of Ponds and South Creek, as well as being intersected by the Hawkesbury stretch of the Hawkesbury-Nepean River. Portions of the landscape have been described as active floodplain, which has unavoidable consequences for any archaeological remains, but gentle rises overlooking water are also present. The Cumberland Plain offered a range of plant and animal resources, and significant sources of raw stone such as the Rickabys Creek gravels and possibly Nepean River gravel deposits further south, are present in the immediate vicinity. Therefore, based on the environmental background alone, it is considered likely that Aboriginal people made use of the area, and further, that archaeological traces of these activities may remain. This likelihood must however be considered in light of the Aboriginal history of the area and the impact of historic land use activities. The Aboriginal history of the area is discussed in the following section, and used to inform the predictive statement thereafter.
4.0 REGIONAL ABORIGINAL HISTORY

4.1 ABORIGINAL GROUPS

The linguistic and social links between pre-contact populations and present Aboriginal groups are obscured by gaps in written and oral histories. Although Aboriginal occupation of the Sydney region extends back to at least 20,000 years, the numbers and precise affiliations of Aboriginal groups in the area prior to European arrival are difficult to estimate as Aboriginal groups avoided the early settlers and lived highly mobile lives. It is also important to note that Aboriginal populations were devastated by newly introduced European diseases such as influenza and smallpox.

However, several distinct Aboriginal groups were recorded as occupying the Sydney region when the First Fleet arrived in 1788. The estimated Aboriginal population of the Sydney region at contact, including the Hawkesbury River and lower Blue Mountains, where occupation was focussed, was between 4,000 and 8,000 individuals, whilst the western Cumberland Plain supported five to eight clans, each with approximately fifty people (Kohen 1986). Boundaries between these groups were very blurred and difficult to record, but geological or natural landscape features usually defined boundaries.

The traditional Aboriginal people of the present study area spoke a Darug language dialect at contact (Attenbrow 2002: 34). Specifically, the study area is located within the Darug (Hinterland) language zone as described by Attenbrow (2002: 23). They are part of a broad language group that originally extended from the eastern suburbs of Sydney, to La Perouse in the south, Bathurst in the west and the Hawkesbury River in the north (Eades 1976 in AHMS 2005).

Figure 4.1: Pre European language groups in the Sydney Basin. Approximate location of study area is indicated by the red circle (Reproduced from Attenbrow 2002: 23).

In historical references the Aboriginal people of the region increasingly became known to the British colonists associated with the nearest town or place name. Hence the Aboriginal people in the region became known as ‘the Windsor tribe’ (Attenbrow 2003: 30).

Accounts of early European explorers and settlers provide information on contact-era Aboriginal lifestyle and historic figures. There is no record of the Aboriginal name of the “Windsor Tribe” listed on the 1828 census and blanket returns (Kohen 1993 in JMCHM Pty
though Captain-Lieutenant Watkin Tench recorded meeting members of the neighbouring Boorooborangal tribe, whose territory was given to be in Richmond, when being guided by Cadigal man Colebee along the Hawkesbury River, during which time he passed directly through the study area (AHMS 2005).

On the return journey, the explorers met Gombereee, with whom they exchanged two hatchets and some bread for two spears and two stone hatchets. After crossing Bardenarang Creek, Tench’s party was rejoined by Gombereee, and two others: Ye-lo-mun-dee (probably Yarramundi) and Dee-im-ba (or Jim-bah). Tench’s observations state that the members of these different Darug groups found their languages mutually intelligible, but may have warred against each other at times (Tench in Fitzhardinge 1979: 230). A memorial to this meeting has been erected on Pitt Town Bottoms Road, which joins the RTA’s Option 8 in the study area at Punt Road, Pitt Town.

This description places Phillip’s meeting with local Aboriginal people in the vicinity of the present study area.

4.2 SOCIAL STRUCTURE

Darug groups were thought to have lived in bands or communities of around 50 members each, and were highly mobile. Each band retained its own hunting district, and each lived a semi-nomadic lifestyle, regularly changing location within their district (Murray & White 1988). Typical dwellings were two-sided bark tents, known as gunyahs throughout NSW, while sandstone rock shelters were used in harsher weather conditions.

Day to day activities underlined a clear sexual delineation within groups. For example, men of the communities were responsible for hunting possum, fish, birds and kangaroo, often collaborating with other bands to hunt and eat the larger animals; while women harvested yams with digging sticks and hunted smaller animals. Foods were gathered from the land and the rivers provided a rich variety of resources to the local community. Food was cooked lightly on open fires or in ovens beneath the ground.

Bands or communities were slightly stratified, with elders in the groups retaining influence and decision making capacities. In the early colonial period the British colonists referred to the individuals with whom they principally communicated and negotiated as chiefs. These people however may not have been elders of the language group nor held any authority (Attenbrow 2002: 61).

The religion and culture of the local groups took the form of a deeply spiritual association with the land and the natural environment. This was evident in singing, dancing and stories describing the formation of the landscape as well as the many engravings on the flat sandstone outcrops of the Sydney Basin (Veale 2001).

4.3 PAST RESOURCE USE AND MATERIAL CULTURE

4.3.1 Aboriginal People and the Archaeological Record

Chapter 3 has shown that the immediate vicinity of the study area contained a wide range of resources for use by Aboriginal people. This is supported by a range of historic and ethnographic accounts from explorers and early settlers in the Sydney region, near the present study area, as summarised by Attenbrow (2002).

These early European observations suggest that Aboriginal people used tool kits largely of organic materials such as wood, bark, palm leaves, shell and bone. The use of stone does not figure prominently in many of these early descriptions. However, this is more likely to reflect the biases of these early observers, rather than the actual material culture of Aboriginal people. Hiscock has recently argued that even very early historical accounts may not be a suitable basis for analogy: as Aboriginal groups in the historic period had to change their economic, cultural and political practices in order to cope with the social impacts of disease after the arrival of Europeans, he argues that it is likely that similar drastic changes happened in the past in response to “altered cultural and environmental circumstances” (Hiscock 2008: 17).

Attempting a reconstruction of pre-contact Aboriginal life based on purely economic factors such as resource availability is also not without limitations. For example, Lourandos (1980b in McNiven et. al. 2006: 11), highlights the limitations of direct analogy based solely on
perceived economic imperatives: demographic change, with associated changes in subsistence methods and ecological relations, could have been undertaken for social reasons unrelated to environmental or economic pressures. McNiven et al (2006: 9-11) use the example of historic Aboriginal groups increasing the food yield of their environment to support large occasional gatherings as opposed to permanent maximum population density. An example of this would be the corroborees and large gatherings for ritual fights or contests such as were recorded some 30 km southeast of the study area, in Parramatta in 1804 (Attenbrow 2002: 137).

With an awareness of the limitations of analogy in mind, investigation of the resources available in an area can be a starting point for discussion of past material culture. The flatter topography of the Cumberland Plain would have provided a different range of resources for Aboriginal people than the coastline.

4.3.2 Non-Lithic Material Culture

The material culture of the Aboriginal people of the Sydney Basin at the time of European contact was diverse. Spear shafts were usually made of a grasstree spike with a hardwood point. Stone, bone, shell or wood was sometimes used as the barb (Turbet 2001: 40). Thin, straight spear-throwers were made from wattle (Turbet 2001: 40). Fishing spears were usually tipped with four hardwood prongs with bone points (Attenbrow 2002: 117, 119; Turbet 2001: 42). Fish were also caught by means of fish hooks made of shell or bird talon (Attenbrow 2002: 117; Turbet 2001: 45).

Bark of various types was used for making such diverse items such as wrappings for newborn babies, shelters, canoes, paddles, shields and torches (Attenbrow 2002; Table 10.1). Resin from the grasstree was used as an adhesive for tool and weapon making (Attenbrow 2002: 116; Turbet 2001: 36). Various kinds of boomerangs and clubs were made from hardwoods, as were such items as digging sticks (Turbet 2001: 37-39, 45; Attenbrow 2002: 112).

4.3.3 Lithic Material Culture

Stone was commonly used for tools and, apart from discarded shell in coastal middens, is the most common material found in archaeological sites of the Sydney region. Stone or stone tools were used for axe heads, spear barbs and as woodworking tools, amongst other things.

Aboriginal people also made good use of local stone raw materials sourced from the known quarries on the Cumberland Plain and from the Hawkesbury-Nepean River gravels. Knowledge of source locations for raw materials such as silcrete, basalt, quartz, tuff and chert is of great importance in determining movements, trade and exchange patterns of the people who inhabited the area (Attenbrow 2002). The majority of the raw stone materials listed above would have been readily available as river pebbles from the Hawkesbury gravel beds, very close to the study area.

There is evidence, in the form of stone artefacts and axes from inland sources (possibly the Nepean River gravels) for trade between the inland Daruk or Darug people with the coastal Guringai (Ross 1976, 1988 in Smith 1990: 20). Early European observers noted that Darug speaking people travelled to the coast for trade and ceremonial purposes (Morris 1978 & Ross 1976: 72-73 in Smith 1990: 20).

Another use of mineral resources is seen in rock art and body decoration, where ochre pigments were used. No sources of ochre are known in the immediate vicinity of the study area.

The knapping of stone artefacts can indicate one of two things: the knapping of stone to create tools or the discard of these tools once they have been used, and sometimes both. The knapping of stone creates a large amount of stone debris in very little time. Large knapping events tend to occur in proximity to sources of permanent water. This is probably because the availability and resources made these good places to camp for short periods of time. Small scale knapping events can occur anywhere in the landscape and are associated with the manufacture or maintenance of stone tools as a direct result of a specific need.

Archaeological investigation has resulted in the recognition of changes in the types of stone tools used by Aboriginal people in the Sydney region through time. A sequence of changes in stone tool types in eastern NSW was identified by archaeologist F.D. McCarthy who named it the Eastern Regional Sequence (McCarthy 1976: 96-98). McCarthy identified Capertian,
Bondaian and Eloueran phases of the sequence which together appear to span the last 15,000 years in the Sydney region.

McCarthy’s sequence was argued for some time with Stockton & Holland (1974: 53-56) modifying his theory by proposing four phases of the Eastern Regional Sequence. After Capertian, they described the Early Bondaian and Middle Bondaian phases where Bondi points and other small tools become apparent in assemblages in Eastern NSW. Late Bondaian referred to McCarthy’s Eloueran phase. Stockton and Holland’s terms are used in the Sydney region today (Attenbrow 2002: 156). Broadly speaking, Capertian assemblages contain tools which are generally larger in size than later assemblages but also contain smaller tools, such as thumbnail scrapers and dentated saws.

In the late Holocene (from approximately 5,000 years ago) backed artefacts such as Bondi points, Elouera and geometric microliths appear in archaeological assemblages in the Sydney region, and these tools are characteristically much smaller than those of earlier phases. McCarthy (1976) used these formal tools to define this period as Bondaian with Stockton and Holland (1974: 53-56) referring to this period as the Early Bondaian and Middle Bondaian phases. Edge ground implements appear in region assemblages for the first time at about 4,500 to 4,000 years ago.

From about 1,600 years ago Bondi points and geometric microliths began to drop out of use in the coastal parts of the Sydney region, although the Elouera continued to be used. This is known as the Late Bondaian phase. On the Cumberland Plain, however, dated archaeological sites suggest that all of these backed artefact types continued to be used "until at least 650-500 years ago, although probably not as late as the time of British colonisation" (Attenbrow 2002: 156). In coastal areas, and possibly through the Sydney Basin, both the use of quartz and the use of the bipolar flaking technique increased through time, although this tendency is less marked on the western Cumberland Plain (Corkill 1999: 135; Attenbrow 2002: 153-159).

4.3.4 Hunting and Fire Use

An intangible but presumably vital component of material culture and past land management, according to ethnographic accounts, was the use of fire. Regular burning promoted the growth and flowering of tuberous plants, such as orchids and lilies, which were abundant on the Cumberland Plain. It is likely that these would have been frequently burnt by Aboriginal people as part of a land management strategy to manipulate plant populations (Benson & Howell 1990: 14). The burning of grass by Aboriginal people, though considered a “curiosity” by European observers, was observed near the Hawkesbury prior to the 1930s (Rosen 1995: 58 in JMCHM Pty Ltd 1998: 12).

Fire appears to have been used as an aid to hunting (Benson & Howell 1990). White (1790, cited in Benson & Redpath 1997) reports that fire was used to smoke out game from trees. Even in open paddocks 50 or 60 men would form a large circle, set fire to the grass, and spear animals as they tried to escape. Kohen suggests that kangaroos formed a relatively minor component of the food intake. This hunting technique was known as walbunga, literally meant ‘wallaby dead’ (1993).

A range of land mammals were hunted for food, including kangaroos, possums, wombats and echidnas as well as native rats and mice (Attenbrow 2002: 70). Birds, such as the mutton bird and brush turkey, were eaten and it is recorded that eggs were a favourite food (Attenbrow 2002: 75-76). In addition to being a mainstay of the diet in historic times, smaller mammals, reptiles and birds may have also provided skins and sinew for apparel, and bone, teeth and feathers for tools and ornaments.

4.3.5 Plant Use

Attenbrow has noted that Sydney vegetation communities include over 200 species that have edible parts, such as seeds, fruits, tubers/roots/rhizomes, leaves, flowers and nectar (Attenbrow 2002: 76). Observations from the earliest European settlers describe Aboriginal people in the Sydney region roasting fern-roots, eating small fruits the size of a cherry as well as a type of nut and the root of a species of the orchid amongst other types of plant food. As Attenbrow points out, however, the settlers’ lack of knowledge of the local plant species make identification of the various plants used difficult (Attenbrow 2002: 76-79).
4.4 Section Summary

The pre-European context of the Cumberland Plain is one of small bands of Aboriginal people living a mobile hunting and gathering lifestyle. Population estimations at the time of contact were difficult due to affects of disease on population numbers. The social structure of pre-European groups was slightly stratified with elders of clans holding decision-making capabilities. Subsistence activities were sexually delineated and the spirituality of groups was detailed and explained through oral traditions.

Material culture, such as tools, was made of a variety of materials such as bark, resin, shell, bone and reeds. Hard stone raw material that was made into stone tools is the main element of this tool kit to remain in the archaeological record.

The Cumberland Plain pre-European environment provided an extensive resource base associated with the multitude of water sources. These water sources are major freshwater rivers (The Hawkesbury River) and freshwater sources (e.g. South Creek further). Habitats associated with these water systems would have supported a wide range of fish, birds and mammals, as well over 200 edible plants, all of which would have contributed to a varied diet and would have been in abundant supply.

The pre-European Cumberland Plain landscape would have been the setting for a variety of human activity. This activity would have included camping, hunting, gathering, cooking, ceremonies, and other cultural activities associated with semi-permanent settlement sites in the region.

Although the language and tribal affiliations of prehistoric Aboriginal groups in the study area cannot be determined, the Aboriginal group known from this region from the time of contact until the 1830s is the Darug-speaking Windsor Tribe. The Boorooberongal tribe were based in nearby Richmond. The meeting between Gombere, Yarramuni and Dee-im-ba of the Boorooberongal and Captain-Lieutenant Watkin Tench, the Cadigal man Colebee, and the rest of the exploration party, is marked by a memorial on Pitt Town Bottoms Road, in the vicinity of study area Option 8.