

Appendix D Cultural Heritage Assessment

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**Darling Anabranh Project
Additional In-stream Infrastructure**

Cultural heritage investigation



**Report to the New South Wales
Department of Environment and Climate Change**

January 2008

Landscape

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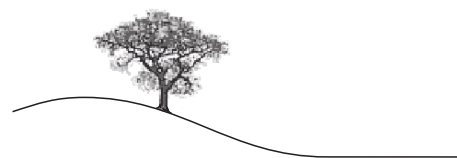
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**Darling Anabranch Project
Additional In-stream Infrastructure**

Cultural heritage investigation

**Report to the New South Wales
Department of Environment and Climate Change
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Landscape

Natural and Cultural Heritage Management

a division of M.L. Copper Pty Ltd

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Executive summary

The New South Wales Department of Environment and Climate Change (NSW DECC) proposes to remove blockbank dams, regulators and other structures along the Darling Anabranh stream course. Low- and high-level crossings would be installed in new locations and to replace some existing in-stream infrastructure. Low-level crossings would consist of rock fords or causeways and high-level crossings would involve construction of box-culverts or modular bridges. Outcomes of the proposed works include returning less regulated flows to the Darling Anabranh to halt and reverse environmental damage caused by damming.

An Environmental Impact Statement (EIS) was prepared for the Darling Anabranh Project in 2004 (Earth Tech 2004). This included a cultural heritage assessment of 17 blockbank work areas (Cupper 2004a). Additional works have subsequently been proposed for in-stream infrastructure. In order to assess the potential impact on cultural heritage places, items and values resulting from the proposed works, Landskape was engaged by NSW DECC to conduct a cultural heritage investigation of an additional 34 proposed work areas.

The key objectives of the cultural heritage study were to:

- conduct a desktop assessment to delineate areas of known and predicted Aboriginal and historical cultural heritage within the proposed work areas;
- undertake a stratified reconnaissance archaeological survey of known and predicted cultural heritage sites identified in the desktop assessment with representatives of the local Aboriginal community;
- record any cultural heritage sites identified within the proposed work areas and assess their significance;
- determine the potential impacts of the proposed developments on cultural heritage sites; and,
- devise options in consultation with the community for mitigating potential impacts of the proposed developments on cultural heritage sites.

One Aboriginal archaeological site has been previously recorded within one of the proposed work areas. This is a stone artefact scatter and hearth site complex located at Patagorah main dam.

This assessment identified an additional 18 Aboriginal archaeological sites within or near the proposed work areas. Of the sites, twelve were scatters of stone artefacts with

associated hearths. Two of these sites contained freshwater mussel shell middens and one also included a tree possibly modified by Aborigines. There were also three isolated trees possibly modified by Aborigines, two freshwater mussel shell middens and a hearth.

Based on the results of this cultural heritage investigation and consultation with representatives of the Barkindji Aboriginal communities of the Dareton-Wentworth and Menindee regions it is recommended that:

- removal of the existing in-stream structures is allowed to proceed. Aboriginal representatives of the Barkindji Elders should be engaged as site monitors during the construction phase of the project to ensure that archaeological resources are not impacted by the works. At least one Aboriginal representative should be on site when construction activities involving earthworks are occurring in the vicinity of known cultural heritage places or items.
- cultural heritage sites near the proposed developments are considered susceptible to direct or indirect impacts from the proposed developments. In these cases, disturbance should be avoided, possibly by erecting temporary barrier fences around the sites during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barriers. Access to the work areas should be from those sides of the Darling Anabranch not near cultural heritage sites. Vehicles should adhere to existing access tracks. Parking and lay-down areas and storage compounds should similarly not be located near cultural heritage sites.
- where cultural heritage sites are within the zones of anticipated direct impact from the proposed infrastructure, the design of works should be modified to remove the threat of disturbing archaeological resources. Alternatively, if engineering constraints dictate that disturbance to cultural heritage is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a *NSW National Parks and Wildlife Act 1974* Section 87 Permit.
- the proponent should apply for a *NSW National Parks and Wildlife Act 1974* Section 87 Permit to potentially move any isolated midden shell, hearthstones/heat retainers or stone artefacts that may occur within the proposed work areas to nearby locations outside the zones of disturbance.

- the following specific management strategies be implemented during removal of the in-stream structures and installation of the low- or high-level crossings:
 - care be taken to avoid disturbance to Aboriginal archaeological sites DA166—171, DA177 and DECC Site Number 39-2-0069 identified within the disturbance zones of the currently proposed work areas at Nindethana dam, Patagorah main dam, Patagorah main dam by-wash, Patagorah main dam alternative causeway, Bells Camp middle blockbank and Bells Camp main dam alternative causeway by modifying the design of works.
 - this should involve only removing those sections of the in-stream structures at Patagorah main dam, Patagorah main dam by-wash, Nindethana dam and Bells Camp middle blockbank that are not near any cultural heritage places or items.
 - low-level crossings at Patagorah main dam alternative causeway and Bells Camp main dam alternative causeway should not be installed near any cultural heritage places or items.
 - similar care be taken to avoid disturbance to Aboriginal archaeological sites DA161—165, DA173—176, DA178—179 and DECC Site Numbers 39-2-0100, 39-2-0102, 39-5-0059 and 39-5-0072 located near the proposed work areas at Willotia Crossing dam, Warwicks Crossing, Warwicks Crossing by-wash, Bonds Windmill dam, Cuthero dam, Moola pipeline crossing, Bingo main dam alternative causeway, Tara Downs main dam, Tara Downs middle by-wash, Watara by-wash (west) and Watara by-wash (east).
- the proponent continues to consult with the Barkindji Elders Committee, the Menindee Barkindji Elders Council and other relevant local Aboriginal community members in matters pertaining to the project;
- the proponent develops a Cultural Heritage Management Protocol prior to the commencement of construction, which documents the procedures to be followed for impact avoidance or mitigation. Personnel involved in the construction and management phases of the project should be trained in procedures to recognise and avoid disturbance to cultural heritage places and items.
- if any previously unidentified Aboriginal or historical cultural heritage places or items that are not isolated midden shell, hearthstones/heat retainers or stone artefacts are encountered during the course of the proposed development all works likely to affect

the material must cease immediately. The Climate Change and Environment Protection Authority of NSW DECC, the Barkindji Elders Committee, the Menindee Barkindji Elders Council or the NSW Heritage Office should be consulted about an appropriate course of action prior to recommencement of work. It is an offence under the relevant acts to disturb or destroy Aboriginal or historic relics without written consent of the relevant statutory authorities.

- if human skeletal remains are encountered during the course of the development all work in that area must cease. Remains must not be handled or otherwise disturbed except to prevent further disturbance. If the remains are thought to be less than 100 years old the Police or the State Coroners Office (tel: 02 9552 4066) must be notified. If there is reason to suspect that the skeletal remains are more than 100 years old and Aboriginal, the proponent should contact the NSW DECC zone archaeologist (tel: 03 5021 8914) for advice.

1 Introduction

The New South Wales Department of Environment and Climate Change (NSW DECC) proposes to remove blockbank dams, regulators and other structures along the Darling Anabranh stream course (Figure 1). Low- and high-level crossings would be installed at new locations and to replace some existing in-stream infrastructure. Low-level crossings would consist of rock fords or causeways and high-level crossings would involve construction of box-culverts or modular bridges. Outcomes of the proposed works include returning less regulated flows to the Darling Anabranh to halt and reverse environmental damage caused by damming.

An Environmental Impact Statement (EIS) was prepared for the Darling Anabranh Project in 2004 (Earth Tech 2004). This included a cultural heritage assessment of 17 blockbank work areas (Cupper 2004a). Additional works have subsequently been proposed for in-stream infrastructure. In order to assess the potential impact on cultural heritage places, items and values resulting from the proposed works, Landsape was engaged by NSW DECC to conduct a cultural heritage investigation of an additional 34 proposed work areas.

The key objectives of the cultural heritage study were to:

- conduct a desktop assessment to delineate areas of known and predicted Aboriginal and historical cultural heritage within the proposed work areas;
- undertake a stratified reconnaissance archaeological survey of known and predicted cultural heritage sites identified in the desktop assessment with representatives of the local Aboriginal community;
- record any cultural heritage sites identified within the proposed work areas and assess their significance;
- determine the potential impacts of the proposed developments on cultural heritage sites; and,
- devise options in consultation with the community for mitigating potential impacts of the proposed developments on cultural heritage sites.

Preparation of this report involved collation of relevant archaeological and environmental information and the use of aerial photographs and topographic and geomorphic maps to identify areas likely to contain archaeological sites. Fieldwork was undertaken on 10 Sep, 2—5 Oct, 9 Oct and 20—21 Nov 2007 by archaeologist Matt Cupper with the assistance

of Aboriginal community representatives Evelyn Bates, Harold Bates, Noel Johnson, Ray Lawson, Alex Pappin and Roland Smith.

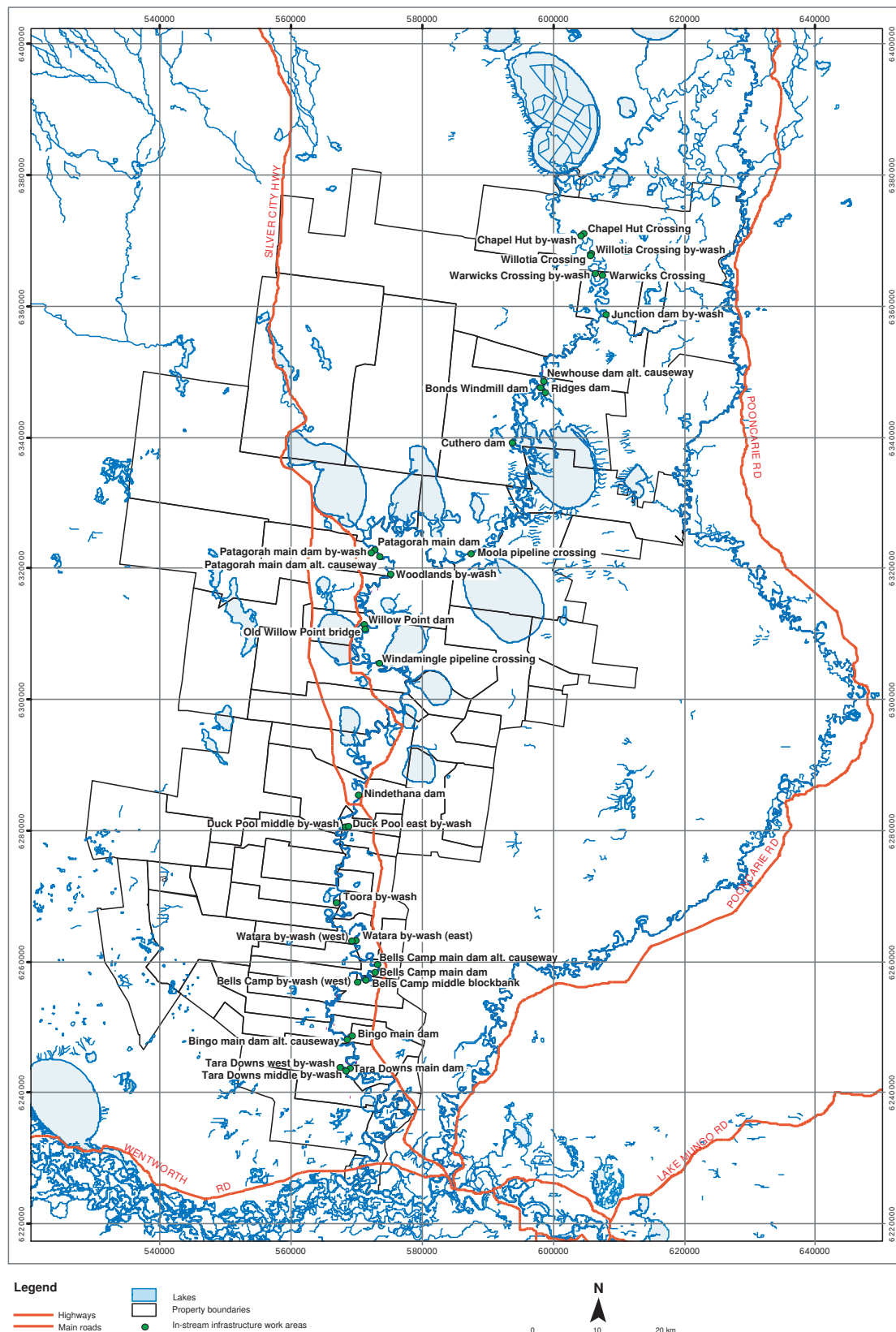


Figure 1. Location of the proposed in-stream infrastructure work areas.

2 Legislative background

All registered and unregistered Aboriginal archaeological sites in NSW are protected by the State *National Parks and Wildlife Act 1974*, *National Parks and Wildlife Amendment Act 2001* and *Environmental Planning and Assessment Act 1979* and the Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*. All historical sites in NSW are protected by the State *Heritage Act 1977* and the *Environmental Planning and Assessment Act 1979*. These Acts prohibit the wilful destruction or disturbance of any cultural heritage site, place or object, whether on private or public land. These places are considered to have significance according to the guidelines of the *Australian ICOMOS Charter for the Conservation of Places of Cultural Significance* (the Burra Charter).

NSW DECC (Climate Change and Environment Protection Authority) and the NSW Department of Planning (NSW Heritage Office) are the State Government agencies that administer these Acts.

2.1 *National Parks and Wildlife Act 1974 and the National Parks and Wildlife Amendment Act 2001*

In NSW, the *National Parks and Wildlife Act 1974* and the *National Parks and Wildlife Amendment Act 2001* provides legislative protection for all Aboriginal (and historic) cultural heritage sites, places and objects. Section 90 of the *National Parks and Wildlife Amendment Act 2001* states:

A person who, without first obtaining the written consent of the Director-General, knowingly destroys, defaces or damages or knowingly causes or permits the destruction or defacement of or damage to, a relic or Aboriginal place is guilty of an offence against this Act.

Section 87 of the *National Parks and Wildlife Act 1974* refers to permits to research, excavate or collect Aboriginal places or relics.

A person found guilty of an offence against this Act is liable to a penalty not exceeding 50 penalty units or to imprisonment for not more than six months or to both. For a corporation, the maximum penalty is 200 penalty units.

The NSW Government is currently reviewing this Act.

2.2 *Environmental Planning and Assessment Act 1979*

The *Environmental Planning and Assessment Act 1979* also recognizes the need to

protect the cultural and natural heritage of NSW. It compliments the *National Parks and Wildlife Act* 1974 in that it provides for planning before development and it obliges the developer to consult persons with relevant expertise or experience (Bowdler 1983:14). The heritage scope of this legislation is wider than that of the *National Parks and Wildlife Act* 1974 and there is no doubt that sites of significance to contemporary communities are included.

2.3 *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*

This Commonwealth Act provides for the blanket protection of all Australian Aboriginal and Torres Strait Islander archaeological sites, places and objects whether privately or publicly owned. Whereas the State provides legislative protection for all physical evidence of past Aboriginal occupation, the Commonwealth Act also protects Aboriginal cultural property in the wider sense so as to include contemporary and ancient traditions and folklore.

Importantly, this Act recognises that the Aboriginal people of NSW are the prior occupants of this State and the owners of their heritage sites regardless of public or private land ownership.

2.4 *Heritage Act 1977*

Historical sites in NSW are protected by the *Heritage Act* 1977. The act is designed to conserve places or items of historic, scientific, cultural, archaeological, natural or aesthetic significance to local communities or to the State. Items of particular importance are listed on the State Heritage Register. The Heritage Council of NSW is responsible for ensuring that listed sites are protected. Major changes to a heritage site require the approval of the NSW Heritage Office.

2.5 *Australian ICOMOS Charter for the Conservation of Places of Cultural Significance (Burra Charter)*

The *Australian ICOMOS Charter for the Conservation of Places of Cultural Significance* (Burra Charter) was adopted at a conference at the historic mining town of Burra, South Australia, in 1979 (latest update 1999). This charter defines the procedures and basic principles to be followed in the preservation of all types of sites, for example, Aboriginal shell middens, ancient campsites represented by stone artefact scatters, or historic mining shafts. These places are considered to have cultural significance either to Aboriginal people or to Australians in general. Cultural significance is a term used to

encompass all the meanings and values that a particular place may have to people, beyond its utilitarian value. It refers to 'aesthetic, historical, scientific or social value for past or present generations, or for its likely value to future generations' (Marquis-Kyle and Walker 1992: 73).

Under the guidelines of the Burra Charter, any Aboriginal or historic sites found in the work areas proposed for construction activities will have social value. According to the charter, social value is defined as:

...the qualities for which a place has become a focus of spiritual, political, national, or other cultural sentiment to a majority or minority group (Marquis-Kyle and Walker 1992: 73)

Some sites found in these areas may also have scientific value. This is assessed according to each particular site's research or scientific potential to provide information about past Aboriginal or wider Australian culture, the environment, or human behaviour generally. According to *the Burra Charter*:

The scientific or research value of a place will depend upon the importance of the data involved or its rarity, quality or representativeness and on the degree to which the place may contribute further substantial information (Marquis-Kyle and Walker 1992: 73).

While the scientific or research value of a place may vary, the Barkindji Aboriginal community consider all Aboriginal archaeological sites to be significant. The Aboriginal people of southwestern NSW have an ancient and unique traditional culture, which is still very much alive today. These sites are important to the local Aboriginal people, and others, because they are a link to their ancestral lands and help keep their traditional culture alive.

3 Aboriginal community involvement

This cultural heritage study has involved the appropriate representatives of the local Aboriginal community and considered their cultural values and concerns in accordance with the *Standards for Archaeological Practice in Aboriginal Heritage Management* (NSW NPWS 1997).

The NSW Department of Environment and Conservation (NSW DEC; now NSW DECC) issued interim requirements for Aboriginal community consultation associated with applications for NSW *National Parks and Wildlife Act* 1974 Section 90 Consents or Section 87 Permits in 2005 (NSW DEC 2005). The interim requirements do not apply to the proposed in-stream infrastructure developments because work had commenced toward the cultural heritage investigation before 1 Jan 2005.

3.1 Aboriginal community groups

The Barkindji Elders Committee and the Menindee Barkindji Elders Council are the Aboriginal community groups from the Wentworth, Dareton and Menindee regions identified as relevant Aboriginal representative bodies to be involved in the cultural heritage investigation of the proposed in-stream infrastructure developments. These Aboriginal community groups were identified as relevant representative bodies through the following processes:

- previous involvement in assessments of cultural heritage significance for developments associated with the Darling Anabranh Project (eg. Cupper 2004a);
- public advertisements issued for the Darling Anabranh Project EIS;
- consultation with NSW DECC zone archaeologist Harvey Johnston; and,
- consultation with representatives of the above groups in Aug and Sep 2007 regarding the in-stream infrastructure developments prior to ground surveys conducted for this investigation

The Aboriginal community groups advised that they did not know of any other relevant Aboriginal community groups or individuals who may have an interest in participating in the cultural heritage assessment.

3.2 Aboriginal participation methodology

During the course of the development of the Darling Anabranh Management Plan (DAMP), the Darling Anabranh Project EIS and associated cultural heritage

assessments and this current cultural heritage investigation, representatives from the NSW DECC, NSW Department of Infrastructure, Planning and Natural Resources (NSW DIPNR; now NSW DECC), NSW Department of Commerce, Bonhomme Craib and Associates (cultural heritage consultancy) and Landskape (cultural heritage consultancy) have been involved in extensive discussions with members of the local Aboriginal community.

Aboriginal community involvement in this current cultural heritage investigation included:

- discussions with Aboriginal community representatives before the field assessment to assess preliminary community views and organise a field survey team;
- involvement of Aboriginal community representatives in the field survey; and,
- forums after the field survey to discuss the findings and recommendations for Aboriginal cultural heritage management.

The locations of the work areas and the nature of the activities associated with the proposal were explained to the Aboriginal community groups, with NSW DECC presented as the proponent of the development. Requirements for a cultural heritage investigation were discussed and input from the Aboriginal community about this study program for assessing potential impacts on cultural heritage places and items was sought. Aboriginal representatives of the Aboriginal community groups participated in the cultural heritage field survey and assisted in devising management protocols to avoid disturbance of cultural heritage sites.

3.2.1 Preliminary Aboriginal involvement

Discussions were initiated with members of the local Aboriginal community about the management of the Darling Anabranh by the DAMP Steering Committee in 1998. Aboriginal representatives from the Dareton community Rex Smith and Rudolf Kirby were members of the DAMP Steering Committee. The DAMP Steering Committee engaged heritage consultants Bonhomme Craib and Associates (2001) to conduct an initial appraisal of the cultural heritage values of the Darling Anabranh. The assessment included ascertaining the views of members of the Barkindji Aboriginal community at a meeting in Dareton on 16 Feb 2001 (Bonhomme Craib and Associates 2001).

The Aboriginal community was extensively involved in the Aboriginal cultural heritage assessment for the Darling Anabranh Project EIS.

Project archaeologist Matt Cupper from Landskape and representatives from EIS project managers Earth Tech Engineering Pty Ltd and NSW DIPNR met with Aboriginal community representatives in Dareton on 2 Oct 2003 and Tandou on 14 Oct 2003 to

explain the proposed methodology of the cultural heritage study. Opinions of the Aboriginal community representatives about the development and cultural heritage study were sought and any concerns or queries were addressed.

On the recommendation of the Aboriginal community representatives, 18 representatives of the local Aboriginal community were involved in the cultural heritage field survey undertaken during Oct-Nov 2003 and Feb-Mar 2004.

Regular contact was maintained by the project archaeologist and representatives of NSW DIPNR with Aboriginal community representatives during the field assessment to keep them informed of its progress. A group of 9 Aboriginal community representatives also inspected some of the sites identified during the survey with project archaeologist Matt Cupper, NSW DECC archaeologist Harvey Johnston and NSW DIPNR Aboriginal Natural Resource Officer Michael Gilby on 9 Dec 2003.

Following the field investigation, meetings with members of the local Aboriginal community were held at Willow Point on 9 Dec 2003, Dareton on 27 Jan 2004 and Kinchega National Park on 19 Feb 2004 to discuss the EIS and the results of the cultural heritage survey.

3.2.2 Aboriginal participation prior to the field assessment

Scott Barnes, Project Manager from the NSW Department of Commence (attending on behalf of NSW DECC), met with Aboriginal community representatives in Dareton on 17 Sep 2007 to explain the proposed in-stream infrastructure works associated with the Darling Anabranh Project.

Project archaeologist Matt Cupper also discussed the proposed developments and requirements for a cultural heritage investigation in telephone conversations with Evelyn Crawford, Michael Gilby, Evelyn Bates and Gai Sheppard.

The Aboriginal community members involved in these discussions were:

- Garry Abdullah (Barkindji Elder)
- Kingsley Abdullah (Barkindji Elder)
- Tim Abdullah (Barkindji Elder)
- Evelyn Bates (Barkindji Elder)
- Evelyn Crawford (Chairperson Barkindji Elders Committee)
- Elsie Coombs (Barkindji Elder)
- Michael Gilby (Aboriginal Natural Resource Officer Lower Darling CMA)
- Noel Johnson (Barkindji Elder)

- Sheila Kirby (Barkindji Elder)
- Cora Lawson (Barkindji Elder)
- Lottie Lawson (Barkindji Elder)
- Ray Lawson (Barkindji Elder)
- Gai Sheppard (Coordinator Menindee Local Aboriginal Land Council)
- Dawn Smith (Barkindji Elder)

3.2.3 Aboriginal participation during the field assessment

On the recommendation of the Aboriginal community groups, Evelyn Bates, Harold Bates, Noel Johnson, Ray Lawson, Alex Pappin and Roland Smith, all representatives of the local Aboriginal community, were involved in the field surveys undertaken on 10 Sep, 2—5 Oct, 9 Oct and 20—21 Nov 2007.

3.2.4 Aboriginal participation following the field assessment

Scott Barnes, Project Manager from the NSW Department of Commerce (attending on behalf of NSW DECC), Pixie Jonasson, Water Recovery Officer from the Lower Murray Darling Catchment Management Authority, and project archaeologist Matt Cupper met with Aboriginal community representatives in Menindee on 14 Nov 2007 and Dareton on 15 Nov 2007 to discuss the proposed project, results of the cultural heritage field survey and strategies for managing cultural heritage.

These meetings also provided an opportunity for the Aboriginal community representatives to inspect some of the cultural heritage sites identified during the field survey and several blockbanks.

Aboriginal community members present at the meeting in Menindee and subsequent field excursion on 14 Nov 2007 were:

- Evelyn Crawford (Chairperson Barkindji Elders Committee)
- Dale Doyle (Aboriginal community member)
- Maggie Doyle (Aboriginal community member)
- Marietta Files (Barkindji Elder)
- Patricia Quayle (Barkindji Elder)

Aboriginal community members present at the meeting in Dareton and subsequent field excursion on 15 Nov 2007 were:

- Garry Abdullah (Barkindji Elder)

- Kingsley Abdullah (Barkindji Elder)
- Tim Abdullah (Barkindji Elder)
- Elsie Coombs (Barkindji Elder)
- Evelyn Crawford (Chairperson Barkindji Elders Committee)
- David Egan (Aboriginal community member)
- Noel Johnson (Barkindji Elder)
- Sheila Kirby (Barkindji Elder)
- Cora Lawson (Barkindji Elder)
- Lottie Lawson (Barkindji Elder)
- Ray Lawson (Barkindji Elder)
- Michael Mitchell (Aboriginal community member)
- Dawn Smith (Barkindji Elder)
- Rex Smith (Aboriginal community member)

3.3 Aboriginal representatives involved in the field investigation

Six representatives from the local Aboriginal community participated in the field survey:

- Barkindji Elders Evelyn and Harold Bates. Evelyn and Harold are both members of the Menindee Local Aboriginal Land Council and involved with the Barkindji Native Title claim.
- Barkindji Elder Ray Lawson. Ray resides in Dareton and is past chairperson of the Dareton Local Aboriginal Land Council. Ray is also a Barkindji Native Title applicant.
- Barkindji Elder Noel Johnson. Noel is a Barkindji Native Title applicant and lives in Wentworth.
- Barkindji Elder Roland Smith. Roland resides in Mildura.
- Alex Pappin. Alex is a resident of Wentworth.

4 Proposed works and potential impacts

4.1 Type of development

NSW DECC proposes to remove blockbank dams, regulators and other structures from the Darling Anabranh stream course. Low-level rock fords or causeways and high-level box-culverts or modular bridges would be installed in new locations and to replace some existing in-stream infrastructure. Environmental flows would be reinstated to the Darling Anabranh. The objectives of the proposed works include returning less regulated flows to the Darling Anabranh to halt and reverse environmental damage caused by damming.

4.2 Description of proposed works

Blockbanks and regulators have been constructed across the Darling Anabranh to provide weir pools for pumping stock and domestic water. These weir pools have become redundant following the construction of a pipeline supplying water to landholders. However access across the Darling Anabranh is required at some points.

A total of 34 work areas required assessment during this cultural heritage investigation, including four new locations for low-level crossings. Twenty-eight blockbank dams, regulators and other structures require removal to provide for free passage of flows and adequate fish passage. Five low-level rock fords or causeways and three high-level box-culverts or modular bridges are required to directly replace blockbank crossings at these locations (i.e. constructed where in-stream structures are previously located). An additional four low-level rock fords or causeways would be installed at new locations. Two low-level crossings are also required at the locations the Darling Anabranh pipeline traverses the streambed at Windamingle and Moola.

4.3 Flexibility of design

The final layout of the proposed work areas would be designed, if engineering constraints allow, to avoid potential impacts to any Aboriginal or historical cultural heritage places or items that may be identified within the study area.

4.4 Identification of direct and indirect impacts

The direct impacts of removal or modification of the blockbank structures include removal of the existing earthworks and weir gate/regulator structures, reinstatement of the earthen fill to the nearby borrow pits from whence it was originally obtained and construction of replacement low-level rock fords/causeways or high-level

box-culverts/modular bridges. The zone of direct impact is likely to be contained within a 50-100 m radius of the existing blockbanks. These areas have typically been extensively disturbed by past earthworks.

The removal of existing structures would involve the excavation of soil from the various banks and return of the soil to nearby borrow areas (usually within 50 m of the structure).

Of the eleven low-level crossings, four new low-level crossing locations are not associated with existing in-stream infrastructure and would require the excavation of soil from the banks and through the stream-bed crossings to a depth of around 400 mm.

Construction of the low-level rock fords/causeways would involve the importation of cobbles and gravel, which would be placed on the banks and streambeds at a thickness of around 400 mm. The estimated width of the low-level crossings is 5 m.

The high-level box-culverts or modular bridges would consist of prefabricated concrete structures. Earthen, gravel and rock fill would form the approaches to the structures. The estimated width of the high-level crossings is 5 m.

Indirect impacts for the proposed in-stream infrastructure developments include possible temporary construction camps, machinery parking areas and temporary access tracks.

Personnel involved in the construction phase should be trained in procedures to recognise and avoid disturbance to cultural heritage places and items.

The operational phase of the development is likely to have minimal impacts on cultural heritage resources. Possible indirect impacts include maintenance vehicles departing from designated access roads. Managers of the infrastructure should be trained in procedures to recognise and avoid disturbance to cultural heritage sites.

5 Environmental background

The Darling Anabranh is semi-permanent stream course with associated lakes and wetland areas in southwestern NSW. The fluvio-lacustrine complex lies within the Central Western Depocentre of the Murray Basin. The surface geology of the region is mostly aeolian (wind-blown) sediments, while underlying sequences within the basin were deposited by shallow seas and lakes over the past 60 million years (Brown and Stephenson 1991).

The Darling Anabranh has incised a narrow tract through underlying sediments of the Murray Basin. The stream course anabranches from the Darling River south of Menindee and enters the Murray River downstream of Wentworth. The Darling Anabranh is some 460 km long, with associated lakes, billabongs and other wetland areas. The channel is broad and sinuous, but meanders through quite a narrow floodplain belt. Higher alluvial terraces are preserved in some reaches.

The Darling Anabranh was the course of the palaeo-Darling River during the last Ice Age. Bowler *et al.* (1978) and Balme and Hope (1990) propose that the river avulsed to occupy the present Darling River channel at around 11,000-7000 years ago. However, some landforms of the Darling River course may be older than this, suggesting that the Darling Anabranh channel had been abandoned at the height of the last Ice Age, around 24,000-18,000 years ago (Ray 1996).

River red gum (*Eucalyptus camaldulensis*) fringe the margins of the Darling Anabranh. Black box (*Eucalyptus largiflorens*) woodlands, often with a black bluebush (*Maireana pyramidata*) or lignum (*Muhlenbeckia cunninghamii*) understorey, grow on the alluvial floodplains. Bluebush low shrublands are common on higher alluvial terraces. Bluebush and saltbush also grow on the dry floors of the Darling Anabranh lakes.

6 Cultural heritage background

6.1 Types of cultural heritage sites

The types of cultural heritage site previously recorded in the Darling Anabranh region and which might therefore be expected to occur in the proposed work areas are described below.

6.1.1 Aboriginal cultural heritage sites

Stone artefact scatters

Scatters of stone artefacts exposed at the ground surface are one of the most commonly occurring types of archaeological site in the region. The remains of fire hearths may also be associated with the artefacts. In rare instances, sites that were used over a long period of time may accumulate sediments and become stratified. That is, there may be several layers of occupation buried one on top of another.

Stone artefact scatters are almost invariably located near permanent or semi-permanent water sources (Hope 1982). Local topography is also important in that stone artefact scatters tend to occur on level, well-drained ground elevated above the local water source. In southwestern NSW they are commonly located on river terraces and along creek-lines and also around the margins of lakes, swamps and claypans.

Hearths

Hearths consist of lumps of burnt clay or stone cobble hearthstones. Sometimes ash and charcoal are preserved. Other materials found in hearths include animal bone, freshwater mussel shell, emu eggshell and stone artefacts. Hearths probably represent the remains of cooking ovens, similar to those described in ethnographic accounts by Major Thomas Mitchell (1839) (see also Coutts *et al.* 1979). These were lined with baked clay nodules and stone cobbles, possibly to retain heat. Hearths may be isolated or occur in clusters and may be associated with open camp sites or middens. They are often located in dune swales, particularly on claypans, near soaks and on floodplain terraces.

Freshwater shell middens

Shell middens are deposits of shell and other food remains accumulated by Aboriginal people as food refuse. In inland NSW these middens typically comprise shells of the freshwater lacustrine mussel *Velesunio ambiguus* or the freshwater riverine mussel *Alathyria jacksoni*. Freshwater middens are most frequently found as thin layers or small patches of shell and often contain stone or bone artefacts and evidence of cooking. Such

sites are relatively common along the Murray and Darling Rivers and their associated lakes and tributaries.

Earth mounds

Earth mounds may have been used by Aboriginal people as cooking ovens or as campsites. They are common along the Murray River and in the Western District of Victoria. Originally they appear to have ranged from 3 to 35 metres in diameter and from 0.5 to 2 metres in height. Today, however, they may be difficult to recognize because of the effects of ploughing, grazing and burrowing rabbits. Earth oven material, stone artefacts, food refuse and the remains of hut foundations have been exposed in excavated earth mounds.

Stone quarries

Quarries are locations where Aboriginal people obtained raw material for their stone tools or ochre for their art and decoration. Materials commonly used for making flaked stone tools include chert, silcrete, quartz and quartzite. Stone sources are particularly scarce in southwestern NSW, but silcrete outcrops do occur at a number of locations, notably at the Willandra Lakes. Chert is found exposed in cliffs incised by the Murray River in South Australia. Most other stone in the Central Murray and Lower Darling regions was probably sourced via long-distance trade links with the Barrier Ranges and the southeastern Australian Highlands.

Modified trees

Slabs of bark were cut from trees by Aboriginal people and used for a variety of purposes including roofing shelters and constructing canoes, shields and containers. Scars also resulted from the cutting of toe holds for climbing trees to obtain honey or to capture animals such as possums. In southwestern NSW river red gums and black box are the most commonly scarred species. The classification of modified trees as natural, European or Aboriginal is often problematic. However, if the scar is Aboriginal the tree must now be more than ~150 years old.

Stone arrangements, ceremonial rings and ceremony and dreaming sites

Stone arrangements range from cairns or piles of rock to more elaborate arrangements such as stone circles or standing slabs of rock held upright by stones around the base. Some stone arrangements were used in ceremonial activities whilst others may represent sacred or totemic sites. Other features associated with the spiritual aspects of Aboriginal life are those now called 'ceremony and dreaming' sites. These can be either stone arrangements or natural features such as rock outcrops, which may be associated

with initiation ceremonies or the activities of ancestral creators.

Burials

Aboriginal burial grounds may consist of a single interment or a suite of burials. Burials tend to be in areas of sandy soil that were easy to dig and above floodwaters. Burials are frequently located in source-bordering sand dunes, sand ridges, lunettes and levees along watercourses (Bonhomme 1990, Hope 1993). Knowledge of Aboriginal burial grounds is best sought from local Aboriginal communities.

6.1.2 Historical cultural heritage sites

Pastoral sites

Historical sites in the Darling Anabranh region mostly relate to the arrival of European graziers and associated industries during the nineteenth century. Old homesteads and associated structures such as work sheds, shearing sheds and labourer's quarters are examples of historical sites that may be encountered. Less conspicuous sites include survey markers, particularly those blazed on eucalypt trees, which are also of historical interest.

Transport and communication sites

Small bridges made from river red gum timber or calcrete cobbles may occur in the region. Shipping sites along the Murray and Darling Rivers comprise the wrecks of old paddle steamers and barges, historic wharves and jetties, ferry and punt landings, shipbuilding yards, customhouses and locks and weirs. Unlike the Darling and Murray Rivers, the Darling Anabranh was not navigable, so generally lacks a shipping heritage. Small punts, however, served to ferry people, stock and goods across the Darling Anabranh up until the early twentieth century (Withers 1989). There were punts at the Darling Anabranh crossing of the Adelaide road and at Bunnerungie as early as the 1850s and '60s (Twynam 1860, Withers 1989). Historic mileage markers and navigation markers may also be encountered. The remains of early telegraph lines such as timber poles with glass and ceramic insulators are sometimes preserved.

Water regulation and irrigation sites

Historical features constructed to divert or alter the flow of water include blockbanks and weirs. Stone, concrete, earth, steel and timber are amongst the construction materials used to erect dams. Irrigation infrastructure includes steam-driven pumping machinery and irrigation pipes.

6.2 Previous cultural heritage investigations

6.2.1 Aboriginal cultural heritage background

Some of the earliest evidence of human occupation of Australia comes from southwestern NSW (Bowler *et al.* 1970, 2003, Thorne *et al.* 1999, Cupper and Duncan 2006, Olley *et al.* 2006). Stone artefacts found at Lake Mungo in the Willandra Lakes region, about 100 km to the northeast of the study area, have been dated to between 46,000 to 50,000 years ago (Bowler *et al.* 2003). The burials of a male and female at Lake Mungo are 42,000 years old (Olley *et al.* 2006, cf. Thorne *et al.* 1999). People were also at nearby Lake Menindee from 45,000 years ago (Cupper and Duncan 2006) and Lake Victoria from 21,000 years ago (Gill 1973). The oldest site on the Darling Anabranh is a freshwater mussel shell midden in the lunette at Lake Nitchie dating to almost 26,000 years ago (Balme and Hope 1990).

Aboriginal people of the Barkindji language group occupied the Darling Anabranh region at the time of first contact with Europeans (Sturt 1833, 1984 [1844-6], Mitchell 1839, Eyre 1985 [1842], Krefft 1865). This language group comprised people who spoke the sub-dialects Barindji, Barkindji, Danggali, Maraura and Wiljakali (Allen 1974, Tindale 1974, Hardy 1976). These tribes shared similar language and kinship systems, notably the division of members into matrilineal moieties (two-part social classification) known as Mukwara (wedge-tailed eagle) and Kilpara (raven) (Blows 1995).

The Barkindji were hunter-fisher-gatherers and appear to have had a semi-sedentary lifestyle. Early accounts by the European explorer Gerard Krefft (1865) suggest that the Barkindji lived along the Lower Darling and Murray Rivers during the warmest months of the year, with people moving away from the rivers into the dunefields to collect food after winter rains.

The material record of this occupation is preserved in the archaeological sites of the Darling Anabranh region, most of which date to the period since the last Ice Age (after around 18,000 years ago). All that remains at many of these sites are flakes of stone debris from the making and resharpening of stone tools. These were made both at Aboriginal open habitation areas (campsites) or special activity areas such as stone knapping sites. As well as being the sites of manufacture and maintenance of stone implements, open habitation areas usually contain evidence of domestic and other activities such as cooking and food preparation. Campfires or oven hearths are common, marked by calcrete, baked clay, ferricrete, sandstone and silcrete heat retaining stones or hearthstones and charcoal. Organic remains consist of burnt animal bones, emu and aquatic bird eggshell and freshwater mussel shell.

6.2.2 Studies of the Aboriginal past

The Aboriginal archaeology of southwestern NSW is known generally from a number of studies but very little systematic archaeological research has been undertaken along the Darling Anabranh. Cupper (2004a, 2004b, 2005, 2006a, 2006b) archaeologically surveyed the route for the Darling Anabranh pipeline and inspected 17 blockbanks and regulators. Surveys of linear developments that cross the channel including electricity transmission lines and road infrastructure have been conducted by McIntyre (1981) and Edmonds (1998, 1999).

Cupper (2004a, 2004b, 2005, 2006a, 2006b) recorded 152 Aboriginal archaeological sites, which were almost exclusively located on the floodplain, elevated terraces and source-bordering dunes near the main channel. Stone artefact scatters, often with associated hearths, were the most abundant site type identified (n=99). Middens (n=23), isolated finds of stone artefacts (n=10), modified trees (n=8), hearths (n=6) and burial/stone artefact scatter site complexes (n=6) were also encountered in these areas.

Stone artefact scatters generally contained low-density scatters of mainly silcrete waste flakes (Cupper 2004a, 2004b, 2005, 2006a, 2006b). Scattered baked clay heat retainers from hearths, and occasionally *in situ* hearths, were often also present at these sites. They tended to occur on more elevated landforms adjacent to the Darling Anabranh. Middens consisted of surface scatters of fragmented freshwater mussel shell and sometimes *in situ* shell lenses. Those on the riverbank were quite large, with sites becoming smaller away from the stream course (Cupper 2004a, 2004b, 2005, 2006a, 2006b).

Edmonds (1998, 1999) investigated small areas of the lower Darling Anabranh on Oakbank, Glen Esk and Milpara Stations. She identified stone artefact scatters (n=7), middens (n=3), midden/stone artefact scatter site complexes (n=2), a modified tree (n=1), a midden (n=1) and a hearth (n=1) (Edmonds 1998, 1999).

6.2.3 Aboriginal cultural heritage sites in the study area

According to the NSW DECC Aboriginal Heritage Information Management System (AHIMS) site database there are 23 registered Aboriginal archaeological sites within approximately 1 km of the proposed work areas (Table 1). Stone artefact scatter and hearth site complexes are the most abundant site type (65 %, n=15). Two stone artefact scatters, two isolated finds of stone artefacts, a shell midden, a burial and stone artefact scatter site complex, a hearth and a modified tree are also represented in the archaeological record. These archaeological sites are mostly located on alluvial terraces

along the Darling Anabranh.

One of these previously recorded Aboriginal archaeological sites is located within one of the proposed work areas. This stone artefact scatter and hearth site complex (DECC Site Number 39-2-0069) is located on the east bank of the Darling Anabranh on the approach to Patagorah main dam (Cupper 2004a). The site consists of a scatter of silcrete, chert and quartz flakes, scattered baked clay heat retainers, including dispersed charcoal from hearths, and some fragments of freshwater mussel shell. It covers an area of some 25 x 25 m.

A black box tree possibly modified by Aboriginal people (DECC Site Number 39-5-0072) is located on the west bank of the Darling Anabranh about 20 m southwest of Tara Downs main dam, a structure proposed to be removed (Cupper 2004a). An isolated find of a broken quartzite grindstone (DECC Site Number 39-5-0059) is also located in this area (Cupper 2004a). The isolated find is about 30 m southeast of Tara Downs middle by-wash, which is proposed to be removed.

Two stone artefact scatter/hearth complexes are located about 50 m south of the proposed low-level rock ford/causeway at the Moola pipeline crossing on Manilla Station (DECC Site Numbers 39-2-0100, 39-2-0102) (Cupper 2004b).

Table 1. Previously recorded Aboriginal cultural heritage sites within 1 km of the proposed in-stream infrastructure work areas.

DECC site number	Type	Name	Location	
			GDA mE	GDA mN
39-2-0033	Stone artefact scatter, hearth	WI-4	573871	6317808
39-2-0035	Burial, stone artefact scatter	WI-1	573590	6317712
39-2-0036	Stone artefact scatter, hearth	WI-2	573897	6317983
39-2-0064	Stone artefact scatter, hearth	DA46	573838	6306114
39-2-0067	Stone artefact scatter, hearth	DA49	573560	6317411
39-2-0069	Stone artefact scatter, hearth	DA51	572923	6322850
39-2-0090	Stone artefact scatter, hearth	DA97	573298	6305327
39-2-0100	Stone artefact scatter, hearth	DA129	587021	6322193
39-2-0101	Isolated find of a stone artefact	DA130	586557	6322872
39-2-0102	Stone artefact scatter, hearth	DA138	586952	6322182
39-3-0067	Stone artefact scatter, hearth	DA86	597820	6347856
39-5-0108	Stone artefact scatter, hearth	DA17	566490	6269602
39-5-0023	Stone artefact scatter	Glen Esk 1	568521	6247878
39-5-0059	Isolated find of a stone artefact	DA59	568579	6243773
39-5-0061	Stone artefact scatter	DA18	566600	6269900
39-5-0068	Midden	DA34	570907	6289134
39-5-0072	Modified tree	DA58	568672	6243827
39-5-0079	Stone artefact scatter, hearth	DA103	572150	6258130
39-5-0080	Stone artefact scatter, hearth	DA104	572334	6258097
39-5-0081	Stone artefact scatter, hearth	DA105	572275	6257611
39-5-0082	Stone artefact scatter, hearth	DA106	572405	6257501
39-5-0102	Hearth	DA11	569526	6263640
39-5-0103	Stone artefact scatter, hearth	DA12	569325	6263297

6.2.4 Historical cultural heritage background

The explorer Captain Charles Sturt was the first European to visit southwestern NSW, passing the junction of the Darling Anabranh with the Murray River during his 1829-1831 expedition of the Murrumbidgee and Murray Rivers (Sturt 1982 [1833]). Sturt (1982 [1833]) described the Darling Anabranh as a creek entering from the north, “almost choaked [sic] up with the trunks of trees”. Within seven years of Sturt’s expedition, the route along the Murray was used to drive cattle overland from the colony of NSW to Adelaide. Joseph Hawdon and Charles Bonney were the first of the so-called ‘overlanders’, fording cattle across the Darling Anabranh in 1838 (Kain 1991). They were closely followed by other overland expeditions led by Sturt and Edward John Eyre. Overlanders driving mobs of cattle to the colony of South Australia soon became a regular occurrence in the region.

Sturt crossed the Darling Anabranh further upstream during his 1844-6 Central Australian expedition (Sturt 1984 [1844-6]). The stream course was dry at this time, and Sturt (1984 [1844-6]) described the region as consisting of “sandy plains...barren in the extreme”. European squatters with a somewhat more optimistic opinion of the region, including the Scots George Melrose and Malcolm McLennan, brought cattle and sheep to the Darling Anabranh from the late 1840s (Hardy 1969, Withers 1989).

The initial squatter runs and later pastoral leases stretched from the Murray or Darling Rivers or Lake Victoria, which provided more permanent sources of water. Larger waterholes on the Darling Anabranh provided some security for settlement, and McLennan constructed a dwelling at Urntah waterhole, now Hunter waterhole on Woodlands Station (Withers 1989, Bonhomme Craib and Associates 2001). Water also tended to flow upstream along the Darling Anabranh channel from the Murray River, making settlement of the southern reaches more favourable. The first settlers noted that river red gums grew as far north as Wilpitara the furthest extent of this upstream flow (Tulloch 1984). In 1867, Licensee Smith erected Old Chimney Hotel on the east bank of the Darling Anabranh at Wilpitara (Dansie 1990). However, the drought of 1868-9 prompted attempts to improve the reliability of flows in the Darling Anabranh.

The Darling and Great Anabranh Cutting Company was formed in 1864, and by 1872 landholders had deepened the channel feeding from the Darling River at Cuthero (Withers 1989). This allowed water to flow into the Darling Anabranh at flood heights some 3 m lower than those previously required. Earthen and stone embankments and other structures were also erected to pool the water or prevent it from flowing into the Darling Anabranh lakes. The first dam across the Darling Anabranh channel is recorded to have been constructed by an early settler, Webb (Tulloch 1984). Webb's dam was located near Wilpitara, between the present Tara Downs and Warras Dam (Twynam 1860). The dam is shown on surveyor Edward Twynam's 1860 map of the Darling Anabranh region.

The Great Anabranh of the Darling River Water Trust was proclaimed in 1917 to manage flows from the Lower Darling into the Darling Anabranh (Withers 1989). Regulation of stream flow permitted more intensive stocking of the Darling Anabranh frontages over the 20th century. A policy of closer settlement was also pursued and sections of the old pastoral holdings of Moorna, Avoca, Lake Victoria, Bunnerungie and Cuthero were leased as smaller properties. Ten new western land leases were granted along the southern Darling Anabranh in 1911-1912 (Withers 1989). The old Bunnerungie pastoral holding was further subdivided in 1944 to provide land for more graziers, including returned soldiers (Withers 1989). The inception of the Menindee

Lakes scheme in the 1950s and 1960s provided a more secure supply of water to the Darling Anabranh landholders, which currently number some 41 properties.

6.2.5 Studies of the historical past

Withers (1989) provides the most comprehensive account of the European settlement of the Darling Anabranh region. The Wentworth Shire Council Heritage Study (Hassell Planning Consultants 1989) and Local Environmental Plan (LEP) (Wentworth Shire Council 1993, 2007) also documents the historic heritage of the Wentworth Shire, the local government area in which most of the Darling Anabranh is located. Cupper (2004a, 2004b) recorded historical items during the cultural heritage assessment for the Darling Anabranh Project EIS.

6.2.6 Historical cultural heritage sites in the study area

The Wentworth Shire Council LEP (Wentworth Shire Council 1993, 2007) lists two historical sites within approximately 1 km of the proposed work areas. These sites are Wilpitarra Homestead and Willow Point Shearers Quarters. These sites are included on the NSW Heritage Office's State Heritage Inventory (NSW Heritage Office 2007). Cupper (2004a) recorded the ruins of Toora homestead and associated outbuildings during the cultural heritage assessment for the Darling Anabranh Project EIS. This site is not included in the Wentworth Shire Council LEP or the NSW Heritage Inventory.

A summary of European heritage sites is provided in Table 2.

Table 2. Previously recorded historical cultural heritage sites within 1 km of the proposed in-stream infrastructure work areas.

Heritage Item Number	Heritage Listing Type	Name	GDA (mE)	GDA (mN)
66	Wentworth Shire Council LEP, NSW Heritage Inventory	Wilpitarra Homestead	568841	6244558
100	Wentworth Shire Council LEP, NSW Heritage Inventory	Willow Point Shearers Quarters	571685	6311555
DAH03	na	Toora homestead ruins and outbuildings	566620	6269527



Figure 2. Willow Point Shearers Quarters.



Figure 3. Toora homestead outbuildings.

The former pastoral dwelling Wilpitara Homestead (Wentworth Shire Council Heritage Item Number 66) is located on the western bank of the Darling Anabranh on Tara Downs Station. It is approximately 750 m northeast of Tara Downs main dam, which is proposed to be removed. Wilpitara Homestead is a milled timber dwelling with iron roof and interior linings. It was constructed in 1917 (Wentworth Shire Council 2007). The site of Old Chimney Hotel, which operated from 1867-9, is located somewhere near Wilpitara Homestead on the east bank of the Darling Anabranh (Dansie 1990).

Willow Point Shearers Quarters (Wentworth Shire Council Heritage Item Number 100) were constructed in 1926 on Willow Point Station (Figure 2). This historic site is located approximately 400 m northeast of Old Willow Point bridge and 600 m southeast of Willow Point dam, both of which are proposed to be removed. The shearers quarters are constructed of timber-framed corrugated iron and retain a large bakers oven with two red brick chimneys (Wentworth Shire Council 2007).

Cupper (2004a) recorded the historic Toora homestead ruins and outbuildings during a cultural heritage assessment for the proposed removal of blockbank dams from the Darling Anabranh stream course. This historic site is located on Toora Station some 150 m west of Toora by-wash, which is proposed to be removed and replaced with a high-level box-culvert or modular bridge.

Toora homestead and outbuildings were constructed by James Maynard and Walter Ross from c. 1912 to c. 1924 (Withers 1989). The homestead complex consists of a native pine drop-log motor shed, a corrugated iron storeroom, a timber-framed meat-house and a rough-sawn native pine two room cottage (Figure 3). The main homestead has been dismantled, with only the milled timber floor remaining.

7 Project design and survey methodology

The Aboriginal heritage survey and assessment was conducted in accordance with the *Guidelines for Archaeological Practice in Aboriginal Heritage Management* (NSW NPWS 1997). The historical heritage assessment is based on the *NSW Heritage Manual* (NSW Heritage Office 1996) and *Assessing Heritage Significance* (NSW Heritage Office 2001).

7.1 Site predictive model

Previous archaeological studies indicate that the most frequently recorded Aboriginal sites in southwestern NSW are open habitation areas represented by stone artefact scatters, shell middens and often hearths (NSW DECC AHIMS site database). Burials and trees modified by Aboriginal people are also represented in the archaeological record. Based on these observations of archaeological site types and their distribution and landscape setting, the following predictive model of site locations for the proposed in-stream infrastructure work areas can be proposed:

- **Stone artefact scatters, isolated finds of stone artefacts and hearth sites** are possible near the proposed in-stream infrastructure work areas. They are typically found within 500 m of water sources, so are most likely to be encountered on the margins of the Darling Anabranh and Redbank Creek.
- **Burial sites** may be encountered in sandy dune deposits beside the Darling Anabranh and Redbank Creek.
- **Modified trees and middens** may be encountered on the banks, floodplains and alluvial terraces of the Darling Anabranh and Redbank Creek. The types of trees commonly scarred by Aboriginal people are mature river red gum and black box. River red gum are usually restricted to be banks of the channel, whereas black box are found on floodplains and alluvial terraces. Middens are rarely found more than 100 m from semi-permanent water sources.

Any historical sites near the proposed in-stream infrastructure work areas will most likely relate to early pastoral activities of the last half of the nineteenth century or the first half of the twentieth century. Most sites such as homesteads and associated structures, bridges and fords and blazed survey marks that may be encountered are expected to occur near the Darling Anabranh and Redbank Creek.

The margins of the Darling Anabranh and Redbank Creek channels are predicted to have a high probability of containing a diverse range of cultural heritage site types. The

location of the proposed in-stream infrastructure work areas within this zone of high 'archaeological sensitivity' means that all of the proposed work areas may have a high potential of containing cultural heritage. A strategy of inspecting every proposed in-stream infrastructure work area was adopted for the field survey.

7.2 Field methodology

7.2.1 Logistics

Fieldwork was undertaken on 10 Sep, 2—5 Oct, 9 Oct and 20—21 Nov 2007 by project archaeologist Matt Cupper with the assistance of Aboriginal community representatives Evelyn Bates, Harold Bates, Noel Johnson, Ray Lawson, Alex Pappin and Roland Smith.

7.2.2 Survey methods

Areas of about 200 m x 200 m at each of the proposed in-stream infrastructure work areas were inspected on foot by the project archaeologist and Aboriginal representatives. Team members walked abreast along both sides of the channel, examining the ground surface for archaeological materials and also mature eucalypt trees for evidence of Aboriginal scarring. Very high coverage was achieved given the intensive nature of the survey.

Areas with high ground surface visibility such as scalds and deflation hollows, eroded gullies and along vehicle tracks were closely inspected. Gully erosion along the banks of Redbank Creek and the Darling Anabranh afforded some sub-surface visibility. The team members also examined sections in the walls of bulldozed earth-works such as borrow pits near the blockbanks for archaeological traces.

7.2.3 Access to survey areas and weather conditions

Access was available to all of the proposed in-stream infrastructure work areas. Weather conditions during the survey were fine.

7.3 Recording methods

For this investigation Aboriginal archaeological sites were defined as a concentration of stone artefacts, heat retainers and/or shell fragments or a single modified tree. When a site was located the following variables were recorded:

Site designation: sites were designated Darling Anabranh (DA) followed by a numeric identifier.

Site type: site types recorded were stone artefact scatters, hearths, middens and trees modified by Aborigines.

Grid reference: this information was obtained using a Garmin handheld Global Positioning System and confirmed using the Lake Tandou 7332, Popiltah 7231, Cuthero 7331 and Bunnerungee 7230 1:100,000 orthophoto and topographic maps.

Environmental setting: this describes the site's environmental context including such factors as landform, slope, vegetation and local hydrology.

Aspect: direction at which the sites face. Aspect is often thought to be a key determinant of site location.

Site size: refers to the dimensions over which artefacts are visible.

Visibility: a measurement of the conditions of ground surface visibility in the survey area. Ground surface visibility conditions will affect whether sites are detected and whether their full extent has been recorded.

Site contents: this is a description of the artefacts at the sites. With stone artefact scatters the features recorded included raw material, artefact type, artefact dimensions, presence of retouch or use wear and any general comments considered relevant. It is important to realise that these artefact descriptions are only preliminary descriptions, as more detailed recording is considered to be more appropriate if a mitigation phase is undertaken for this or other regional projects.

Site condition: describes the condition of the site in terms of factors which may have disturbed it or which may have the potential to disturb.

Management considerations: this details the potential threat to the site specifically in terms of the planned development. In addition, specific ameliorative measures are recommended if warranted.

Additional measurements and descriptions were made of modified trees. These included:

Tree attributes: measurements and descriptions of the tree bearing the scar.

Taxon: tree species – botanical and common name.

Diameter at breast height (1.35 m) [DBH]: trunk diameter at 1.35 m from the modern land surface.

Height: an approximation of tree height.

Condition: assessment of tree health.

Scar attributes: measurements and descriptions of the scar.

Length: length of scar at longest extent.

Width: width of scar at widest extent.

Height above ground: base of scar above modern land surface.

Aspect: compass orientation of scar.

Description: scar shape and other attributes.

8 Survey coverage data

8.1 Conditions of visibility

Conditions of ground surface visibility will affect how many sites are located. Visibility may also skew the results of a survey. If, for example, conditions of ground surface visibility vary dramatically between different environments, then this in turn will be reflected in the numbers of sites reported for each area. The area with the best visibility may be reported as having the most sites (because they are visible on the ground) while another area with less visibility but perhaps more sites will be reported as having very little occupation. It is important therefore to consider the nature of ground surface visibility as part of any archaeological investigation.

Gullying, scalding and erosion from vehicular traffic and stock provided very high surface visibility around the blockbanks. This was typically around 60-80 %. Bank erosion and earth-works also provided some visibility of the sub-surface.

8.2 Coverage analysis

Coverage analysis is a useful measurement to allow cultural resource managers to assess surveys from adjacent areas and it also allows some meaningful calculation of the actual sample size surveyed. The *actual* or *effective* area surveyed by a study depends on the conditions of ground surface visibility. Conditions of surface visibility are affected by vegetation cover, geomorphological processes such as sedimentation and erosion rates and the abundance of natural rock that may obscure the remains of cultural activities.

Approximately 27 % of the ground surface within each work area was inspected, with an effective coverage of 19 % (Table 3). This is a relatively high coverage and is largely due to the intensive nature of the foot survey, the small sizes of the survey areas and the generally excellent conditions of surface visibility.

Table 3. Effective coverage of the proposed in-stream infrastructure work areas.

Location	Area	Visibility	Coverage		Effective coverage		Aboriginal cultural heritage sites
	(m ²)	(%)	(m ²)	(%)	(m ²)	(%)	
Chapel Hut Crossing	40,000	80	8,000	20	6,400	16	
Chapel Hut by-wash	40,000	80	8,000	20	6,400	16	
Willotia Crossing dam	40,000	70	8,000	20	5,600	14	1
Willotia Crossing by-wash	40,000	80	8,000	20	6,400	16	
Warwicks Crossing	40,000	70	9,600	24	6,720	17	1
Warwicks Crossing by-wash	40,000	60	8,000	20	4,800	12	2
Junction dam by-wash	40,000	80	11,200	28	8,960	22	
Newhouse dam alternative causeway	40,000	80	8,000	20	6,400	16	
Bonds Windmill dam	40,000	70	8,000	20	5,600	14	1
Ridges dam	40,000	60	8,000	20	4,800	12	
Cuthero dam	40,000	80	20,000	50	16,000	40	2
Moola pipeline crossing	40,000	80	6,000	15	4,800	12	
Patagorah main dam	40,000	70	16,000	40	11,200	28	
Patagorah main dam by-wash	40,000	70	8,000	20	5,600	14	1
Patagorah main dam alternative causeway	40,000	70	24,000	60	16,800	42	2
Woodlands by-wash	40,000	80	8,000	20	6,400	16	
Old Willow Point bridge	40,000	60	8,000	20	4,800	12	
Willow Point dam	40,000	50	8,000	20	4,000	10	
Windamingle pipeline crossing	40,000	80	6,000	15	4,800	12	
Nindethana dam	40,000	60	12,000	30	7,200	18	1
Duck Pool middle by-wash	40,000	50	12,000	30	6,000	15	
Duck Pool east by-wash	40,000	50	9,600	24	4,800	12	
Toora by-wash	40,000	80	20,000	50	16,000	40	
Watara by-wash (west)	40,000	70	8,000	20	5,600	14	1
Watara by-wash (east)	40,000	70	8,000	20	5,600	14	1
Bells Camp main dam	40,000	70	8,000	20	5,600	14	
Bells Camp main dam alternative causeway	40,000	70	24,000	60	16,800	42	2
Bells Camp middle blockbank	40,000	80	20,000	50	16,000	40	1
Bells Camp by-wash (west)	40,000	70	6,000	15	4,200	11	
Bingo main dam alternative causeway	40,000	60	8,000	20	4,800	12	1
Bingo by-wash	40,000	60	8,000	20	4,800	12	
Tara Downs main dam	40,000	60	6,000	15	3,600	9	
Tara Downs middle by-wash	40,000	80	20,000	50	16,000	40	1
Tara Downs west by-wash	40,000	80	12,000	30	9,600	24	
Total	1,360,000		370,400	(27 %)	263,080	(19 %)	18

9 Results

9.1 Previously recorded cultural heritage sites

A stone artefact scatter and hearth site complex (DECC Site Number 39-2-0069) has previously been recorded in the proposed work area of Patagorah main dam (Cupper 2004a). This site covers an area of some 25 x 25 m and is located on the east bank of the Darling Anabranh on the approach to the in-stream structure. The site consists of a scatter of silcrete, chert and quartz flakes, scattered baked clay heat retainers, including dispersed charcoal from hearths, and some fragments of freshwater mussel shell.

A black box tree possibly modified by Aboriginal people (DECC Site Number 39-5-0072) is located on the west bank of the Darling Anabranh about 20 m southwest of Tara Downs main dam, a structure proposed to be removed (Cupper 2004a). An isolated find of a broken quartzite grindstone (DECC Site Number 39-5-0059) is also located in this area (Cupper 2004a). The isolated find is about 30 m southeast of Tara Downs middle by-wash, which is proposed to be removed.

Two stone artefact scatter/hearth complexes are located about 50 m south of the proposed low-level rock ford/causeway at the Moola pipeline crossing on Manilla Station (DECC Site Numbers 39-2-0100, 39-2-0102) (Cupper 2004b).

9.2 Newly identified cultural heritage sites

Eighteen Aboriginal archaeological sites (DA161—DA171, DA173—DA179) are located within or near proposed in-stream infrastructure work areas (Figure 4):

- DA161, DA162 – scatters of stone artefacts, scattered baked clay heat retainers and *in situ* hearths on sandplains near Warwicks Crossing by-wash.
- DA163 – a scatter of stone artefacts, scattered baked clay heat retainers and *in situ* hearths and freshwater mussel shell midden on the bank of Redbank Creek near Willotia Crossing dam.
- DA164, DA165 – black box trees possibly scarred by Aborigines on the riverbank of the Darling Anabranh near Watara by-wash (west) and Watara by-wash (east).
- DA166, DA167 – scatters of stone artefacts, scattered baked clay heat retainers and *in situ* hearths on the riverbank of the Darling Anabranh near Patagorah main dam alternative causeway.
- DA168 – a scatter of stone artefacts, scattered baked clay heat retainers and *in situ*

hearths on the Darling Anabranh riverbank near Patagorah main dam by-wash.

- DA169 – a scatter of stone artefacts, scattered baked clay heat retainers and *in situ* hearths on the Darling Anabranh riverbank near Nindethana dam.
- DA170, DA171 – scatters of stone artefacts, scattered baked clay heat retainers and *in situ* hearths on the Darling Anabranh riverbank near Bells Camp main dam alternative causeway. DA171 also contained a black box tree possibly modified by Aborigines.
- DA173 – a freshwater mussel shell midden on the Darling Anabranh riverbank near Bingo main dam alternative causeway.
- DA174 – scattered baked clay heat retainers on an alluvial terrace of the Darling Anabranh near Warwicks Crossing.
- DA175 – a freshwater mussel shell midden on the Darling Anabranh riverbank near Bonds Windmill dam.
- DA176 – a black box tree possibly scarred by Aborigines on the riverbank of the Darling Anabranh near Tara Downs middle by-wash.
- DA177 – a scatter of stone artefacts and scattered baked clay heat retainers on the Darling Anabranh riverbank near Bells Camp middle blockbank.
- DA178, DA179 – scatters of stone artefacts and scattered baked clay heat retainers on the Darling Anabranh riverbank near Cuthero dam. Site DA178 also contained a freshwater mussel shell midden.

A summary of the sites is presented in Tables 4 and 5. A more detailed description of these sites is included in Attachment 1.

No historical cultural heritage sites were identified in the proposed work areas.

Table 4. Summary data of the possible Aboriginal modified trees within and near the proposed in-stream infrastructure work areas.

Site name	Location (GDA)	Tree taxon	Tree height (m)	DBH (m)	Scar length (m)	Scar width (m)	Height above ground (m)	Orient-ation	Scar type	Scar cond.
DA164	569826, 6263694	Black box	~10	0.80	1.50	0.40	0.30	S	Dish	Good
DA165	569929, 6263810	Black box	~12	0.90	0.85	0.15	1.00	S	Dish	Good
DA171	573498, 6259883	Black box	~8	0.70	1.20	0.25	0.50	SW	Dish	Good
DA176	568509, 6243853	Black box	~15	1.00	1.00	0.20	0.70	SW	Dish	Good

Table 5. Summary data of the Aboriginal cultural heritage sites within and near the proposed in-stream infrastructure work areas.

Site name	Type	GDA (mE)	GDA (mN)	Site dimensions (m)	Landform	Contents
DA161	Stone artefact, hearth	606483	6365032	50 x 50	Sandplain	67 silcrete artefacts, 4 <i>in situ</i> hearths, scattered baked clay heat retainers
DA162	Stone artefact, hearth	606432	6364991	50 x 50	Sandplain	1 quartzite artefact, 33 silcrete artefacts, 3 <i>in situ</i> hearths, scattered baked clay heat retainers
DA163	Stone artefact, hearth, shell midden	605859	6367762	300 x 100	Alluvial terrace	2 sandstone artefacts, 145 silcrete artefacts, 1 <i>in situ</i> hearth, scattered baked clay heat retainers, freshwater mussel shell valves and shell fragments
DA166	Stone artefact, hearth	573729	6321527	25 x 25	Alluvial terrace	1 sandstone artefact, 5 silcrete artefacts, 1 <i>in situ</i> hearth, scattered baked clay heat retainers
DA167	Stone artefact, hearth	573751	6321497	10 x 10	Alluvial terrace	1 chert artefact, 7 silcrete artefacts, scattered baked clay heat retainers
DA168	Stone artefact, hearth	572226	6322745	20 x 20	Alluvial terrace	1 sandstone artefact, 7 silcrete artefacts, 2 <i>in situ</i> hearths, scattered baked clay heat retainers
DA169	Stone artefact, hearth	571032	6288880	50 x 50	Alluvial terrace	39 silcrete artefacts, 1 <i>in situ</i> hearth, scattered baked clay heat retainers
DA170	Stone artefact, hearth	573403	6259905	50 x 50	Alluvial terrace	1 sandstone artefact, 4 chert artefacts, 19 silcrete artefacts, 1 <i>in situ</i> hearth with charcoal, scattered baked clay heat retainers
DA171	Stone artefact, hearth, possible modified tree	573498	6259883	50 x 50	Alluvial terrace	1 quartzite artefact, 4 sandstone artefacts, 9 silcrete artefacts, 1 <i>in situ</i> hearth, scattered baked clay heat retainers
DA173	Shell midden	567992	6248247	20 x 20	Alluvial terrace	Freshwater mussel shell fragments
DA174	Hearth	607430	6364330	50 x 50	Alluvial terrace	Scattered baked clay heat retainers
DA175	Shell midden	598672	6347783	10 x 10	Alluvial terrace	Freshwater mussel shell fragments
DA177	Stone artefact, hearth	570983	6257515	20 x 20	Alluvial terrace	5 silcrete artefacts, scattered baked clay heat retainers
DA178	Stone artefact, hearth, shell midden	593894	6339196	100 x 50	Alluvial terrace	5 sandstone, 175 silcrete, 32 chert, 4 quartz artefacts, scattered baked clay heat retainers, freshwater mussel shell fragments
DA179	Stone artefact, hearth	594047	6339099	20 x 20	Alluvial terrace	23 silcrete, 9 chert, 2 quartz artefacts, scattered baked clay heat retainers

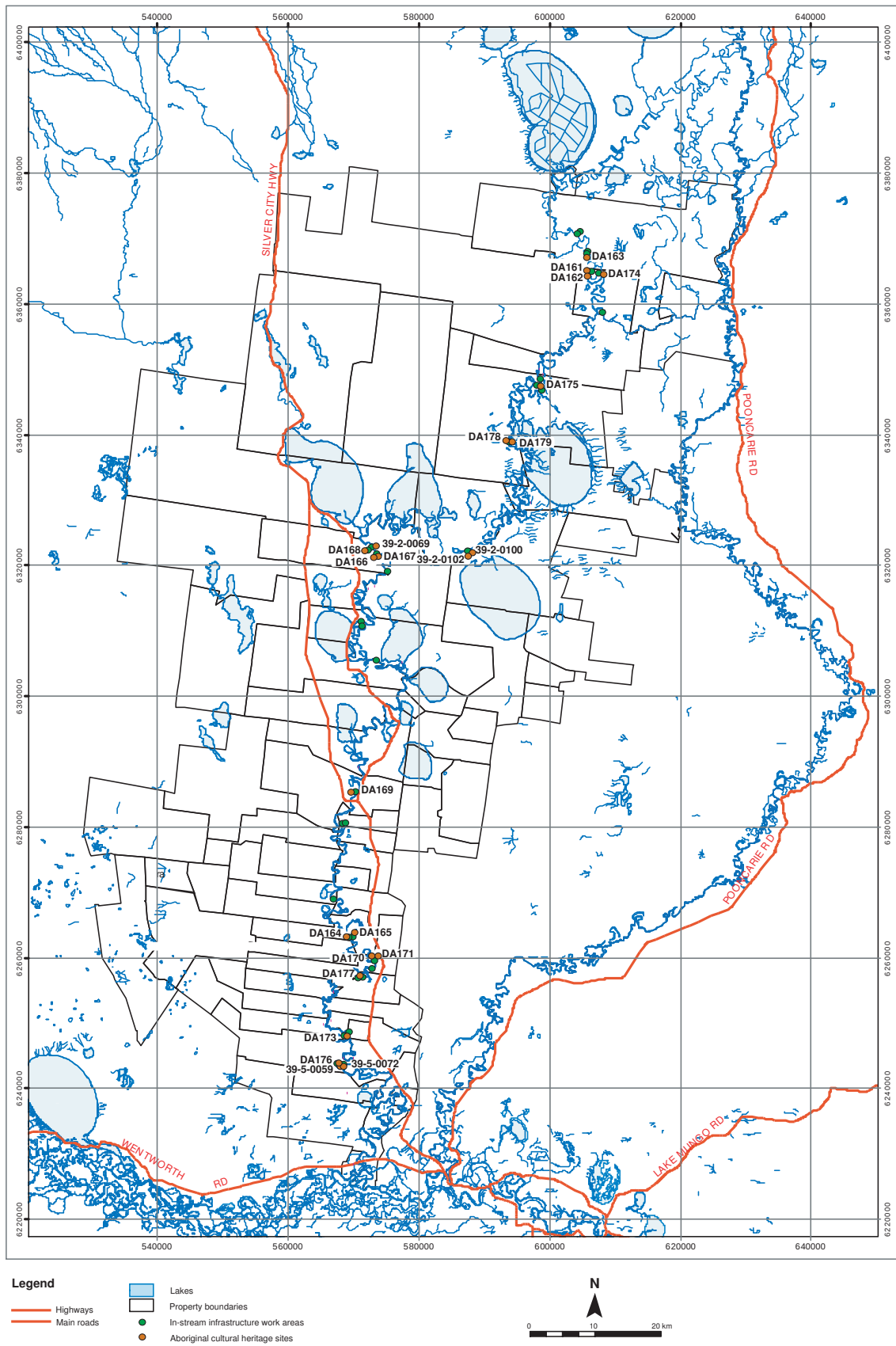


Figure 4. Aboriginal cultural heritage sites within and near the proposed in-stream infrastructure work areas.

10 Assessment of significance

The significance of Aboriginal archaeological sites such as those found during this study are usually assessed in terms of their importance to archaeologists (ie. their scientific or research significance), their importance to Aboriginal people and their importance to the general public. Once the significance of a site has been assessed it can be ranked against others and specific recommendations formulated. Criteria for assessing scientific significance are set out below. The values used in this assessment have been the subject of some discussion in the archaeological literature and the information provided is drawn from a number of sources (eg. Bowdler 1983).

A summary of the archaeological significance assessment of the sites is presented in Table 6.

10.1 Scientific significance

A number of criteria are used to assess the scientific significance of a site. These include the integrity of a site, its structure and contents. All of these criteria combine to give a site its value as a research tool for archaeologists. In addition to the above criteria a site may also be of scientific significance because of its representativeness or rarity. It is a basic tenet of archaeology that any site which is not represented elsewhere is of great value because archaeologists are concerned with preserving a representative sample of all site types for future generations.

10.1.1 Site integrity

Site integrity refers to its state of preservation or condition. A site can be disturbed through a number of factors including natural erosional processes, destructive land use practices or repeated use of a site in the past by both humans and animals.

Low	highly disturbed or poorly preserved with little research potential.
Moderate	some disturbance but remaining cultural material allows for some research potential.
High	little or no disturbance to site, good preservation and considerable research potential.

In terms of site integrity the sites located during this survey would rate moderate to low. This assessment is based on the degree of disturbance noted during the investigation. All of the stone artefact scatter, shell midden and hearth sites are located near the Darling Anabranh or Redbank Creek and have been disturbed by repeated traffic of

hooved animals and vehicles, coupled with erosion by water. The possible Aboriginal modified trees are in good condition. The possibility that the scars on the trees are natural in origin, however, limits their research potential.

10.1.2 Site structure

Site structure refers to the physical dimensions of a site (ie. its area and depth or stratification). A large site or a site with stratified deposits usually has more research potential than a small site or surface scatter. In some instances, however, specific research questions may be aimed at smaller sites in which case they would be rated at a higher significance than normal.

Low	small surface scatters with no stratified deposit.
Moderate	medium to large surface scatters with or without stratification.
High	large <i>in situ</i> surface scatters, any site with stratified deposit.

Most of the stone artefact scatter, shell midden and hearth sites are medium in size and have a moderate site structure. The midden deposits at DA163 and DA173 may be stratified in the riverbank. Many of the sites also have *in situ* hearths, at least one of which (DA170) contains charcoal. The surfaces of all these sites are degrading and most artefacts form a lag deposit on deflated surfaces.

This criterion does not apply to the modified trees.

10.1.3 Site contents

Site contents refers to the range and type of occupation debris found in a site. Generally, sites that contain a large and varied amount of organic and non-organic material are considered to have greater research potential than those sites with small, uniform artefacts.

Low	small amount and low diversity of cultural material.
Moderate	medium amount and diversity of cultural material.
High	large and diverse amount of cultural material.

The original cultural materials of the sites recorded during the survey have been exposed to weathering. Although typically only stone artefacts and heat retainers remain, organic materials preserved at some sites include freshwater mussel shells (DA163, DA173, DA175, DA178) and charcoal (DA170). Stone artefacts are mainly of silcrete, although quartz, quartzite, sandstone and chert artefacts were also recorded. Formal tool types are not prevalent, but include groundstone implements. The stone artefact

assemblage is dominated by unmodified flakes and flaked pieces. Artefact density at these sites is typically relatively low.

Most of the stone artefact scatter and hearth sites rate moderate by the site contents criterion. Sites DA163, DA173, DA175 and DA178 with shell middens could be valuable for studies of human subsistence strategies (eg. Balme and Hope 1990, Balme 1995) and rate high to moderate. Charcoal preserved in hearths may be useful for radiocarbon dating. Hearths could also be dated by luminescence.

This criterion does not apply to modified trees.

10.1.4 Site representativeness and rarity

Representativeness or *rarity* refers to how often a particular site type occurs in an area and requires some knowledge of the background archaeology of the area in which the study is being undertaken. Sites that are representative of the local and regional archaeological record may have value for that reason and if a site is rare or unique in some way then it is *ipso facto* significant (Bowdler 1983).

Low	many of the same site type occurring in a single area or region.
Moderate	site type occurs elsewhere but not in great quantity or with good preservation.
High	site type is rare or unique.

On the basis of the results of previous archaeological investigations (eg. Bonhomme Craib and Associates 1999, Cupper 2004a, 2004b, 2005, 2006a, 2006b) and information held on the NSW DECC AHIMS site register it is clear that stone artefact scatters, shell middens, hearths and modified trees are widespread in the region. The types of archaeological sites located during this study are therefore generally not unique and are well represented outside the study area.

Due to their larger size and higher artefact density and diversity, sites DA161—DA163, DA169—DA171, DA178 are less common and rate moderate according to the site representativeness criterion.

10.2 Educational significance

The value of archaeological sites to the general public is generally assessed by their potential to educate the public about the Aboriginal past. Most of the sites rank low by this criterion. Most are isolated and unlikely to attract interest in Aboriginal heritage.

10.3 Aboriginal significance

The significance of a site is not restricted to its scientific or research value. The views of Aboriginal people on the significance of archaeological sites are also important. Their perceptions usually stem from traditional, cultural and educational beliefs although most local Aboriginal communities also value the scientific information that archaeological sites may be able to provide.

Archaeological sites provide connections to the past for the present Aboriginal community and for future generations. Aboriginal cultural heritage sites such as those identified during this survey can also provide information about past lifestyles and strengthen the links between Aboriginal people and the land.

The level of significance attributed to individual sites may vary according to a number of factors including the nature and integrity of the heritage items and the landscape in which the site is located. Any comprehensive assessment of the Aboriginal significance of the archaeological sites would need to be obtained from wider consultation with the Aboriginal community. (Such detailed statements of Aboriginal significance are necessary when developers apply for NSW *National Parks and Wildlife Act 1974* Section 90 Consents, for example). The views of the Aboriginal representatives involved in the field survey are indicative of Aboriginal community attitudes, however.

Generally, the Aboriginal representatives viewed all the archaeological sites located during the survey as significant because they preserve a record of how and where people lived in the past. Such cultural heritage sites also stand as testimony to the continuation of Aboriginal culture and association with the land.

Table 6. Assessment of significance of the Aboriginal cultural heritage sites.

Site name	Type	Significance		
		Scientific	Educational	Aboriginal (preliminary)
DA161	Stone artefact, hearth	Moderate	Low	(Moderate)
DA162	Stone artefact, hearth	Moderate	Low	(Moderate)
DA163	Stone artefact, hearth, shell midden	Moderate-high	Low	(Moderate)
DA164	Possible modified tree	Low	Low	(Moderate)
DA165	Possible modified tree	Low	Low	(Moderate)
DA166	Stone artefact, hearth	Low-moderate	Low	(Moderate)
DA167	Stone artefact, hearth	Low-moderate	Low	(Moderate)
DA168	Stone artefact, hearth	Low-moderate	Low	(Moderate)
DA169	Stone artefact, hearth	Low-moderate	Low	(Moderate)
DA170	Stone artefact, hearth	Moderate	Low	(Moderate)
DA171	Stone artefact, hearth, possible modified tree	Moderate	Low	(Moderate)
DA173	Shell midden	Moderate	Low	(Moderate)
DA174	Hearth	Low	Low	(Moderate)
DA175	Shell midden	Moderate	Low	(Moderate)
DA176	Possible modified tree	Low	Low	(Moderate)
DA177	Stone artefact, hearth	Low-moderate	Low	(Moderate)
DA178	Stone artefact, hearth, shell midden	Moderate-high	Low	(Moderate)
DA179	Stone artefact, hearth	Moderate	Low	(Moderate)

11 Aboriginal concerns

Aboriginal people of southwestern NSW are concerned about any development that might impact upon Aboriginal sites on land that is traditionally theirs. All land has high cultural significance for individual Aboriginal people and for the Aboriginal community collectively. It should also be noted that any development upon, or disturbance of land is contrary to principal Aboriginal beliefs regarding land, its values and its inherent cultural significance.

Liaison with the local Aboriginal community involved discussions with Barkindji Elders Gary Abdullah, Kingsley Abdullah, Tim Abdullah, Evelyn Bates, Harold Bates, Elsie Coombs, Evelyn Crawford, Marietta Files, Noel Johnson, Sheila Kirby, Cora Lawson, Lottie Lawson, Ray Lawson, Patricia Quayle, Dawn Smith and Roland Smith. Discussions were also held with other local Aboriginal people, including Dale Doyle, Maggie Doyle, David Egan and Michael Mitchell. Aboriginal representatives Evelyn Bates, Harold Bates, Noel Johnson, Ray Lawson, Alex Pappin and Roland Smith participated in the field survey. Elsie Coombs, Evelyn Crawford, Dale Doyle, Maggie Doyle, David Egan, Marietta Files, Cora Lawson, Lottie Lawson, Michael Mitchell, Patricia Quayle, Dawn Smith and Rex Smith also accompanied the project archaeologist in the field to inspect some of the sites.

This report was discussed with the Aboriginal representatives and draft copies were given to the Barkindji Elders for comment.

The Aboriginal community is particularly concerned about the preservation of Aboriginal archaeological sites. They wish to see that the cultural heritage places and items within and near the proposed work areas are properly protected during and after the construction phase of the development. This may include erecting temporary barriers around sites, or modifying the proposed infrastructure so that cultural heritage values are not impacted. The Aboriginal community representatives are also concerned about potential damage to cultural heritage sites by heavy vehicles accessing the proposed work areas.

The Aboriginal community requested that Barkindji representatives are engaged as site monitors during earthwork activities during the construction phase of the project to ensure that cultural heritage is not impacted by the works. They endorsed the recommendation (section 12) that the proponent should apply for a NSW *National Parks and Wildlife Act 1974* Section 87 Permit to allow isolated midden shell, hearthstones/heat retainers or stone artefacts to be moved from zones of potential disturbance to nearby locations outside the work areas. They also requested that the

proponent develop a cultural heritage management protocol that clearly details the procedures to be followed during the construction and operational phases of the proposed developments to avoid disturbing cultural heritage. This should include a strategy of staff education and training.

12 Recommendations

The following recommendations are based on the results of this investigation and consultation with representatives of the Barkindji Aboriginal community.

12.1 Specific site management recommendations

Generally, it is recommended that where cultural heritage sites are within the zones of anticipated direct impact from the proposed infrastructure, the design of works should be modified to remove the threat of disturbing archaeological resources. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a NSW *National Parks and Wildlife Act* 1974 Section 87 Permit.

Cultural heritage sites near the proposed developments are considered susceptible to direct or indirect impacts from the proposed developments. In these cases, disturbance should be avoided, possibly by erecting temporary barrier fences around the sites during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barriers.

Specific recommendations for each of the Aboriginal archaeological sites located within and near the proposed in-stream infrastructure work areas are provided in Tables 7—13 below. For further management details refer to Attachment 1.

Table 7. Specific site management strategies for Aboriginal cultural heritage sites within and near the proposed in-stream infrastructure work areas.

Site name	Type	Location	Potential impacts	Proposed activity	Management recommendations
DA161	Stone artefact, hearth	~100 m W of Warwicks Crossing by-wash	Indirect	Removal of existing in-stream structure and construction of low-level crossing	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the east.
DA162	Stone artefact, hearth	~100 m W of Warwicks Crossing by-wash	Indirect	Removal of existing in-stream structure and construction of low-level crossing	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the east.
DA163	Stone artefact, hearth, shell midden	~20 m S of Willotia Crossing dam	Indirect	Removal of existing in-stream structure	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the north.
DA164	Possible modified tree	~50 m W of Watara by-wash (west)	Indirect	Removal of existing in-stream structure and construction of low-level crossing	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks.
DA165	Possible modified tree	~50 m NE of Watara by-wash (east)	Indirect	Removal of existing in-stream structure and construction of low-level crossing	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks.

Table 8. Specific site management strategies for Aboriginal cultural heritage sites within and near the proposed in-stream infrastructure work areas.

Site name	Type	Location	Potential impacts	Proposed activity	Management recommendations
DA166	Stone artefact, hearth	~5 m SW of Patagorah main dam alternative causeway	Direct	Construction of low-level crossing	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the north. The design of works should be modified so that the low-level crossing is not installed near any cultural heritage places or items. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a NSW NP&W Act 1974 Section 87 Permit.
DA167	Stone artefact, hearth	~5 m SE of Patagorah main dam alternative causeway	Direct	Construction of low-level crossing	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the north. The design of works should be modified so that the low-level crossing is not installed near any cultural heritage places or items. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a NSW NP&W Act 1974 Section 87 Permit.

Table 9. Specific site management strategies for Aboriginal cultural heritage sites within and near the proposed in-stream infrastructure work areas.

Site name	Type	Location	Potential impacts	Proposed activity	Management recommendations
DA168	Stone artefact, hearth	~5 m S of Patagorah main dam by-wash	Direct	Removal of existing in-stream structure	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the north. Only those sections of the in-stream infrastructure not near any cultural heritage places or items are removed. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a NSW <i>NP&W Act 1974</i> Section 87 Permit.
DA169	Stone artefact, hearth	~5 m W of Ninde-tha na dam	Direct	Removal of existing in-stream structure	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the east. Only those sections of the in-stream infrastructure not near any cultural heritage places or items are removed. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a NSW <i>NP&W Act 1974</i> Section 87 Permit.

Table 10. Specific site management strategies for Aboriginal cultural heritage sites within and near the proposed in-stream infrastructure work areas.

Site name	Type	Location	Potential impacts	Proposed activity	Management recommendations
DA170	Stone artefact, hearth	~5 m NW of Bells Camp main dam alternative causeway	Direct	Construction of low-level crossing	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the south. The design of works should be modified so that the low-level crossing is not installed near any cultural heritage places or items. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a NSW NP&W Act 1974 Section 87 Permit.
DA171	Stone artefact, hearth, possible modified tree	~5 m NE of Bells Camp main dam alternative causeway	Direct	Construction of low-level crossing	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the south. The design of works should be modified so that the low-level crossing is not installed near any cultural heritage places or items. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a NSW NP&W Act 1974 Section 87 Permit.

Table 11. Specific site management strategies for Aboriginal cultural heritage sites within and near the proposed in-stream infrastructure work areas.

Site name	Type	Location	Potential impacts	Proposed activity	Management recommendations
DA173	Shell midden	~50 m S of Bingo main dam alternative causeway	Indirect	Construction of low-level crossing	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the north and re-routed away from any cultural heritage places or items.
DA174	Hearth	~100 m SE of Warwicks Crossing	Indirect	Removal of existing in-stream structure	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks.
DA175	Midden	~20 m E of Bonds Windmill dam	Indirect	Removal of existing in-stream structure	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the west and re-routed away from any cultural heritage places or items.
DA176	Possible modified tree	~20 m N of Tara Downs middle by-wash	Indirect	Removal of existing in-stream structure	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks.

Table 12. Specific site management strategies for Aboriginal cultural heritage sites within and near the proposed in-stream infrastructure work areas.

Site name	Type	Location	Potential impacts	Proposed activity	Management recommendations
DA177	Stone artefact, hearth	~5 m SW of Bells Camp middle blockbank	Direct	Removal of existing in-stream structure	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the northeast. Only those sections of the in-stream infrastructure not near any cultural heritage places or items are removed. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a NSW NP&W Act 1974 Section 87 Permit.
DA178	Stone artefact, hearth, midden	~80 m NW of Cuthero dam	Indirect	Removal of existing in-stream structure	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the northeast and re-routed away from any cultural heritage places or items.
DA179	Stone artefact, hearth	~100 m E of Cuthero dam	Indirect	Removal of existing in-stream structure	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the northeast and re-routed away from any cultural heritage places or items.

Table 13. Specific site management strategies for Aboriginal cultural heritage sites within and near the proposed in-stream infrastructure work areas.

Site name	Type	Location	Potential impacts	Proposed activity	Management recommendations
DECC 39-5-0072	Possible modified tree	~20 SW of Tara Downs main dam	Indirect	Removal of existing in-stream structure	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks.
DECC 39-2-0069	Stone artefact, hearth	~5 m NE of Patagorah main dam	Direct	Removal of existing in-stream structure	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Only those sections of the in-stream infrastructure not near any cultural heritage places or items are removed. Access to the work area should be from the southwest and re-routed away from any cultural heritage places or items.
DECC 39-2-0100, 39-2-0102	Stone artefact, hearth	~50 m S of Moola pipeline crossing	Indirect	Construction of low-level crossing	Avoid disturbing the sites, possibly by erecting temporary barriers around them when works are occurring in their vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks.
DECC 39-5-0059	Stone artefact	~30 m SE of Tara Downs middle by-wash	Indirect	Removal of existing in-stream structure	Avoid disturbing the site, possibly by erecting a temporary barrier around it when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks.

12.2 General recommendations

Based on the results of this cultural heritage investigation and consultation with representatives of the Barkindji Aboriginal communities of the Dareton-Wentworth and Menindee regions, in addition to the specific site management strategies proposed in section 12.1, it is recommended that:

- removal of the existing in-stream structures be allowed to proceed. Aboriginal representatives of the Barkindji Elders should be engaged as site monitors during the construction phase of the project to ensure that archaeological resources are not impacted by the works. At least one Aboriginal representative should be on site when construction activities involving earthworks are occurring in the vicinity of known cultural heritage places or items.
- access to the work areas should be from those sides of the Darling Anabranch not near cultural heritage sites. Vehicles should adhere to existing access tracks. Parking and lay-down areas and storage compounds should similarly not be located near cultural heritage sites.
- the proponent should apply for a NSW *National Parks and Wildlife Act 1974* Section 87 Permit to potentially move any isolated midden shell, hearthstones/heat retainers or stone artefacts that may occur within the proposed work areas to nearby locations outside the zones of disturbance.
- the proponent continues to consult with the Barkindji Elders Committee and other relevant local Aboriginal community members in matters pertaining to the project;
- the proponent develop a Cultural Heritage Management Protocol prior to the commencement of construction, which documents the procedures to be followed for impact avoidance or mitigation. Personnel involved in the construction and management phases of the project should be trained in procedures to recognise and avoid disturbance to cultural heritage places and items.
- if any previously unidentified Aboriginal or historical cultural heritage places or items that are not isolated midden shell, hearthstones/heat retainers or stone artefacts are encountered during the course of the proposed development all works likely to affect the material must cease immediately. The Climate Change and Environment Protection Authority of NSW DECC, the Barkindji Elders Committee, the Menindee Barkindji Elders Council or the NSW Heritage Office should be consulted about an appropriate course of action prior to recommencement of work. It is an offence under

the relevant acts to disturb or destroy Aboriginal or historic relics without written consent of the relevant statutory authorities.

- if human skeletal remains are encountered during the course of the development all work in that area must cease. Remains must not be handled or otherwise disturbed except to prevent further disturbance. If the remains are thought to be less than 100 years old the Police or the State Coroners Office (tel: 02 9552 4066) must be notified. If there is reason to suspect that the skeletal remains are more than 100 years old and Aboriginal, the proponent should contact the NSW DECC zone archaeologist (tel: 03 5021 8914) for advice.

Copies of this report should be supplied to:

Mr Harvey Johnston
Zone Archaeologist
Climate Change and Environment Protection Authority
NSW Department of Environment and Climate Change
PO Box 318
Buronga NSW 2739
(3 copies)

Mr Randell Blair
Aboriginal Heritage Conservation Officer
National Parks and Wildlife Service
NSW Department of Environment and Climate Change
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Ms Evelyn Crawford
Chairperson
Barkindji Elders Committee
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Attachment A

Description of Aboriginal archaeological sites

Darling Anabranh (DA) 161

Site type: Stone artefact, hearth.

Location: Site is approximately 80 km from Menindee via Tandou Road. Turn off Tandou Road 54 km SW of Menindee into track to Wycot Station and follow track S along Redbank Creek towards Warwicks Crossing. Site is ~100 m W of Warwicks Crossing by-wash on an elevated sandplain adjacent to Redbank Creek.

Grid reference: GDA 606483 mE, 6365032 mN Lake Tandou 7332 1:100,000 topographic map

Environmental setting: The site is located on the regional sandplain abutting the Redbank Creek floodplain. Black box open woodland and prickly wattle grows on the sandplain.

Aspect: Easterly

Site size: Artefacts were visible over an area 50 x 50 m (ie. 2500 m²).

Visibility: Site surface visibility was very high (~60%) due to erosion by deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~50%) due to erosion by wind, water and stock and vehicular traffic.

Site contents: 67 silcrete artefacts, 4 *in situ* hearths of baked clay heat retainers and scattered baked clay heat retainers occur at the site (Table A1, Figure A1).

Table A1. Artefact attributes from Aboriginal archaeological site DA161.

Material	Type	Retouch	Platform type	Shape	L	W	T
Silcrete	Flake	na	Unifacial	Expanded	23	13	5
Silcrete	Flake	na	Unifacial	Expanded	37	19	8
Silcrete	Flake	na	Unifacial	Expanded	41	33	9
Silcrete	Flake	na	Unifacial	Intermediate	23	19	11
Silcrete	Flaked piece	na	na	na	51	41	12
Silcrete	Flake	na	Unifacial	Elongate	18	13	5
Silcrete	Flake	na	Unifacial	Intermediate	36	29	10
Silcrete	Angul. Frag.	na	na	na	34	18	12
Silcrete	Flake	na	Unifacial	Elongate	34	25	9
Silcrete	Flake	na	Unifacial	Expanded	27	19	6
Silcrete	Flake	na	Unifacial	Intermediate	28	23	9

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.



Figure A1. Stone artefact scatter and hearth site DA161.

Management considerations: The site is approximately 100 m W of Warwicks Crossing by-wash, which is proposed to be removed. The proponent should avoid disturbing the site, possibly by erecting a temporary barrier fence around it during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barrier. Access to the work area should be from the east. The proponent should also engage Aboriginal site monitors to oversee construction activities involving earthworks in the vicinity of the site.

Darling Anabranh (DA) 162

Site type: Stone artefact, hearth.

Location: Site is approximately 80 km from Menindee via Tandou Road. Turn off Tandou Road 54 km SW of Menindee into track to Wycot Station and follow track S along Redbank Creek towards Warwicks Crossing. Site is ~100 m W of Warwicks Crossing by-wash on an elevated sandplain adjacent to Redbank Creek.

Grid reference: GDA 606432 mE, 6364991 mN Lake Tandou 7332 1:100,000 topographic map

Environmental setting: The site is located on the regional sandplain abutting the Redbank Creek floodplain. Black box open woodland and prickly wattle grows on the sandplain.

Aspect: Southeasterly

Site size: Artefacts were visible over an area 50 x 50 m (ie. 2500 m²).

Visibility: Site surface visibility was very high (~60%) due to erosion by deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~50%) due to erosion by wind, water and stock and vehicular traffic.

Site contents: 1 quartzite artefact, 33 silcrete artefacts, 3 *in situ* hearths of baked clay heat retainers and scattered baked clay heat retainers occur at the site (Table A2, Figure A2).

Table A2. Artefact attributes from Aboriginal archaeological site DA162.

Material	Type	Retouch	Platform type	Shape	L	W	T
Silcrete	Flake	na	Unifacial	Intermediate	36	32	13
Silcrete	Core	na	na	na	47	39	29
Silcrete	Flaked piece	na	na	na	27	27	14
Quartzite	Hammerstone or pestle	na	na	Broken	49	28	13
Silcrete	Flake	na	Unifacial	Intermediate	21	19	7
Silcrete	Flake	na	Unifacial	Elongate	31	22	7
Silcrete	Flake	na	Unifacial	Intermediate	41	36	9
Silcrete	Angul. Frag.	na	na	na	28	16	10
Silcrete	Flake	na	Unifacial	Intermediate	27	25	9
Silcrete	Flaked piece	na	na	na	27	22	9
Silcrete	Flaked piece	na	na	na	20	19	14
Silcrete	Angul. Frag.	na	na	na	19	10	10
Silcrete	Flake	na	Unifacial	Intermediate	29	26	4



Figure A2. Stone artefact scatter and hearth site DA162.

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.

Management considerations: The site is approximately 100 m W of Warwicks Crossing by-wash, which is proposed to be removed. The proponent should avoid disturbing the site, possibly by erecting a temporary barrier fence around it during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barrier. Access to the work area should be from the east. The proponent should also engage Aboriginal site monitors to oversee construction activities involving earthworks in the vicinity of the site.

Darling Anabranh (DA) 163

Site type: Stone artefact, hearth, shell midden.

Location: Site is approximately 75 km from Menindee via Tandou Road. Turn off Tandou Road 54 km SW of Menindee into track to Willotia Station and follow track S along Redbank Creek towards Willotia Crossing. Site is ~30 m S of crossing on an elevated sandplain adjacent to Redbank Creek.

Grid reference: GDA 605859 mE, 6367762 mN Lake Tandou 7332 1:100,000 topographic map

Environmental setting: The site is located on the regional sandplain abutting the Redbank Creek floodplain. Black box open woodland and prickly wattle grows on the sandplain.

Aspect: Northerly

Site size: Artefacts were visible over an area 300 x 100 m (ie. 30000 m²).

Visibility: Site surface visibility was very high (~60%) due to erosion by deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~50%) due to erosion by wind, water and stock and vehicular traffic.

Site contents: 2 sandstone artefacts, 145 silcrete artefacts, 1 *in situ* hearth of baked clay heat retainers and scattered baked clay heat retainers occur at the site (Table A3). Freshwater mussel shell valves and shell fragments are also eroding from the present land surface (Figure A3).

Table A3. Artefact attributes from Aboriginal archaeological site DA163.

Material	Type	Retouch	Platform type	Shape	L	W	T
Sandstone	Millstone	na	na	Broken	180	110	35
Silcrete	Flaked piece	na	na	na	41	28	18
Silcrete	Flaked piece	na	na	na	28	27	23
Silcrete	Flake	na	Unifacial	Intermediate	32	28	8
Silcrete	Core	na	na	na	37	27	19
Silcrete	Angul. Frag.	na	na	na	12	11	9
Silcrete	Angul. Frag.	na	na	na	23	22	11
Silcrete	Angul. Frag.	na	na	na	31	23	13
Silcrete	Flake	na	Unifacial	Intermediate	29	26	9
Silcrete	Flake	na	Unifacial	Expanded	33	26	5
Silcrete	Flake	na	Unifacial	Elongate	27	16	4
Silcrete	Flake	na	Unifacial	Elongate	29	21	6



Figure A3. Stone artefact scatter, hearth and shell midden site DA163.

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.

Management considerations: The site is approximately 20 m S of Willotia Crossing dam, which is proposed to be removed. The proponent should avoid disturbing the site, possibly by erecting a temporary barrier fence around it during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barrier. Access to the work area should be from the north. The proponent should also engage Aboriginal site monitors to oversee construction activities involving earthworks in the vicinity of the site.

Darling Anabranh (DA) 164

Site type: Possible modified tree.

Location: Site is approximately 45 km from Wentworth via the Silver City Hwy. Turn W off highway 42 km N of Wentworth into 4WD track to Watara Station. Site is located ~3 km W of highway and 50 m W of Watara by-wash (west).

Grid reference: GDA 569826 mE, 6263694 mN Bunnerungee 7230 1:100,000 topographic map

Environmental setting: The scarred black box is located within a cohort of similar mature trees on the floodplain adjacent of the Darling Anabranh channel.

Tree attributes:

Taxon: *Eucalyptus largiflorens* (black box)

Diameter at breast height (1.35 m) [DBH]: 0.80 m

Height: ~10 m

Condition: Good.

Scar attributes:

Length: 1.50 m

Width: 0.40 m

Height above ground: 0.30 m

Aspect: S

Description: The scar is elliptical in shape (Figure A4). There are no diagnostic axe or adze marks. It is possible that a slab of bark was removed from the tree to serve as dish-like container or coolamon.

Scar condition: The scar is in good condition, with no fungal or insect attack.

Management considerations: The site is approximately 50 m W of Watara by-wash (west), which is proposed to be removed. The proponent should avoid disturbing the site, possibly by erecting a temporary barrier fence around it during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barrier. The proponent should also engage

Aboriginal site monitors to oversee construction activities involving earthworks in the vicinity of the site.

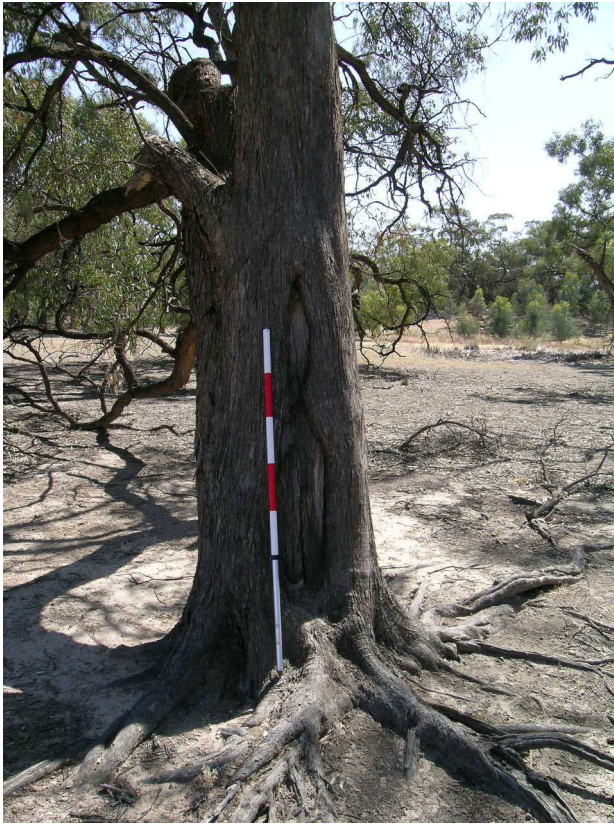


Figure A4. Possible modified tree DA164.

Darling Anabranh (DA) 165

Site type: Possible modified tree.

Location: Site is approximately 45 km from Wentworth via the Silver City Hwy. Turn W off highway 42 km N of Wentworth into 4WD track to Watara Station. Site is located ~3 km W of highway and 50 m NE of Watara by-wash (east).

Grid reference: GDA 569929 mE, 6263810 mN Bunnerungee 7230 1:100,000 topographic map

Environmental setting: The scarred black box is located within a cohort of similar mature trees on the floodplain adjacent of the Darling Anabranh channel.

Tree attributes:

Taxon: *Eucalyptus largiflorens* (black box)

Diameter at breast height (1.35 m) [DBH]: 0.90 m

Height: ~15 m

Condition: Good.

Scar attributes:

Length: 0.85 m

Width: 0.15 m

Height above ground: 1.00 m

Aspect: S

Description: The scar is elliptical in shape (Figure A5). There are no diagnostic axe or adze marks. It is possible that a slab of bark was removed from the tree to serve as dish-like container or coolamon.

Scar condition: The scar is in good condition, with no fungal or insect attack.

Management considerations: The site is approximately 50 m NE of Watara by-wash (east), which is proposed to be removed. The proponent should avoid disturbing the site, possibly by erecting a temporary barrier fence around it during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barrier. The proponent should also engage

Aboriginal site monitors to oversee construction activities involving earthworks in the vicinity of the site.

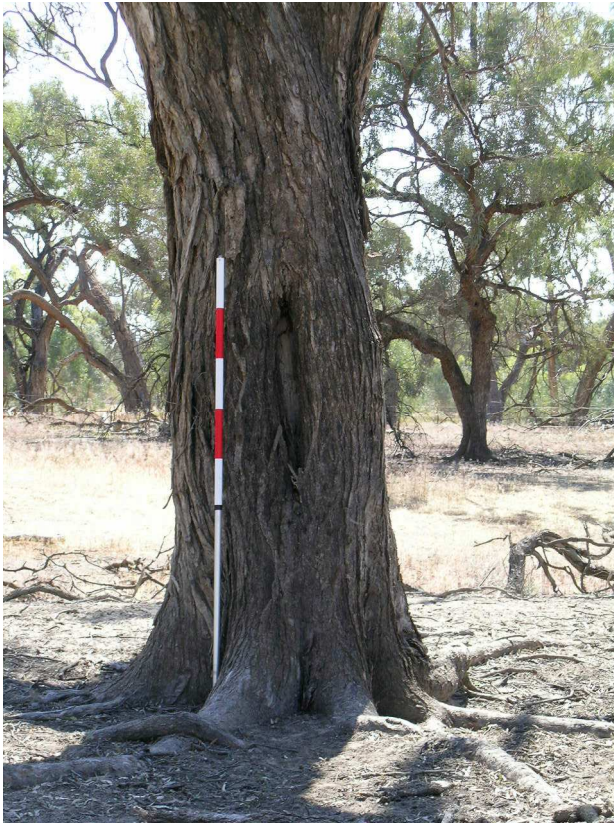


Figure A5. Possible modified tree DA165.

Darling Anabranh (DA) 166

Site type: Stone artefact, hearth.

Location: Site is approximately 123 km from Wentworth via the Silver City Hwy. Turn off highway 109 km N of Wentworth into gravel road to Woodlands Station. Follow 4WD track along Darling Anabranh towards Popiltah. Site is on W bank of channel ~1.5 km NW of Woodlands homestead.

Grid reference: GDA 573729 mE, 6321527 mN Popiltah 7231 1:100,000 topographic map

Environmental setting: The site is located on the elevated alluvial terrace of the Darling Anabranh. Black box open woodland grows on the alluvial terrace.

Aspect: Easterly

Site size: Artefacts were visible over an area 25 x 25 m (ie. 625 m²).

Visibility: Site surface visibility was very high (~80%) due to erosion by gully, deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~80%) due to erosion by wind, water and stock and vehicular traffic.

Site contents: 1 sandstone artefact, 5 silcrete artefacts, 1 *in situ* hearth of baked clay heat retainers and scattered baked clay heat retainers occur at the site (Table A4, Figure A6).

Table A4. Artefact attributes from Aboriginal archaeological site DA166.

Material	Type	Retouch	Platform type	Shape	L	W	T
Silcrete	Flaked piece	na	na	na	39	28	13
Silcrete	Flake	na	Unifacial	Expanded	28	26	10
Sandstone	Muller	na	na	Broken	100	65	40
Silcrete	Flake	na	Unifacial	Expanded	27	23	9
Silcrete	Angul. Frag.	na	na	na	29	21	12
Silcrete	Core	na	na	na	42	36	27

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.



Figure A6. Stone artefact scatter and hearth site DA166.

Management considerations: The site is approximately 5 m SW of a proposed rock ford/causeway (Patagorah main dam alternative causeway). The proponent should avoid disturbing the site, possibly by erecting a temporary barrier around the site when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the north. The design of works should be modified so that the low-level rock ford/causeway is not installed near any cultural heritage places or items. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a NSW *National Parks and Wildlife Act 1974* Section 87 Permit.

Darling Anabranh (DA) 167

Site type: Stone artefact, hearth.

Location: Site is approximately 123 km from Wentworth via the Silver City Hwy. Turn off highway 109 km N of Wentworth into gravel road to Woodlands Station. Follow 4WD track along Darling Anabranh towards Popiltah. Site is on W bank of channel ~1.5 km NW of Woodlands homestead.

Grid reference: GDA 573751 mE, 6321497 mN Popiltah 7231 1:100,000 topographic map

Environmental setting: The site is located on the elevated alluvial terrace of the Darling Anabranh. Black box open woodland grows on the alluvial terrace.

Aspect: Easterly

Site size: Artefacts were visible over an area 10 x 10 m (ie. 100 m²).

Visibility: Site surface visibility was very high (~80%) due to erosion by gully, deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~80%) due to erosion by wind, water and stock and vehicular traffic.

Site contents: 1 chert artefact, 7 silcrete artefacts and scattered baked clay heat retainers occur at the site (Table A5, Figure A7).

Table A5. Artefact attributes from Aboriginal archaeological site DA167.

Material	Type	Retouch	Platform type	Shape	L	W	T
Chert	Flake	na	Unifacial	Intermediate	12	11	5
Silcrete	Angul. Frag.	na	na	na	24	21	17
Silcrete	Flaked piece	na	na	na	47	32	12
Silcrete	Flake	na	Unifacial	Expanded	45	38	12
Silcrete	Flake	na	Unifacial	Intermediate	37	23	9
Silcrete	Flake	na	Unifacial	Expanded	22	17	7
Silcrete	Flake	na	Unifacial	Elongate	28	26	6
Silcrete	Flake	na	Unifacial	Expanded	33	29	10

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.



Figure A7. Stone artefact scatter and hearth site DA167.

Management considerations: The site is approximately 5 m SE of a proposed rock ford/causeway (Patagorah main dam alternative causeway). The proponent should avoid disturbing the site, possibly by erecting a temporary barrier around the site when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the north. The design of works should be modified so that the low-level rock ford/causeway is not installed near any cultural heritage places or items. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a NSW *National Parks and Wildlife Act 1974* Section 87 Permit.

Darling Anabranh (DA) 168

Site type: Stone artefact, hearth.

Location: Site is approximately 124 km from Wentworth via the Silver City Hwy. Turn off highway 109 km N of Wentworth into gravel road to Woodlands Station. Follow 4WD track along Darling Anabranh towards Patagorah main dam. Site is on W bank of channel ~5 m S of Patagorah main dam by-wash.

Grid reference: GDA 572226 mE, 6322745 mN Popiltah 7231 1:100,000 topographic map

Environmental setting: The site is located on the elevated alluvial terrace of the Darling Anabranh. Black box open woodland grows on the alluvial terrace.

Aspect: Northerly

Site size: Artefacts were visible over an area 20 x 20 m (ie. 400 m²).

Visibility: Site surface visibility was very high (~70%) due to erosion by gullying, deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~60%) due to erosion by wind, water and stock and vehicular traffic.

Site contents: 1 sandstone artefact, 7 silcrete artefacts, 2 *in situ* hearths of baked clay heat retainers and scattered baked clay heat retainers occur at the site (Table A6, Figure A8).

Table A6. Artefact attributes from Aboriginal archaeological site DA168.

Material	Type	Retouch	Platform type	Shape	L	W	T
Silcrete	Core	na	na	na	31	30	28
Silcrete	Flaked piece	na	na	na	32	28	12
Sandstone	Pestle	na	na	Broken	40	30	15
Silcrete	Hammerstone	na	na	na	180	180	150
Silcrete	Flake	na	Unifacial	Expanded	33	28	12
Silcrete	Flake	na	Unifacial	Elongate	27	19	8

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.

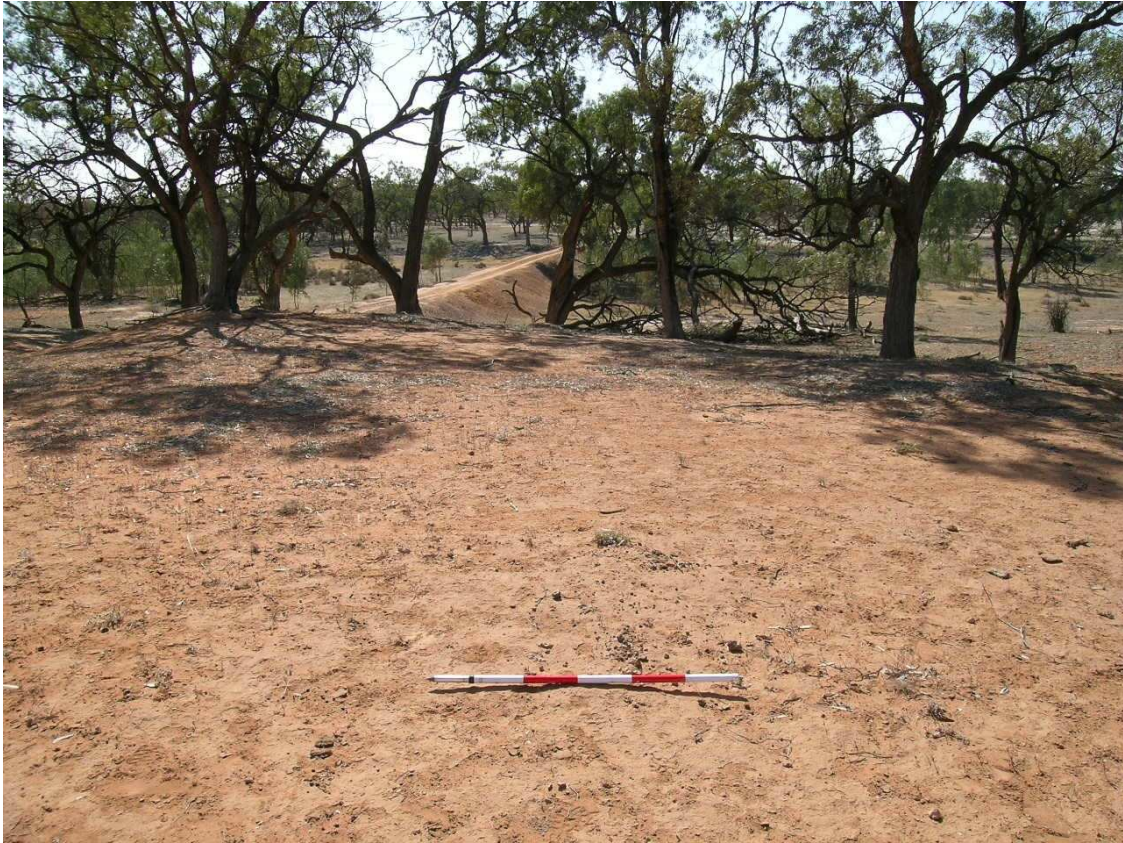


Figure A8. Stone artefact scatter and hearth site DA168.

Management considerations: The site is approximately 5 m S of Patagorah main dam by-wash, which is proposed to be removed. The proponent should avoid disturbing the site, possibly by erecting a temporary barrier fence around it during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barrier. Access to the work area should be from the north.

The proponent should also engage Aboriginal site monitors to oversee removal activities involving earthworks in the vicinity of the site.

Only those sections of the in-stream infrastructure not near any cultural heritage places or items should be removed. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a NSW *National Parks and Wildlife Act 1974* Section 87 Permit.

Darling Anabranh (DA) 169

Site type: Stone artefact, hearth.

Location: Site is approximately 75 km from Wentworth via the Silver City Highway. Turn right off highway into Nindethana Station drive and travel approximately 3 km to homestead. Site is 5 m W of Nindethana dam on the Darling Anabranh.

Grid reference: GDA 571032 mE, 6288880 mN Bunnerungee 7230 1:100,000 topographic map

Environmental setting: The site is located on the elevated alluvial terrace of the Darling Anabranh. Black box open woodland grows on the alluvial terrace.

Aspect: Easterly

Site size: Artefacts were visible over an area 50 x 50 m (ie. 2500 m²).

Visibility: Site surface visibility was very high (~70%) due to erosion by gully, deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~60%) due to erosion by wind, water and stock and vehicular traffic.

Site contents: 39 silcrete artefacts, 1 *in situ* hearth of baked clay heat retainers and scattered baked clay heat retainers occur at the site (Table A7, Figure A9).

Table A7. Artefact attributes from Aboriginal archaeological site DA169.

Material	Type	Retouch	Platform type	Shape	L	W	T
Silcrete	Flake	na	Unifacial	Expanded	27	21	11
Silcrete	Flake	na	Unifacial	Expanded	32	24	8
Silcrete	Flake	na	Unifacial	Expanded	37	27	7
Silcrete	Flaked piece	na	na	na	24	22	8
Silcrete	Flake	na	Unifacial	Expanded	38	24	8
Silcrete	Flake	na	Unifacial	Elongate	25	18	10
Silcrete	Flake	na	Unifacial	Intermediate	25	22	9
Silcrete	Angul. Frag.	na	na	na	32	23	12
Silcrete	Flake	na	Unifacial	Intermediate	29	26	6
Silcrete	Flake	na	Unifacial	Expanded	26	19	6
Silcrete	Flake	na	Unifacial	Intermediate	23	18	7
Silcrete	Flake	na	Unifacial	Intermediate	21	17	5
Silcrete	Flake	na	Unifacial	Expanded	17	8	6
Silcrete	Flake	na	Unifacial	Expanded	12	6	5



Figure A9. Stone artefact scatter and hearth site DA169.

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.

Management considerations: The site is approximately 5 m W of Nindethana dam, which is proposed to be removed. The proponent should avoid disturbing the site, possibly by erecting a temporary barrier fence around it during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barrier. Access to the work area should be from the east.

The proponent should also engage Aboriginal site monitors to oversee removal activities involving earthworks in the vicinity of the site.

Only those sections of the in-stream infrastructure not near any cultural heritage places or items should be removed. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a *NSW National Parks and Wildlife Act 1974 Section 87 Permit*.

Darling Anabranh (DA) 170

Site type: Stone artefact, hearth.

Location: Site is approximately 37 km from Wentworth via the Silver City Hwy. Turn W off highway 34 km N of Wentworth into 4WD track to Bells Camp main dam. Site is located ~3 km NW of highway on E bank of Darling Anabranh ~2 km NE of Bells Camp main dam.

Grid reference: GDA 573403 mE, 6259905 mN Bunnerungee 7230 1:100,000 topographic map

Environmental setting: The site is located on the elevated alluvial terrace of the Darling Anabranh. Black box open woodland grows on the alluvial terrace.

Aspect: Southerly

Site size: Artefacts were visible over an area 50 x 50 m (ie. 2500 m²).

Visibility: Site surface visibility was very high (~60%) due to erosion by gully, deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~50%) due to erosion by wind, water and stock and vehicular traffic.

Site contents: 1 sandstone artefact, 4 chert artefacts, 19 silcrete artefacts, 1 *in situ* hearth with charcoal, scattered baked clay heat retainers occur at the site (Table A8, Figure A10).

Table A8. Artefact attributes from Aboriginal archaeological site DA170.

Material	Type	Retouch	Platform type	Shape	L	W	T
Sandstone	Millstone	na	na	na	175	155	24
Silcrete	Flake	na	Unifacial	Intermediate	28	17	8
Chert	Flake	na	Unifacial	Intermediate	21	19	8
Silcrete	Flake	na	Unifacial	Elongate	17	9	7
Silcrete	Flake	na	Unifacial	Expanded	30	25	10
Chert	Flaked piece	na	na	na	13	9	5
Silcrete	Core	na	na	na	48	37	25
Silcrete	Flaked piece	na	na	na	33	28	13
Silcrete	Angul. frag.	na	na	na	28	12	8
Silcrete	Flake	na	Unifacial	Intermediate	37	26	7



Figure A10. Stone artefact scatter and hearth site DA170.

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.

Management considerations: The site is approximately 5 m NW of a proposed rock ford/causeway (Bells Camp main dam alternative causeway). The proponent should avoid disturbing the site, possibly by erecting a temporary barrier around the site when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the south. The design of works should be modified so that the low-level rock ford/causeway is not installed near any cultural heritage places or items. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a NSW *National Parks and Wildlife Act 1974* Section 87 Permit.

Darling Anabranh (DA) 171

Site type: Stone artefact, hearth, possible modified tree.

Location: Site is approximately 37 km from Wentworth via the Silver City Hwy. Turn W off highway 34 km N of Wentworth into 4WD track to Bells Camp main dam. Site is located ~3 km NW of highway on E bank of Darling Anabranh ~2 km NE of Bells Camp main dam.

Grid reference: GDA 573498 mE, 6259883 mN Bunnerungee 7230 1:100,000 topographic map

Environmental setting: The site is located on the elevated alluvial terrace of the Darling Anabranh. Black box open woodland grows on the alluvial terrace.

Aspect: Southerly

Site size: Artefacts were visible over an area 50 x 50 m (ie. 2500 m²).

Visibility: Site surface visibility was very high (~60%) due to erosion by gully, deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~50%) due to erosion by wind, water and stock and vehicular traffic.

Site contents: 1 quartzite artefact, 4 sandstone artefacts, 9 silcrete artefacts, 1 *in situ* hearth of baked clay heat retainers and scattered baked clay heat retainers occur at the site (Table A9). A tree possibly scarred by Aborigines was also recorded at the site (Figure A11).

Table A9. Artefact attributes from Aboriginal archaeological site DA171.

Material	Type	Retouch	Platform type	Shape	L	W	T
Silcrete	Flaked piece	na	na	na	38	21	8
Chert	Flake	na	Unifacial	Expanded	15	8	4
Silcrete	Flake	na	Unifacial	Intermediate	21	17	4
Chert	Flake	na	Unifacial	Expanded	9	5	3
Silcrete	Flaked piece	na	na	na	25	15	9
Sandstone	Muller	na	na	Broken	49	48	20
Sandstone	Muller	na	na	Broken	80	60	19
Sandstone	Muller	na	na	Broken	40	38	21
Quartzite	Pestle	na	na	na	108	83	42
Sandstone	Millstone	na	na	Broken	211	189	32

Tree attributes:

Taxon: *Eucalyptus largiflorens* (black box)

Diameter at breast height (1.35 m) [DBH]: 0.70 m

Height: ~7 m

Condition: Good.

Scar attributes:

Length: 1.20 m

Width: 0.25 m

Height above ground: 0.50 m

Aspect: S

Description: The scar is elliptical in shape. There are no diagnostic axe or adze marks. It is possible that a slab of bark was removed from the tree to serve as dish-like container or coolamon.

Scar condition: The scar is in good condition, with no fungal or insect attack.



Figure A11. Possible modified tree DA171.

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.

Management considerations: The site is approximately 5 m NE of a proposed rock ford/causeway (Bells Camp main dam alternative causeway). The proponent should avoid disturbing the site, possibly by erecting a temporary barrier around the site when

works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the south. The design of works should be modified so that the low-level rock ford/causeway is not installed near any cultural heritage places or items. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a NSW *National Parks and Wildlife Act 1974* Section 87 Permit.

Darling Anabranh (DA) 173

Site type: Shell midden.

Location: Site is approximately 35 km from Wentworth via the Silver City Highway and Anabranh Mail Road. Turn off Anabranh Mail Road 3 km N of Tara Downs homestead towards Bingo main dam. Site is approximately 2 km SE of Anabranh Mail Road and is located on elevated terrace above the Darling Anabranh channel.

Grid reference: GDA 567992 mE, 6248247 mN Bunnerungee 7230 1:100,000 topographic map

Environmental setting: The site is located on the elevated alluvial terrace of the Darling Anabranh. Black box open woodland grows on the alluvial terrace.

Aspect: Northwesterly

Site size: Artefacts were visible over an area 20 x 20 m (ie. 400 m²).

Visibility: Site surface visibility was very high (~60%) due to erosion by gullyng, deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~50%) due to erosion by wind, water and stock and vehicular traffic.

Site contents: Fragmented freshwater mussel shell valves are eroding from the present land surface at the site (Figure A12).



Figure A12. Shell midden site DA173.

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.

Management considerations: The site is approximately 50 m S of a proposed rock ford/causeway (Bingo main dam alternative causeway). The proponent should avoid disturbing the site, possibly by erecting a temporary barrier around the site when works are occurring in its vicinity and engaging Aboriginal site monitors to oversee construction activities involving earthworks. Access to the work area should be from the north and re-routed away from any cultural heritage places or items.

Darling Anabranh (DA) 174

Site type: Hearth.

Location: Site is approximately 81 km from Menindee via Tandou Road. Turn off Tandou Road 54 km SW of Menindee into track to Wycot Station and follow track S along Redbank Creek towards Warwicks Crossing. Site is ~100 m SE of Warwicks Crossing on an elevated alluvial adjacent to Redbank Creek.

Grid reference: GDA 607430 mE, 6364330 mN Lake Tandou 7332 1:100,000 topographic map

Environmental setting: The site is located on the elevated alluvial terrace of the Redbank Creek floodplain. Black box open woodland grows on the alluvial terrace.

Aspect: Northwesterly

Site size: Artefacts were visible over an area 50 x 50 m (ie. 2500 m²).

Visibility: Site surface visibility was very high (~90%) due to erosion by deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~90%) due to erosion by wind, water and stock and vehicular traffic.



Figure A13. Hearth site DA174.

Site contents: Scattered baked clay heat retainers occur at the site (Figure A13).

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.

Management considerations: The site is approximately 100 m SE of Warwicks Crossing, which is proposed to be removed. The proponent should avoid disturbing the site, possibly by erecting a temporary barrier fence around it during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barrier. Access to the work area should be from the west. The proponent should also engage Aboriginal site monitors to oversee construction activities involving earthworks in the vicinity of the site.

Darling Anabranh (DA) 175

Site type: Shell midden.

Location: Site is approximately 182 km from Wentworth via the Silver City Hwy. Turn off highway 137 km N of Wentworth into gravel road to Cuthero Station. Travel 29 km E to intersection, then travel 14 km NE to Bonds Windmill dam. Site is ~20 m E of dam.

Grid reference: GDA 598672 mE, 6347783 mN Cuthero 7331 1:100,000 topographic map

Environmental setting: The site is located on the elevated alluvial terrace of the Darling Anabranh. Black box open woodland grows on the alluvial terrace.

Aspect: Northwesterly

Site size: Artefacts were visible over an area 10 x 10 m (ie. 100 m²).

Visibility: Site surface visibility was very high (~60%) due to erosion by gullying, deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~50%) due to erosion by wind, water and stock and vehicular traffic.



Figure A14. Shell midden site DA175.

Site contents: Fragmented freshwater mussel shell valves are eroding from the present

land surface at the site (Figure A14).

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.

Management considerations: The site is approximately 20 m E of Bonds Windmill dam, which is proposed to be removed. The proponent should avoid disturbing the site, possibly by erecting a temporary barrier fence around it during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barrier. The proponent should also engage Aboriginal site monitors to oversee construction activities involving earthworks in the vicinity of the site. Access to the work area should be from the west and re-routed away from any cultural heritage places or items.

Darling Anabranh (DA) 176

Site type: Possible modified tree.

Location: Site is approximately 31 km from Wentworth via the Silver City Hwy. Turn off highway 23 km N of Wentworth into gravel road to Tara Downs. Travel into Tara Downs middle by-wash ~2 km S of Tara Downs homestead. Site is located ~ 20 m N of by-wash on bank of Darling Anabranh.

Grid reference: GDA 568509 mE, 6243853 mN Bunnerungee 7230 1:100,000 topographic map

Environmental setting: The scarred black box is located within a cohort of similar mature trees on the floodplain adjacent of the Darling Anabranh channel.

Tree attributes:

Taxon: *Eucalyptus largiflorens* (black box)

Diameter at breast height (1.35 m) [DBH]: 1.00 m

Height: ~15 m

Condition: Good.

Scar attributes:

Length: 1.00 m

Width: 0.20 m

Height above ground: 0.70 m

Aspect: SW

Description: The scar is elliptical in shape (Figure A15). There are no diagnostic axe or adze marks. It is possible that a slab of bark was removed from the tree to serve as dish-like container or coolamon.

Scar condition: The scar is in good condition, with no fungal or insect attack.

Management considerations: The site is approximately 20 m N of Tara Downs middle by-wash, which is proposed to be removed. The proponent should avoid disturbing the site, possibly by erecting a temporary barrier fence around it during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be

engaged to oversee the erection of the protective barrier. The proponent should also engage Aboriginal site monitors to oversee construction activities involving earthworks in the vicinity of the site.



Figure A15. Possible modified tree DA176.

Darling Anabranh (DA) 177

Site type: Stone artefact, hearth.

Location: Site is approximately 37 km from Wentworth via the Silver City Hwy. Turn W off highway 34 km N of Wentworth into 4WD track to Bells Camp middle blockbank. Site is located ~3 km NW of highway on N bank of Darling Anabranh ~5 m W of Bells Camp middle blockbank.

Grid reference: GDA 570983 mE, 6257515 mN Bunnerungee 7230 1:100,000 topographic map

Environmental setting: The site is located on the elevated alluvial terrace of the Darling Anabranh. Black box open woodland grows on the alluvial terrace.

Aspect: Southwesterly

Site size: Artefacts were visible over an area 20 x 20 m (ie. 400 m²).

Visibility: Site surface visibility was very high (~80%) due to erosion by gullying, deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~60%) due to erosion by wind, water and stock and vehicular traffic.

Site contents: 5 silcrete artefacts and scattered baked clay heat retainers occur at the site (Table A10, Figure A16).

Table A10. Artefact attributes from Aboriginal archaeological site DA177.

Material	Type	Retouch	Platform type	Shape	L	W	T
Silcrete	Angul. Frag.	na	na	na	25	18	11
Silcrete	Steep-edged scraper	Scaler – 30 mm	Unifacial	na	32	14	12
Silcrete	Flake	na	Unifacial	Expanded	14	12	7
Silcrete	Flaked piece	na	na	na	28	25	11
Silcrete	Flake	na	Unifacial	Elongate	28	24	9



Figure A16. Stone artefact scatter and hearth site DA177.

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.

Management considerations: The site is approximately 5 m SW of Bells Camp middle blockbank, which is proposed to be removed. The proponent should avoid disturbing the site, possibly by erecting a temporary barrier fence around it during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barrier. Access to the work area should be from the east.

The proponent should also engage Aboriginal site monitors to oversee removal activities involving earthworks in the vicinity of the site.

Only those sections of the in-stream infrastructure not near any cultural heritage places or items should be removed. Alternatively, if engineering constraints dictate that disturbance to cultural heritage places or items is unavoidable, and the cultural heritage consists of isolated midden shell, hearthstones/heat retainers or stone artefacts, Aboriginal representatives of the Barkindji Elders and/or an archaeologist should move the cultural heritage items to a nearby location outside the zone of disturbance under a *NSW National Parks and Wildlife Act 1974 Section 87 Permit*.

Darling Anabranh (DA) 178

Site type: Stone artefact, hearth, shell midden.

Location: Site is approximately 175 km from Wentworth via the Silver City Hwy. Turn off highway 137 km N of Wentworth into gravel road to Cuthero Station. Travel past Cuthero homestead into Cuthero dam. Site is ~80 m NW of dam in middle of track to pump and windmill.

Grid reference: GDA 593894 mE, 6339196 mN Cuthero 7331 1:100,000 topographic map

Environmental setting: The site is located on the elevated alluvial terrace of the Darling Anabranh. Black box open woodland grows on the alluvial terrace.

Aspect: Southeasterly

Site size: Artefacts were visible over an area 100 x 50 m (ie. 5000 m²).

Visibility: Site surface visibility was very high (~80%) due to erosion by deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~60%) due to erosion by wind, water and stock and vehicular traffic.

Site contents: 5 sandstone artefacts, 175 silcrete artefacts, 32 chert artefacts, 4 quartz artefacts and scattered baked clay heat retainers occur at the site (Table A11). Freshwater mussel shell valves and shell fragments are also eroding from the present land surface (Figure A17).

Table A11. Artefact attributes from Aboriginal archaeological site DA178.

Material	Type	Retouch	Platform type	Shape	L	W	T
Sandstone	Muller	na	na	Broken	24	23	14
Silcrete	Flake	na	Unifacial	Intermediate	31	26	10
Chert	Flake	na	Unifacial	Expanded	17	11	6
Sandstone	Muller	na	na	Broken	49	29	15
Chert	Flake	na	Unifacial	Intermediate	21	17	8
Silcrete	Flaked piece	na	na	na	32	22	17
Silcrete	Angul. Frag.	na	na	na	33	27	12
Silcrete	Flake	na	Unifacial	Expanded	32	19	9
Chert	Flake	na	Unifacial	Expanded	19	11	6
Silcrete	Flake	na	Unifacial	Intermediate	23	22	8
Silcrete	Flake	na	Unifacial	Elongate	29	21	9
Silcrete	Flake	na	Unifacial	Elongate	26	18	7



Figure A17. Stone artefact scatter, hearth and shell midden site DA178.

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.

Management considerations: The site is approximately 80 m NW of Cuthero dam, which is proposed to be removed. The proponent should avoid disturbing the site, possibly by erecting a temporary barrier fence around it during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barrier. Access to the work area should be from the northeast. The proponent should also engage Aboriginal site monitors to oversee construction activities involving earthworks in the vicinity of the site.

Darling Anabranh (DA) 179

Site type: Stone artefact, hearth.

Location: Site is approximately 175 km from Wentworth via the Silver City Hwy. Turn off highway 137 km N of Wentworth into gravel road to Cuthero Station. Travel past Cuthero homestead into Cuthero dam. Site is ~100 m E of dam.

Grid reference: GDA 594047 mE, 6339099 mN Cuthero 7331 1:100,000 topographic map

Environmental setting: The site is located on the elevated alluvial terrace of the Darling Anabranh. Black box open woodland grows on the alluvial terrace.

Aspect: Westerly

Site size: Artefacts were visible over an area 20 x 20 m (ie. 400 m²).

Visibility: Site surface visibility was very high (~80%) due to erosion by deflation and scalding and stock and vehicular traffic. Off site visibility was also very high (~60%) due to erosion by wind, water and stock and vehicular traffic.

Site contents: 23 silcrete artefacts, 9 chert artefacts, 2 quartz artefacts and scattered baked clay heat retainers occur at the site (Table A12, Figure A18).

Table A12. Artefact attributes from Aboriginal archaeological site DA179.

Material	Type	Retouch	Platform type	Shape	L	W	T
Quartz	Angul. Frag.	na	na	na	17	11	9
Chert	Flake	na	Unifacial	Intermediate	21	17	4
Chert	Flaked piece	na	na	na	32	27	8
Silcrete	Flaked piece	na	na	na	41	25	9
Quartz	Angul. Frag.	na	na	na	23	20	10
Silcrete	Angul. Frag.	na	na	na	32	19	11
Silcrete	Angul. Frag.	na	na	na	25	22	12
Silcrete	Flake	na	Unifacial	Expanded	33	24	8
Silcrete	Flake	na	Unifacial	Intermediate	29	26	9
Silcrete	Flaked piece	na	na	na	38	29	11
Silcrete	Flake	na	Unifacial	Elongate	26	15	7
Silcrete	Flake	na	Unifacial	Elongate	23	14	6



Figure A18. Stone artefact scatter and hearth site DA179.

Site condition: This site is in poor condition having been disturbed by erosion by wind, water and stock and vehicular traffic.

Management considerations: The site is approximately 100 m E of Cuthero dam, which is proposed to be removed. The proponent should avoid disturbing the site, possibly by erecting a temporary barrier fence around it during the construction phase of the project. Aboriginal representatives of the Barkindji Elders should be engaged to oversee the erection of the protective barrier. Access to the work area should be from the northeast. The proponent should also engage Aboriginal site monitors to oversee construction activities involving earthworks in the vicinity of the site.

