Taurus Energy
Proposed Wind Farm – Cullerin, via Goulburn
Aboriginal Archaeological Assessment

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A Report to Nick Graham-Higgs
nghenvironmental
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1. SUMMARY

1.1 Introduction

New South Wales Archaeology Pty Ltd was commissioned by nghenvironmental in July 2005 to undertake an Aboriginal archaeological assessment of an area of land at Cullerin, east of Gunning, in relation to a proposal by Taurus Energy Pty Ltd to develop a 30MW wind farm.

Taurus Energy proposes to develop a wind farm at Cullerin for the purpose of electricity generation. The proposal area is at situated ca. 11 kilometres east of Gunning. The proposal area is located on a number of private properties which are currently utilised for cattle and sheep grazing. The proposal area is primarily situated on the ridge crest of a part of the Cullerin Range.

This archaeological assessment is concerned with areas of direct impact related to the proposal including the location of wind turbines, on-site electrical connections, communications cabling, two alternative substation sites and road access.

The proposal is to develop a 30 MW wind farm to supply electricity to the grid. The proposal is comprised of the construction, operation and decommissioning of the following components:

- Up to 16 wind turbines, each with three blades measuring up to 46 metres in length, and mounted on a tabular steel tower measuring up to 80 metres high;
- Electrical connections between wind turbines using a combination of underground cabling and overhead concrete pole power lines;
- Underground communication cabling;
- A substation and transmission connection linking the wind turbines to the existing Country Energy 132 kV transmission system which passes across the proposal site;
- Access roads across the site for installation and maintenance of wind turbines; and
- An onsite control room and equipment storage facility.

The project description is based on current planning; site layout may change as a result of issues which might arise in relation to ongoing assessments including biodiversity, archaeology, geology, wind regime, wind turbine availability and transmission connection design issues.

The proposed wind farm is defined as a Major Project under Part 3A of the Environmental Planning and Assessment Act 1979. The Director General, Department of Planning has issued requirements for the preparation of an Environmental Assessment dated 9 January 2006, in which it is stated that an archaeological/cultural heritage assessment is required to be prepared which addresses the potential impact of the project on Aboriginal heritage values and items.

nghenvironmental has been commissioned by Taurus Energy to conduct a number of studies in relation to the proposal. This archaeological assessment forms one component of an Environmental Assessment Report.

The Department of Planning (DoP) is the consent authority in regard to the proposal.

1.2 The Archaeological Study

This archaeological project has been managed by Julie Dibden. An investigation for Aboriginal archaeological sites within the proposal area has been conducted by Julie Dibden, Andrew Pearce and Tom Knight, NSW Archaeology Pty Ltd, Justin Boney, Pejar Local Aboriginal Land Council, Dorothy Dickson, Onerwal Local Aboriginal Land Council, and Don Bell and Karen Denny, Buru Ngunawal Aboriginal Corporation.

The study has sought to identify and record any Aboriginal objects which may be present in the proposal area, to assess the archaeological potential of the landform elements present and to formulate management recommendations based on the results of background research, a field survey and site significance assessment.

The investigation has included both a literature search and field survey and has been undertaken in partnership with Pejar Local Aboriginal Land Council, Onerwal Local Aboriginal Land Council and Buru Ngunawal Aboriginal Corporation.

The approach to archaeological recording in the current study has been a 'nonsite' methodology: the elementary unit recorded is an artefact (described as artefact locales) rather than a site. It is assumed that stone artefacts will be distributed across the landscape in a continuum with significant variations in artefact density and nature in different landform elements. While cultural factors will have informed the nature of land use, and the resultant artefact discard, environmental variables are those which can be utilised archaeologically in order to analyse archaeological variability across the landscape. Accordingly in this study while the artefact is the elementary unit recorded it is the Survey Unit which is utilised as a framework of recording and analysis.

A landscape based approach and methodology has therefore been implemented during this study. The proposal area has been divided into a number of Survey Units each of which has been defined on the basis of a combination of environmental variables. These areas are termed *archaeological terrain units* which in this study have been defined according to landform element, gradient and aspect.

The rationale for employing this definition relates to its utility in regard to predicting the archaeological potential of landforms; archaeological terrain units are "…discrete, recurring areas of land for which it is assumed that the Aboriginal land use and resultant heritage evidence in one location may be extrapolated to other similar locations" (Kuskie 2000: 67); the archaeological evidence observed within individual Survey Units is assumed to be generally representative of the archaeological resource located within the entire Survey Unit.

The New South Wales National Parks and Wildlife Service has prepared a draft document which provides a series of guidelines regarding the assessment and management of Aboriginal cultural heritage in New South Wales. This report has been prepared in accordance with these draft guidelines (NSW NPWS 1997). Additionally the study has been conducted in accordance with the Interim Guidelines for Aboriginal Community Consultation - Requirements for Applicants (NSW DEC 2004).

1.3 Previously Recorded Sites

A search of the New South Wales DEC Aboriginal Heritage Information Management System (AHIMS) has indicated that there are no previously recorded sites located within the proposal area. However a number of sites have been recorded to the south of the proposal area (AHIMS: 20th December 2005).

1.4 Results

Field work was undertaken in November 2005. The field survey was focused on investigating zones of proposed impact and these were subject to a comprehensive survey. Four locales containing stone artefacts were recorded. Artefact density calculations based on a consideration of effective survey coverage indicate that all artefact locales, and the Survey Units in which they are situated, contain low density artefact distributions.

1.5 Conclusions

Given the absence of a reliable fresh water source and the limited resources that would have been present in the proposal area when the region was occupied by Aboriginal people, it is predicted that the area was not likely to have been subject to sustained Aboriginal habitation. Aboriginal habitation sites are expected to be present elsewhere in areas close to permanent watercourses and near to a confluence of resource zones.

The proposal area is likely to have been utilised for hunting and gathering forays conducted away from base camps. Such short term events are unlikely to result in the formation of large, high density or complex archaeological sites. It is predicted that such land usage would result in low to very low levels of artefactual discard.

Effective survey coverage achieved during the survey is assessed to have been adequate for the purposes of providing a reasonably reliable indication of the archaeological status of the proposal area.

The Survey Units present in the study area are each assessed to be of low or very low archaeological potential based on various environmental factors including steep gradients, the distance from reliable water and the shallow or skeletal soils which are present across the proposal area.

The proposal area is assessed to be of low archaeological potential and sensitivity. The survey results are assessed to be in accordance with the predictive model of site location relevant to the proposal area.

1.6 Recommendations

It is recommended that (see Section 12 for a full listing of recommendations):

- The proponent should give due consideration to the discussion in regard to management and mitigation of Aboriginal artefact locales and Survey Units as outlined in Section 11 of this report.

- The proposal area is assessed to be of low archaeological potential and sensitivity. Accordingly, no further archaeological assessment is considered necessary in relation to the proposed Taurus Energy wind farm at Cullerin.

- The four locales containing Aboriginal stone artefacts recorded in the proposal area do not surpass any scientific significance thresholds which would act to preclude impacts which may ensue as a result of the construction of the proposed wind farm.

  Accordingly, if impacts to any of the four stone artefact locales recorded in the proposal area are proposed unmitigated impacts are justified.

- It is recommended that the proponent consult with the Aboriginal communities who have participated in the assessment in regard to impacts to the Aboriginal objects in the proposal area.

Acknowledgements

Gratitude is extended to the following people for their assistance in this project:

Delice Freeman and Justin Boney, Pejar Local Aboriginal Land Council
Dorothy Dickson, Onerwal Local Aboriginal Land Council
Don Bell and Karen Denny, Buru Ngunawal Aboriginal Corporation
David Wright, NSW DEC Administrator, Information Systems Section
Rod Wellington, NSW Department of Environment and Conservation
Jackie Taylor, NSW DEC Environment and Protection Branch
Brooke Marshall, nghenvironmental
Andrew Durran, Taurus Energy

Figure 1 Location of the Cullerin wind farm (Gunning Sheet 8728 (edition 1) 1:100,000 topographic map).

2. INTRODUCTION

2.1 Introduction

New South Wales Archaeology was commissioned by nghenvironmental on behalf of Taurus Energy in July 2005 to undertake an archaeological assessment of a proposed wind farm at Cullerin (Figure 1).

Taurus Energy proposes to develop a wind farm at Cullerin for the purpose of electricity generation. The proposal area is at situated ca. 11 kilometres east of Gunning. The proposal area is located on private properties which are currently utilised for cattle and sheep grazing.

This archaeological assessment is concerned with areas of direct impact related to the proposal including the location of wind turbines, on-site electrical connections, underground communications cabling, two alternative substation sites and road access.

The proposal is to develop a 30 MW wind farm to supply electricity to the grid. The proposal is comprised of the construction, operation and decommissioning of the following components:

- Up to 16 wind turbines, each with three blades measuring up to 46 metres in length, and mounted on a tabular steel tower measuring up to 80 metres high;
- Electrical connections between wind turbines using a combination of underground cabling and overhead concrete pole power lines;
- Underground communications cabling;
- A substation and transmission connection linking the wind turbines to the existing Country Energy 132 kV transmission system which passes across the proposal site;
- Access roads across the site for installation and maintenance of wind turbines; and
- An onsite control room and equipment storage facility.

The project description is based on current planning; site layout may change as a result of issues which might arise in relation to ongoing assessments including biodiversity, archaeology, geology, wind regime, wind turbine availability and transmission connection design issues.

The proposed wind farm is defined as a Major Project under Part 3A of the Environmental Planning and Assessment Act 1979. The Director General, Department of Planning has issued requirements for the preparation of an Environmental Assessment dated 9 January 2006, in which it is stated that an archaeological/cultural heritage assessment is required to be prepared which addresses the potential impact of Aboriginal heritage values and items.

In accordance with the NSW NPWS guidelines for archaeological reporting this report aims to document:

- the proposed impacts;
- the involvement in the project of the Aboriginal community;
- the methodology implemented during the study;
- the environmental setting of the study area in order to establish background parameters;
- a review of archaeological and relevant literature and heritage listings on the NSW DEC Aboriginal Heritage Information Management System;
- a synthesis of local and regional archaeology;
- a predictive model of site location relevant to the proposal area;
- the archaeological sensitivity of the landforms subject to proposed impacts;
- the field survey strategy and results; and
- a series of recommendations based on the results of the investigation.

The field work component of this project has been conducted by Julie Dibden, Andrew Pearce and Tom Knight, NSW Archaeology Pty Ltd, Justin Boney, Pejar Local Aboriginal Land Council, Dorothy Dickson, Onerwal Local Aboriginal Land Council, and Don Bell and Karen Denny, Buru Ngunawal Aboriginal Corporation. This report has been written by Julie Dibden.

3. PARTNERSHIP WITH THE ABORIGINAL COMMUNITY

The proposed wind farm is defined as a Major Project under Part 3A of the Environmental Planning and Assessment Act 1979. The Director General, Department of Planning has issued requirements for the preparation of an Environmental Assessment dated 9 January 2006, in which it is stated that an archaeological/cultural heritage assessment is required to be prepared which addresses the potential impact of Aboriginal heritage values and items.

It is noted that under the terms of the Part 3A of the Environmental Planning and Assessment Act 1979 approvals etc and legislation that does not apply include:

- a permit under section 87 or a consent under section 90 of the National Parks and Wildlife Act 1974

This project has been undertaken in accordance with the NSW DEC Interim Guidelines for Aboriginal Community Consultation - Requirements for Applicants (IGACC) (NSW DEC 2004). The NSW DEC requires proponents to undertake consultation with the Aboriginal community "…as an integral part of the impact assessment" process (NSW DEC 2004).

The NSW DEC manages Aboriginal cultural heritage in NSW in accordance with the National Parks and Wildlife Act 1974. Part 6 of the Act provides protection for Aboriginal objects and Aboriginal Places. When an activity is likely to impact Aboriginal objects or declared Aboriginal Places approval of the Director-General of the NSW DEC under s90 or s87 of the NPW Act is required. The decision as to whether or not to issue s90 Consent or a s87 Permit is based on the supply to the NSW DEC by a proponent of adequate information to enable the Director-General to make a decision (NSW DEC 2004).

When administering its approval functions under the NPW Act the NSW DEC requires applicants to have consulted with the Aboriginal community about the Aboriginal cultural heritage values (cultural significance) of Aboriginal objects and place present in the area subject to development (NSW DEC 2004).

The NSW DEC requires consultation with the Aboriginal community because it recognises the following:

- That Aboriginal heritage has a cultural and archaeological significance and that both should be the subject of assessment to inform its decision process;
- That Aboriginal people are the primary determinants of the significance of their heritage;
- That Aboriginal community involvement should occur early in the assessment process to ensure that their values and concerns can be taken into account and so that their own decision making structures can function;
- That the information arising from consultation allows consideration of Aboriginal community views about significance and impact and allows for management and mitigation measures to be considered in an informed way (NSW DEC 2004).

The community consultation process as outlined in the IGACC document aims to improve the assessment process by providing the Aboriginal community with an opportunity to:

- Influence the design of the assessment of cultural and scientific significance;
- Provide relevant information about cultural significance values of objects/places;
- Contribute to the development of cultural heritage management recommendations; and
- Provide comment on draft assessment reports (NSW DEC 2004).

The role of the Aboriginal Community is outlined by the NSW DEC (2004) as follows:

- The Aboriginal community is the primary determinant of the significance of their heritage;
- The Aboriginal community may participate in the process via comment on the assessment methodology and contribution of cultural knowledge; and
- The Aboriginal community may comment on cultural significance of potential impacts and/or mitigation measures.

While it is recognised that under Part 3A of the Environmental Planning and Assessment Act 1979 approvals and legislation under the National Parks and Wildlife Act do not apply to the current project fulfilment of the consultation requirements as outlined in the IGACC document has nevertheless been undertaken as follows:

1. Notification and Registration of Interests

   The proponent has actively sought to identify stakeholder groups or people wishing to be consulted about the project and has invited them to register their interest as follows:

   Written notification about the project dated 27th July 2005 has been supplied to the following bodies:

   - Pejar Local Aboriginal Land Council
   - Onerwal Local Aboriginal Land Council
   - Buru Ngunawal Aboriginal Corporation
   - Gundungurra Tribal Council Aboriginal Corporation
   - Native Title Services
   - Goulburn Mulwaree Shire Council
   - The NSW Department of Environment and Conservation

   The Registrar of Aboriginal Owners was not notified of the project given that the proposal area is not situated within a National Park which possesses a register of Aboriginal owners.

   In addition an advertisement has been placed in the 13th July 2005 edition of the Goulburn Post.

   The closing date of registration of interest was noted as 27th July 2005.

   No individuals or groups registered a written interest in this project.

The proposal area is situated at the boundary of both the Pejar Local Aboriginal Land Council and Onerwal Local Aboriginal Land Council. Accordingly representatives of both Land Councils participated in the field assessment.

Additionally the Buru Ngunawal Aboriginal Corporation indicated via verbal communication an interest in the project. Accordingly representatives of this organisation assisted in the field assessment.

4. THE DEVELOPMENT PROJECT

The proposal involves the installation of up to 16 power generating wind turbines. The turbines are to be spaced in roughly linear succession along a section of the Cullerin Range ridge crest. Each wind turbine will have a capacity of between 1.5 MW and 3.0 MW.

In addition to the instalment of turbines, associated infrastructure including transmission connections to the grid, communications cabling, on-site roads and on-site electrical connections are also proposed. The project description as outlined below is based on the current status of planning. Site layouts as described in this report may change as a result of issues arising from the biodiversity and archaeological assessment and issues in regard to geology, wind regime, wind turbine availability and transmission connection design.

A description of these components and their related impacts are outlined as follows:

- Turbine Placements

  Up to 16 turbines are proposed. The proposed wind turbine envelope is on Figure 2.

  Turbines will possess three blades measuring up to 46 metres in length mounted on a tubular steel tower measuring up to 80 metres in height.

  Each turbine will require a ground surface area measuring 80 - 90 metres in diameter which is reasonably clear of trees. The ground disturbance associated with each turbine will include the construction of reinforced concrete footings excavated to a maximum size of 15 x 15 metres.

  A hardstand area adjacent to the turbine footings which could measure up to 30 x 30 meters is required for a crane. A delivery area for the various components is also necessary. In most cases it is anticipated that the turbine access track could be used as a delivery area.

  Each tower will have a transformer which will be housed either within the base of the tower, in the nacelle (located on the tower) or adjacent to the tower as a small pod mount transformer.

- Electrical Connections

  The onsite electrical works will include on-site power reticulation cabling (underground and overhead) at either 22,000V or 33,000V linking the rows of turbines and the turbines to a Substation. Underground cabling is proposed between the turbines, with overhead cabling connecting the turbines to the northern substation (if this alternative substation site is used).

  Underground cabling would be laid out in trenches measuring 1 - 1.5 metre deep and 0.5 - 1 metre wide and where possible the trench routes will follow access tracks, with short spur connections to each turbine.

  Overhead cabling would require an easement of ca. 20 metre wide and is proposed to be erected on 17- 20 metre high single wood or concrete poles spaced 150 - 300 metres apart, with spans avoiding all wet areas. Postholes would be 1.5 - 2 metres deep and ca. 0.5 metre in diameter.

- Substation

  A substation is required to convert power from onsite reticulation voltage of 22kV or 33kV to a transmission voltage of 132kV suitable to connect to the Country Energy transmission system.

  The substation is indicated to occupy an area measuring ca. 50 x 75 metres. The substation will be fenced and the ground covered with crushed rock and partly by concrete pads for equipment, walkways and cable covers. The exact location for the substation has not been determined; however two alternate site options have been identified:

  Location A: On-site near the point where the existing 132kV line crosses the ridge.

Location B: Off-site north of the Great Southern Railway where a common substation is being considered by Taurus Energy and the proponent of the proposed Gunning Wind Farm (located further to the north).

- Site Access

  Site access is proposed from the Old Sydney Road. An alternative site access road is proposed from Lerida Road.

  On-site access tracks would be unsealed formations measuring 5 metres wide. Tracks are required to the base of each turbine and the Substation and Control and Facilities Building.

- On-site Control and Facilities Building

  An on-site Control and Facilities Building which will house instrumentation, control and communications equipment is proposed. The building will measure up to 15 x 10 metres and will be built on a concrete slab. Control and communications cabling is also required to extend from the Control and Facilities Building to each turbine and to the site Substation. The control cabling will be installed using the same method and route as the power cabling.

- On-going Wind Monitoring Equipment

  A 65 meter high lattice tower monitoring mast is installed on the ridge for the purposes of assessing wind speeds at the site. It is proposed to continue the operation of the mast. However, as a result of finalisation of turbine locations there may be some requirement to relocate the existing mast to a different location within the site, to replace the mast with a shorter or taller mast, or to install an additional mast.

Summary

This archaeological assessment is carried out in relation to those areas of proposed impact associated with the installation of the wind turbines; the access roads on the property; the substation options and the transmission connection route.

Given the nature of the proposed works the project has the potential to cause impacts to any Aboriginal objects or deposits which may be present within the zones of direct impact. However it is noted that impacts will be discrete and generally small in area.

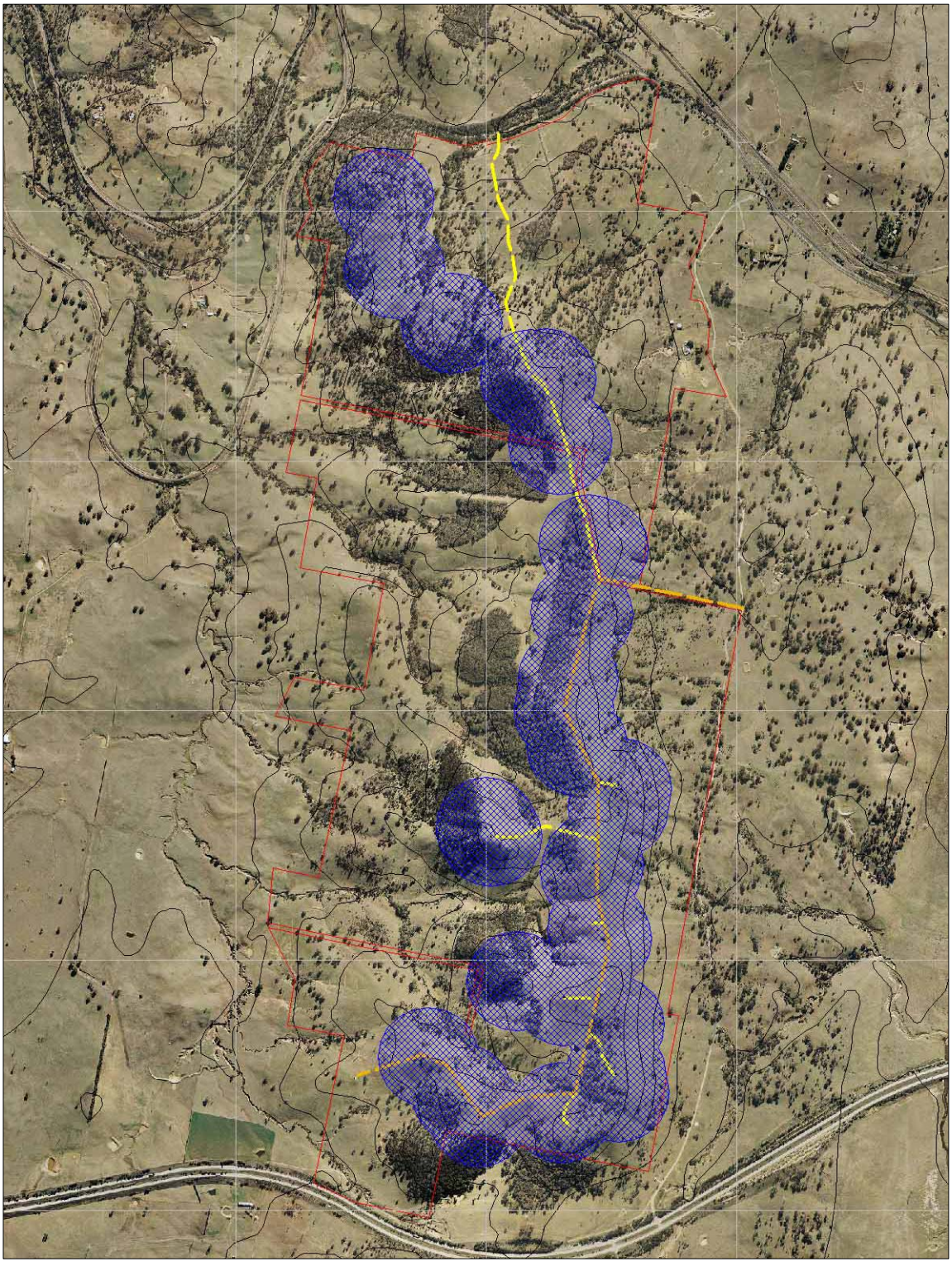

Figure 2. Location of proposed impacts defined as a turbine envelope and shown in blue (supplied by nghenvironmental).

5. STUDY METHODOLOGY

This Aboriginal archaeological study has included the following components:

- A NSW DEC Aboriginal Heritage Information Management System site search to determine whether or not previously recorded sites are present on the proposal area and to give consideration to the type of sites known to be present within the local area.
- A review of local and regional archaeological reports and other relevant documents in order to provide a contextual framework to the study and heritage management process.
- A review of impacts relating to the construction of the Cullerin Wind Farm aimed at determining the potential nature and extent of impacts to any potential Aboriginal objects which may be present.
- A comprehensive field survey of the proposal area aimed at locating Aboriginal objects, recording survey coverage data and assessing the archaeological potential of the landforms present.
- Documentation of survey results.
- An analysis of survey results.
- A site significance assessment.
- The formulation of management recommendations ensuing from the above.

5.1 Literature Review

Background research has been conducted to determine if known Aboriginal heritage sites are located in the proposal area and to assist in the construction of a relevant model of site type and location.

The following information sources were accessed for this study:

- NSW DEC Aboriginal Heritage Information Management System
- Relevant archaeological reports held in the NSW DEC Cultural Heritage Unit

5.2 Field Survey and Methodology

Field work was undertaken in November 2005.

The field survey was designed to encompass all areas of proposed impacts as defined by a turbine envelope, but inclusive of additional components such as roads and a substation located outside the envelope. Field survey entailed a foot survey and was undertaken by seven people. Survey coverage is described in Section 8 of this report.

The field survey was aimed at locating Aboriginal objects as defined under the Act. An assessment was also made of prior land disturbance, survey coverage variables (ground exposure and archaeological visibility) and the potential archaeological sensitivity of the land.

The approach to recording in the current study has been a 'nonsite' methodology: the elementary unit recorded is an artefact rather than a site (*cf* Dunnell 1993; Shott 1995). The rationale behind this approach is that artefacts may be directly observed however 'sites' are a construction within an interpretative process. Given that it can be expected that full archaeological visibility will not be encountered during the survey the process of identifying site boundaries (if they exist at all) will not be possible.

However, it can be expected that artefacts will be distributed across the proposal area in a virtual continuum. This phenomenon is not anomalous; subsurface work conducted elsewhere in the south east confirms this pattern (see Dibden 2005a; 2005b and 2005c). Therefore in respect of stone artefact distribution the notion of site is itself a meaningless concept and cannot encompass or reflect the actual distribution of artefacts across the landscape. Given that artefacts are continuous in distribution and not discrete 'site' occurrences artefact distribution is better conceptualised in continuous terms.

The density and nature of the artefact distribution will vary across the landscape in accordance with a number of behavioural factors which resulted in artefact discard. While cultural factors will have informed the nature of land use, and the resultant artefact discard, environmental variables are those which can be utilised archaeologically in order to analyse the variability in artefact density and nature across the landscape. Accordingly in this study while the artefact is the elementary unit recorded it is the Survey Unit which is utilised as a framework of recording and analysis (Wandsnider and Camilli 1992).

The study area has been divided into a number of Survey Units each of which have been defined on the basis of a combination of environmental variables which are assumed to relate to Aboriginal usage of the area. These areas are termed *archaeological terrain units* and in this study have been defined on the basis of a combination of landform element, gradient and aspect (*cf* Kuskie 2000: 67). The Survey Unit is defined as an individual area that is bounded on all sides by different archaeological terrain units.

The rationale for employing this definition relates to its utility in regard to predicting the archaeological potential of landforms; archaeological terrain units are "…discrete, recurring areas of land for which it is assumed that the Aboriginal land use and resultant heritage evidence in one location may be extrapolated to other similar locations" (Kuskie 2000: 67). Additionally, the archaeological evidence which has been located within individual Survey Units during the current study is assumed to be generally representative of the archaeological resource located within the entire Survey Unit.

Field survey was designed to encompass the entire proposal area. Field survey entailed a foot survey and was comprehensive. The survey methodology entailed walking parallel transects across individual archaeological terrain units with each surveyor situated ca. 10 m apart. Each terrain unit was surveyed until the entire area had been systematically inspected. This methodology enabled direct visual inspection of as much of the ground surface of each Survey Unit as practicable.

It is noted here that survey routes and areas of ground exposure are not shown on Figure 4 in Section 8 for practical reasons. Survey transects were undertaken so as to visually inspect as much of the ground as possible and/or necessary and to maximize the chance of inspecting all areas of ground exposure which were present. Generally ground exposures were minimal in area (size) although present in innumerable instances as bare earth patches, tracks and erosional features. Accordingly, accurate mapping of exposures would be largely impossible without any extremely accurate GPS system and an excessively large amount of time neither of which were deemed to be necessary for conducting the task at hand.

6. LANDSCAPE CONTEXT

A consideration of the landscape is necessary in archaeological work in order to characterise and predict the nature of Aboriginal occupation across the land (NPWS 1997). In Aboriginal society landscape could be both the embodiment of Ancestral Beings and the basis of a social geography and economic and technological endeavour. The various features and elements of the landscape are/were physical places that are known and understood within the context of social and cultural practice.

Given that the natural resources that Aboriginal people harvested and utilised were not evenly distributed across landscapes Aboriginal occupation and the archaeological manifestations of that occupation will not be uniform across space. Therefore, the examination of the environmental context of a study area is valuable for predicting the type and nature of archaeological sites which might be expected to occur. Factors which typically inform the archaeological potential of a landform include the presence or absence of water, animal and plant foods, stone and other resources, the nature of the terrain and the cultural meaning associated with a place.

Additionally, geomorphological and humanly activated processes need to be defined as these will influence the degree to which archaeological sites may be visible and/or conserved. Land which is heavily grassed will prevent the detection of archaeological material while land which has suffered disturbance may no longer retain artefacts or stratified deposits. A consideration of such factors is necessary in formulating site significance and mitigation and management recommendations.

The following sections provide information in regard to the landscape context of the study area.

6.1 Topography, geology and vegetation

The proposed Cullerin Wind Farm is situated at ca. 10 kilometres east of Gunning and ca. 8 kilometres west of Breadalbane, on the Southern Tablelands of New South Wales.

The Wind Farm site is accessed via Lerida Road, off the Hume Highway and is situated between the Hume Highway in the south and the Southern Railway (and Old Sydney Road) in the north.

The turbines are proposed to be installed on the undulating crest of the prominent Cullerin Range. The highest elevation at the site is approximately 860 metres. The topographic context of the proposal area is shown on Figure 3.

The proposal area is situated within the Midgee Soil Landscape (nghenvironmental 2005). This landscape consists of rolling to low hills on Ordovician, Silurian and Devonian metasediments. The soil present across the proposal area is skeletal and stony, possessing high shattered shale content. Bedrock shale commonly outcrops in the area, especially on the higher points of the ridge. Given the thin, rocky nature of soils, the potential for Aboriginal objects (stone artefacts) to be present in a subsurface context is negligible.

The proposal area is situated within the Lachlan Catchment with the Lachlan River itself situated at ca. 4 kilometres to the north east.

The topography within the proposal area is dominated by the high, exposed ridge of the Cullerin range. The landform elements located within the zones of proposed impact include ridge crest, simple slopes and drainage depressions.

The ridge crest on which the turbines are proposed is undulating and possesses slopes which vary between relatively flat to moderate gradient. The land falls on either side of the crest as simple slopes which vary between moderate to steep gradients.

The proposal area is drained by steep, intermittent 1st order drainage depressions; the immediate local area would not have provided Aboriginal land users with a source of reliable water. Accordingly the area of proposed impacts is unlikely to have been utilised for long-term or repeated Aboriginal occupation.

Prior to European land clearance the proposal area would have been covered with woodland tree species and can accordingly be characterised as a woodland resource zone. The immediate area local area possesses limited biodiversity; the proposal area is situated away from a confluence of resource zones. Accordingly the area

would have been utilised by Aboriginal people for a limited range of activities which may have included hunting and gathering and travel through country. Such activities are likely to have resulted in low levels of artefact discard distributed in a spatially dispersed rather than focused manner. The nature of stone artefacts discarded can be expected to have been correspondingly limited in terms of artefact diversity and complexity.

The proposal area is utilised for cattle and sheep grazing and possesses a combination of native and introduced pasture with scattered trees and areas of regrowth. Tree species present are all regrowth of no more than ca. 50 years of age (Jackie Miles pers. comm. 2005).

Summary

The impact areas relating to the proposed Cullerin Wind Farm are situated primarily on the crest of a high ridge. The area is subject to high wind speeds (Davy and Coppin 2003). Such an environment is unlikely to have been a favoured area for Aboriginal occupation.

The proposal area consists of a ridge crest of high elevation in respect of the surrounding country. The slopes which fall away from the crest are of either moderate or steep gradient. Generally such landforms are known to be of low archaeological sensitivity.

The proposal area contains relatively low biodiversity values and in an Aboriginal land use context would have been a woodland resource environment. A source of abundant and reliable fresh water is absent from the proposal area. The area is predicted to have been utilised for low levels of Aboriginal occupation associated with hunting and gathering forays conducted away from base camp locations situated closer to sources of reliable water.

Given the environmental context, the proposal area is therefore assessed to be of relatively low archaeological sensitivity. The proposal area is predicted to contain low levels of artefact discard associated with hunting and gathering forays and movement through country. Given the skeletal and rocky nature of soils present artefacts are not predicted to be present in subsurface contexts.

Figure 3. The topographic context of the Cullerin Wind Farm (Gunning Series R753; Sheet 8728 2; edition 1 – AAS; 1:50,000 topographic map).

7. ARCHAEOLOGICAL CONTEXT

7.1 Social geography

On the basis of archaeological research it is known that Aboriginal people have occupied Australia for at least 40,000 years and possibly as long as 60,000 years (Mulvaney and Kamminga 1999: 2). By 35,000 years before present (BP) all major environmental zones in Australia, including periglacial environments of Tasmania, were occupied (Mulvaney and Kamminga 1999:114).

At the time of early occupation Australia experienced moderate temperatures. However, between 25,000 and 12,000 years BP (a period called the Last Glacial Maximum) dry and either intensely hot or cold temperatures prevailed over the continent (Mulvaney and Kamminga 1999: 114). At this time the mean monthly temperatures on land were 6-10ºC lower; in southern Australia coldness, drought and winds acted to change the vegetation structure from forests to grass and shrublands (Mulvaney and Kamminga 1999: 115-116).

During the Last Glacial Maximum at about 24-22,000 years ago, sea levels fell to about 130 m below present levels and accordingly, the continent was correspondingly larger. With the cessation of glacial conditions, temperatures rose with a concomitant rise in sea levels. By ca. 6000 BP sea levels had more or less stabilised to their current position. With the changes in climate during the Holocene Aboriginal occupants had to deal not only with reduced landmass, but changing hydrological systems and vegetation; forests again inhabited the grass and shrublands of the Late Glacial Maximum. As Mulvaney and Kamminga (1999: 120) have remarked:

> *When humans arrived on Sahul's shores and dispersed across the continent, they faced a continual series of environmental challenges that persisted throughout the Pleistocene. The adaptability and endurance in colonising Sahul is one of humankinds' inspiring epics*.

Human occupation of south east NSW dates from at least 20,000 years ago as evidenced by dated sites at Burrill Lake (Lampert 1971), Bass Point (Bowdler 1970) and two sites near Buchan in Victoria; Cloggs Cave (Flood 1980) and New Guinea 2 (Ossa *et al* 1995). The Bulee Brook 2 site in the south coast hinterland ranges, excavated by Boot (1994) provides evidence that occupation of this zone had occurred by at least 18,000 years ago. Pleistocene occupation sites are however few with the majority of recorded sites dating from the mid to late Holocene. It is nevertheless reasonable to assume that the Goulburn/Gunning area was occupied and utilised by Aboriginal people from the late Pleistocene onwards.

The earliest European reports regarding the Aborigines of the region are provided through the written observations of the first explorers, adventurers and settlers to the district. These sources present only fragmentary and incomplete accounts of the traditional culture of those Aboriginal groups who inhabited the area. Very soon after European contact, with increasing numbers of white settlers in the 1820s, much of the Aboriginal language and lifestyle had changed before it could accurately be recorded. Because of this, reliable information is limited regarding traditional Aboriginal culture and the extent of group territories at the time of European arrival.

Tindale (1974) determined that the area of present-day Goulburn was situated at the boundary of two tribes – the Gandangara to the north and the Ngun(n)awal to the south. Tribal boundaries are derived principally from linguistic evidence and a virtually identical correspondence in word lists recorded from both the Ngun(n)awal and Gandangara languages has been observed (Eades 1976:6). Because of this there remains conjecture as to which of these two groups actually occupied the region in which the study area is situated at the time of European settlement.

Smith (1992) suggests that the current location of Goulburn fell within the territory of the Gandangara and was in effect an intersection of boundaries and a 'cross roads' for at least six Gandangara 'bands', including the Burra Burra, Tarlo, Wollondilly, Cookmai, Parramarrago and Pajong (Smith 1992: 45). According to Smith's research (1992: 5) at least one of these 'bands' , the Burra Burra, had strong links with the Gandangara of the O'Connell Plains south of Bathurst and may have occupied a traditional range extending as far south as Lake George.

The paucity of reliable ethno-historic sources for this early period of European settlement also means that an estimate of the pre-European Aboriginal population of the district cannot confidently be established. By the time any dependable observations were made small pox, influenza and the effects of European settlement had devastated the local Aboriginal populations. The number of Aborigines estimated to occupy the Goulburn

Plains in 1827 was 45 (Smith 1992: 22). It is variously estimated that by the last years of the 1840s the local Aboriginal population had been reduced to 25 individuals (Smith 1992: 30) or less than 20 (Lance and Koettig 1986:13). This is a slight number when one considers that in 1839 Aborigines are said to have outnumbered Europeans by 10 to 1 at the first Goulburn horse races to be held. Unfortunately the number of Europeans who attended the outing is not supplied.

In 1814 Hamilton Hume started to explore the country to the south of the established colony and on that trip came to the region which became known as Argyle. He revisited this area several times over the following years and in 1818 returned with a party which included the Deputy Surveyor James Meehan. On this journey they came to Lake Bathurst on 3 March, after which Meehan traveled north-west with a smaller party and reached that area now called the Mulwaree Chain of Ponds with its extensive surrounding plains (Taylor 1987). Other exploration parties to the district at this time were led by Throsby – 1818, Throsby-Smith – 1820, Wild – 1820, and Kearns – 1822 (Navin Officer Heritage Consultants 2003:8).

The Goulburn Plains were found to be attractive land for European grazing purposes as they were extensive, lightly timbered with an abundance of native grasses, and the water provided by the Chain of Ponds appeared to be permanent.

The granting of land in the district of Argyle was first promised to the public in 1822, and the township of Goulburn was established in 1824. However, settler expansion by land hungry graziers into these newly discovered districts south of Sydney was rapid, taking place before official grants were sanctioned. In part this was driven by the harsh droughts of 1825 and 1828, and vast expanses of uncultivated land were simply taken up by these first graziers without endorsement from the governing authorities (Navin Officer Heritage Consultants 2003:8).

Prior to European occupation the Aboriginal people of the area practiced a hunting and gathering economy. The study area is situated at the boundary between the Onerwal and Pejar Local Aboriginal Land Council areas.

7.2 Previously Recorded Sites

A search of the NSW DEC Aboriginal Heritage Management Information System has been conducted (AHIMS 20/12/2005). There are no previously recorded sites in the proposal area as listed on the AHIMS register. The AHIMS register only includes sites which have been reported to NSW DEC. Accordingly, this search cannot be considered to be an actual or exhaustive inventory of Aboriginal sites situated within the local area. Generally, sites are only recorded during targeted surveys undertaken in either development or research contexts. It can be expected that additional sites will be present within the local area but that to date they have not been recorded and/or reported to NSW DEC.

Common sites recorded in the region include isolated finds, open artefact scatters or camp sites. The distribution of each site type is related to variance in topography and ground surface geology. Rare site types include rock shelter, scarred trees, quarry and procurement sites, burials, stone arrangements, carved trees and traditional story or other ceremonial places.

The following discussion in Section 7.3 will present a review of previous archaeological work in the region for the purposes of producing a predictive model of site type and location relevant to the study area.

7.3 Archaeology – The local area

There have been no previous archaeological studies conducted within the study area itself and few have been undertaken within the immediate local area. However, a number of studies have been undertaken in the broader region in response to statutory requirements for environmental impact assessment. The following discussion includes a review of archaeological work and its results conducted within the regional area.

Koettig (1983) surveyed the proposed highway by-pass route, to the south and east of Goulburn. Twenty two sites were located, all of which were surface scatters of stone artefacts situated within 200 metres of watercourses, but distributed over a variety of landform units. Fifty four percent were located on slopes, 23% on ridges and 23% along creeks or river flats. Most of the artefacts scatters were distributed at low density but one site (G17) located on a low sandbar on the eastern bank of the Mulwaree River near its junction with Gundary Creek was found to be a high density site with stratified deposit. Koettig (1883) recovered 650 artefacts from test pits, and when Paton (1990) later excavated that section of the site threatened by the construction of the freeway (about 15%), 15,000 artefacts were revealed. Of these less than 1% were formal tool types, 85% were of quartz and the next most frequent raw material was silcrete (10%).

Lance (1984) surveyed the route of a proposed pipeline between Sooley Dam and Rossi Weir on the Wollondilly River, finding a single quartz flake adjacent to Sooley Creek in conditions of reduced exposure.

Dallas (1985) conducted a survey of the Cullerin Range Bypass which extended between Breadalbane and Gunning for a distance of 31 kilometres. This survey route passed immediately to the south of the current proposal area. A total of 7 artefact scatters were recorded, six of which were found to the east of the Cullerin Range. During a subsequent survey of a realignment of the route conducted by Koettig and Silcox (1985) an additional 7 sites were recorded, all of which were situated to the south of the current proposal area. However, these sites were thought to most probably represent a near continuous artefact distribution rather than individual sites. These latter sites were situated on elevated ground and close to a creekline in zones of high visibility. All of the sites recorded during these surveys, except for one near Breadalbane, contained small artefact numbers. Silcox (1993) summarised the results of these two surveys indicating that in the local area open campsites are generally situated on slopes adjacent to water but were also found on creek flats and ridges.

Koettig (1986) carried out an excavation of one of the sites (CR14) on the Bypass route which was situated on a small knoll overlooking a creekline. An extensive assemblage of mostly quartz artefacts was retrieved with material occurring in variable density across the site. Both quartz and silcrete were found to have been worked by both direct percussion and bipolar flaking techniques.

Lance and Koettig (1986) compiled an Aboriginal Resources Planning Study for the City of Goulburn. Using ethnographic, environmental, archaeological and sampled field survey data, an Aboriginal site location model for the Goulburn area was proposed. Four landform zones were designated (major watercourses, undulating hills and plains, hill tops and built-up areas), and each assigned an archaeological sensitivity and site significance rating. The most common site-type within the Goulburn region was found to be stone artefact scatters situated within the undulating hills and plains zone and predominantly on basal slopes adjacent to watercourses.

Silcox (1988) conducted a survey at a reopened slate quarry at Chatsbury. Three surface scatters of stone artefacts were located (C1 – 33 artefacts; C2 - 25 artefacts; C3 – 23 artefacts) with quartz being the dominant raw material, and silcrete, chert, acid volcanic and 'other' also present. These sites were all located within 50m of the Tarlo River, on lower slopes. The characteristic landform of the area consisted of prominent rounded hills with moderate to steep slopes and sloping valley floors. The survey area was situated at the junction of the Tarlo River and Kings Creek. Site C1 was located on a gentle to moderate slope leading down to the original course of the Tarlo River (the river having been diverted when the original mine operated). Site C2 was located on the lower slopes of a spur ridge adjacent to the river. Site C3 was found along a steep eroding bank of Kings Creek. Silcox (1988) identified several potential campsite locations, and it was determined that excavation should be carried out at two of these (CA & CB). CA was an area of moderately sloping land on both sides of the original course of the Tarlo River. Location CB consisted of an expanse of flat ground bordering the west bank of the original Tarlo River.

Test excavations were subsequently carried out (Silcox 1989) at both locations near to the river, but only 5 artefacts were recovered. The 5 artefacts that were recovered from excavation were all from the uphill end of location CA. The absence of subsurface material from the majority of the test locations was explained to be the result of a real absence of past activity on the sites.

Fuller (1989) conducted a further archaeological investigation of Aboriginal site location within the Goulburn area, and in so doing explored and developed Lance and Koettig's (1986) model. Locating 17 artefact scatters and 5 isolated finds during field survey, it was found that the majority of sites were small low density scatters of less than 10 artefacts. However, at one site (GC5) more than 100 artefacts were located, while at another (GC4) an estimated 1000 artefacts were scattered over an area measuring 1 km². Quartz, chert and silcrete were the most common stone from which artefacts were made. Fuller's analysis largely supported Lance and Koettig's (1986) model and added further refinement with regard to the landform unit 'undulating hills and plains' (discussed further below).

Silcox (1991) conducted a field survey and test excavation at a proposed storm flow detention pond in Goulburn, adjacent to the Wollondilly River. The area was situated on an extensive elevated surface overlooking the wide floodplain. No artefacts were found and this was attributed to thick grass cover producing low levels of ground visibility. Subsequent subsurface testing recovered 97 artefacts from a total of 30 pits (Silcox 1991). Artefacts were found to be present in low numbers; density ranged between 36/m² and 1.5/m². The stone artefact assemblage was dominated by quartz (78%) with silcrete representing the next most common raw material.

Williams (1992) surveyed archaeologically sensitive areas located on a proposed Optus cable route between Goulburn and Campbelltown. In the Goulburn district he conducted both surface survey and subsurface testing in the vicinity of G17, the site previously located by Koettig (1983) adjacent to the Mulwaree River and later reinvestigated by Paton (1990). While no artefacts were located on the western side of the river, some were recovered from surface survey and deposits at G17. Examination of Koettig's (1983) site G19/20 led to the relocation of 53 of 191 artefacts originally recorded at that site.

Australian Archaeological Survey Consultants (1993) surveyed some 5 kilometres of a proposed Telstra optical fibre cable route between Goulburn and 'The Forrest', and located 3 very low density artefact scatters, 4 isolated finds and a possible scarred tree.

Silcox (1993a) carried out test excavations at a proposed ironstone mine access road situated ca. 3 km east of the proposal area near Breadalbane. While no sites had been identified in a previous survey (Silcox 1992), two areas of potential archaeological sensitivity were noted, one on a gentle slope and the other on a flattish saddle at the end of a ridge. The excavation work conducted at these two locations retrieved 4 artefacts from a total of 57 pits at the site situated on the gentle slope. None were found at the site situated on the broad flatfish saddle.

Effenberger (1994) conducted a survey of the new Goulburn racecourse, an area of 93 ha, and located 2 isolated finds.

Silcox (1995) surveyed the route of a proposed power line and Telstra radio base at Sunnyside, some 14 kilometres south west of Goulburn. Two artefact scatters and one isolated find were located. Site S1, an extensive but low density scatter calculated to be comprised of at least 2,500 lithic artefacts, was situated on a low, broad spur ridge at the base of a major ridge system some 3.75 kilometres west of the Mulwaree River and 100 m from a tributary creekline. S2 consisted of 4 artefacts distributed across an area of 50 m on the opposite side of the tributary creekline.

Stuart (1995) carried out a survey for proposed effluent irrigation areas east of Goulburn and near to the Wollondilly River. Two small artefact scatters and 2 isolated finds were located, both of which were situated in Lance and Koettig's (1986) high potential 'zone 1', which in this instance was near to the Wollondilly River.

Kuskie (1996) surveyed the proposed site of a rural residential development on Lots 2-4 DP835933, just south west of the Goulburn township. One small artefact scatter and 1 isolated find were recorded. The scatter was located in the middle of a lower slope, 150m east of a minor drainage line, and consisted of two silcrete flakes.

Navin Officer Heritage Consultants (2000) conducted an archaeological assessment for the raising of Sooley Dam, 5.5 kilometers north west of Goulburn, as part of the Goulburn Water Supply Augmentation Project. The survey encompassed low hills and gently undulating land in areas on both sides of creeks subsequently inundated by Lake Sooley. The area was assessed to be of low archaeological potential. No Aboriginal sites or areas with archaeological sensitivity were recorded.

Dominic Steele Consulting Archaeology (2003) conducted a survey in relation to the proposed Goulburn Sewerage Augmentation works within Goulburn itself, in the areas of Ross Street, Gorman Road and sections of Kenmore Hospital. The proposal area was situated predominantly on flat and/or undulating elevated land overlooking the Wollondilly River. The area was found to have been significantly disturbed by European development. One scarred tree was relocated, 2 possible scarred trees identified, and 1 quartz flake located. It was assessed that the proposal had low potential to cause impacts to subsurface deposits of significance.

Navin Officer Heritage Consultants (2003) carried out a survey for the proposed Pictura Tourist Complex on the lower catchment of the Run of Waters Creek just south west of Goulburn. The study area is situated on a broad low gradient ridge and adjoining low to moderate gradient mid and upper slopes. A 1st to 2nd order tributary stream traversed one corner of the 37.8 ha property. One low density artefact scatter was found situated on a broad, low gradient spur top over 700 m from the watercourse, and consisting of one chert flake and one silcrete flaked piece.

Dibden (2004a and 2004b) carried out a survey of the Greenwich Park subdivision area situated northeast of Goulburn. A large number artefact scatters were recorded on spur crests, spur side slopes and drainage depression/spur side slope interface landforms in conditions of very good archaeological visibility. Artefact density which was calculated according to effective archaeological visibility was found to be extremely low.

A number of studies have been carried out specifically in relations to wind farms in the local area. These are discussed below:

At Crookwell Jo McDonald Cultural Heritage Management (1998) conducted salvage excavation at the proposed Crookwell wind farm. Excavating a total of 25 1 m x 1 m squares, 2,154 stone artefacts were retrieved, with this find interpreted as '…indicating a single limited encampment where one (or several) person(s) knapped a limited range of raw materials (silcrete, chalcedony and quartz) to produce a set of distinctive tools…' including 10 complete *Pejar Points*. The site was located on a secondary spur with a westerly aspect and was situated at ca. 1 km from Middle Creek.

Jo McDonald Cultural Heritage Management Pty Ltd (2003) undertook a survey of the Gunning Wind Farm, situated on the Cullerin Range north of the current study area. The Gunning Wind Farm proposal area consists of range crest and valley topography elevated at 840 meters (asl). Four sites containing stone artefact scatters and three isolated artefacts were recorded across the proposal area (Jo McDonald Cultural Heritage Management Pty Ltd 2003). One of the scatters was identified as a quartz quarry; blocky quartz was found to outcrop at the site. The majority of recorded artefacts were identified as quartz, however, quartzite, silcrete and red agate was also recorded. Steep hill tops were considered to be of low archaeological potential, while elevated contexts close to water were considered to be of higher sensitivity.

Reeves and Thomson (2004) undertook a survey in relation to the proposed Woodlawn Wind Farm at Tarago. The Woodlawn proposal area is situated at the site of the former Woodlawn open cut mine situated 9 kilometers west of Tarago. The majority of the proposed impact zones are situated on the spine of a steep ridge of the Turallo Range. Fifteen stone artefact sites, eight of which were isolated finds, were recorded and the low density distribution was determined to be representative of background scatter calculated to be 6 artefacts per hectare. Artefacts were recorded across a wide range on landform elements including crest, slopes, and drainage depressions; the results indicated no strong patterning of artefact location in relation to landform. Stone materials recording included rhyolite, quartz and silcrete, volcanics and tuff. The impact zone was assessed to be of low archaeological potential. The results indicated that the range was utilised for low levels of Aboriginal exploitation and may have functioned as a transit route between larger resource zones.

OzArk Environment & Heritage Management P/L (2004) conducted an assessment of the proposed Taralga Wind Farm. The Taralga proposal area is situated 2-4 kilometers to the east of Taralga. The proposed impact zones encompassed ridge crest, slopes and drainage depression. Six artefact sites and one scarred tree were recorded. Stone materials recording included rhyolite, quartz and silcrete and volcanics. The majority of site recordings were made near water.

Based on the above review and a consideration of the elevation, geology, hydrology and topography of the study area the type of sites known to occur in the region and the potential for their presence within the study area are listed as follows.

7.4 Predictive Model of Site Type and Location

Stone artefact scatter sites containing low artefact numbers and densities are in the most common site type found within the region. In the wider Goulburn area a general correlation between different types of watercourses and the nature of the evidence of past Aboriginal occupation is evident. Higher artefact density sites are located near to permanent water sources and low density artefact distributions are found elsewhere.

Lance and Koettig (1986) developed a predictive model for Aboriginal site location around Goulburn City based on four defined environmental zones – major watercourses, undulating hills and plains, hill tops and built-up areas. This model was later tested and refined by Fuller (1989) who conducted surface surveys of these zones. Areas of good exposure and natural erosion were targeted however no subsurface investigation was involved.

Fuller (1989) recorded 17 open artefact scatters and 5 isolated finds during this survey. These sites were found across all environmental zones as previously defined by Lance and Koettig (1986), including those indicated as less archaeologically sensitive. Eleven of the 17 open sites were recorded in Lance and Koettig's (1986) 'Zone 2: Undulating hills and plains', predicted in their model to be of low archaeological sensitivity, including GC4 and GC5, estimated by Fuller (1989) to contain over 1,000 and 100 artefacts respectively. Nine of the 11 sites located in the 'undulating hills and plains' zone were situated on mid-slope landform units.

From the results of this survey Fuller (1989) produced a subsequent augmented model of predicted Aboriginal site location in the Goulburn City region, based on a combination of: - proximity to watercourses; the nature of those watercourses; elevation; and steepness of slope. Fuller's (1989) conclusion was that Aboriginal

occupation in the Goulburn area appeared to be concentrated to a large extent around utilization of the resources of the Mulwaree and Wollondilly Rivers, although the presence of other lesser watercourses distributed at intervals throughout the region meant that land usage was not limited to these major rivers.

Subsequent surveys carried out in the broader region, cited above, have to a large extent borne out Fuller's (1989) findings. Consequently, a predictive model for Aboriginal sites in the Southern Tablelands informs that Aboriginal sites will be found across a broad spectrum of topographic units such as slopes, hilltops, ridges, spurs and watercourse flats (Silcox 1991), and according to Lance & Koettig (1986) and Fuller (1989), within close proximity to watercourses. Koettig (1983) has identified that larger sites will be contiguous with major streams, while lesser sites will be associated with low order watercourses.

The type of sites known to occur in the region and the potential for their presence within the study area are listed as follows:

Stone Artefacts

Stone artefacts are found either on the ground surface and/or in subsurface contexts. The raw materials used for artefact manufacture in the local area will commonly be silcrete, chert and quartz.

Stone artefacts will be widely distributed across the landscape in a virtual continuum, with significant variations in density in relation to different environmental factors. Artefact density and site complexity is expected to be greater near reliable water and the confluence of a number of different resource zones.

The detection of artefact scatters depends on ground surface factors and whether or not the potential archaeological bearing soil profile is visible. Prior ground disturbance, vegetation cover and sediment/gravel deposition can act to obscure artefact scatter presence.

Given the environmental context of the proposed Cullerin Wind Farm stone artefacts are predicted to be present in very low densities only. The soils in the proposal area are skeletal and rocky; accordingly stone artefacts are unlikely to be present in a subsurface context.

Grinding Grooves

Grinding grooves are found in rock surfaces and result from the manufacture and maintenance of ground edge tools. Grinding grooves are only found on sedimentary rocks such as sandstone. Given the absence of suitable rock exposures in the study area grinding groove sites are unlikely to be present.

Burials sites

Burial sites have been recorded within the wider region. This site type is rarely located during field survey and given the topography, nature of the soils and geology, burials are not predicted to be present in the study area.

Rock Shelter Sites

Rock shelters sites are unlikely to be present in the study area given the absence of large vertical stone outcrops.

Scarred and Carved Trees

Scarred and Carved trees result from either domestic or ceremonial bark removal. Carved trees associated with burial grounds and other ceremonial places have been recorded in the wider region. In an Aboriginal land use context this site type would most likely have been situated on flat or low gradient landform units in areas suitable for either habitation and/or ceremonial purposes.

Bark removal by European people through the entire historic period and by natural processes such as fire blistering and branch fall make the identification of scarring from a causal point of view very difficult. Accordingly, given the propensity for trees to bear scarring from natural causes their positive identification is impossible unless culturally specific variables such as stone hatchet cut marks or incised designs are evident and rigorous criteria in regard to tree species/age/size and it specific characteristics in regard to regrowth is adopted.

Nevertheless, the likelihood of trees bearing cultural scarring remaining extant and in situ is low given events such as land clearance and bushfires. Generally scarred trees will only survive if they have been carefully protected (such as the trees associated with Yuranigh's grave at Molong where successive generations of European landholders have actively cared for them).

The study area has been extensively cleared and the trees present are less than 50 years of age. While not impossible this site type is unlikely to have survived and therefore be extant in the study area.

Stone Quarry and Procurement Sites

A lithic quarry is the location of an exploited stone source (Hiscock & Mitchell 1993:32). Sites will only be located where exposures of a stone type suitable for use in artefact manufacture occur. Given the absence of stone outcrops in the proposal area this site type is unlikely to be recorded during the study.

8. SURVEY RESULTS

8.1 Results

A total of four locales containing stone artefacts were recorded within the survey area during this study. These sites are further described below and their location is shown on Figure 4.

The table below provides a summary of stone artefact recordings.

Name	Grid reference AMG Hand GPS Aust 66		Landform	Description	Impacts
Survey Unit 6/Locale 1	718795e	6144606n	knoll on ridge crest	2 stone artefacts	Turbine; access road; on-site electrical connection
Survey Unit 8/Locale 1	718486e	6144545n	shoulder on ridge crest	25 stone artefacts	Access road
Survey Unit 9/Locale 1	719359e	6144869n	knoll on ridge crest	3 stone artefacts	Turbine; access road; on-site electrical connection
Survey Unit 22/Locale 1	719444e	6146556n	saddle on ridge crest	1 stone artefact	Turbine; access road; on-site electrical connection

Table 1 Summary of stone artefact recordings.

Cullerin Survey Unit 6/Locale 1 grid reference: Hand GPS (Aust 66): 718795. 6144606 (AMG)

This recording consists of two stone artefacts found on a knoll of a ridge crest in Survey Unit 6 (Plate 3). The site location has an open aspect and a gradient of between 0-3º. Soils in the area are skeletal with a high shattered shale content. The area is situated at ca. 500 m away from ephemeral water courses. The land falls relatively steeply away from the crest both to the north and south of the Survey Unit.

In an Aboriginal land use context it is predicted that such an area would have been utilised for low levels of occupation which probably included intermittent hunting and gathering activities conducted away from base camp locations, movement through country and so on. Such landuse is predicted to have resulted in a corresponding low level of artefact discard.

The artefacts are situated in a grassed paddock and were located in exposures of bare earth patches.

The artefacts recorded are described as follows:

- Milky quartz flake measuring 27 x 12 x 3 mm
- Milky quartz core measuring 32 x 22 x 20 mm

The two artefacts were found in an area measuring 5 m x 5 m (25 m²). Ground exposure within that area is estimated to be 50% with ca. 85% of that exposure assessed to be archaeological visibility. Based on surface indicators artefact density at the artefact locale is therefore calculated to be 2/10.6 m² (0.18 artefacts per m²). However, artefact density across the wider Survey Unit is calculated to be significantly less: 0.007/m² (see Table 3).

It is probable that additional artefacts are present across Survey Unit 6, however it is predicted that any additional artefacts will be present in extremely low numbers and density. Given the very shallow and rocky soil, the Survey Unit will, if at all, contain artefacts in a very shallow subsurface context (<10 cm) only.

This artefact recording is situated within a general area in which a turbine, access track and onsite electrical connections are proposed and may therefore be subject to impacts relating to the wind farm proposal.

Cullerin Survey Unit 8/Locale 1 grid reference: Hand GPS (Aust 66): 718486. 6144545 (AMG)

This recording consists of twenty five stone artefacts found on a shoulder of a ridge crest in Survey Unit 8 (Plate 4). The site location has an open aspect and a gradient of between 0-3º. Soils in the area are skeletal with a high shattered shale content. The area is situated at ca. 200 m away from the head of a 1st order stream. The land falls relatively steeply away from the crest both to the north and south of the Survey Unit.

In an Aboriginal land use context it is predicted that such an area would have been utilised for low levels of occupation which probably included intermittent hunting and gathering activities conducted away from base camp locations, movement through country and so on. Such landuse is predicted to have resulted in a corresponding low level of artefact discard.

The artefacts are situated in a grassed paddock and were located in exposures of bare earth patches and a vehicle track.

A sample of the artefacts is described as follows:

- Grey silcrete flake measuring 18 x 24 x 6 mm
- Milky quartz flaked piece measuring 8 x 12 x 4 mm
- Milky quartz flaked piece measuring 12 x 10 x 4 mm
- Grey silcrete flake measuring 12 x 6 x 2 mm
- Grey silcrete flaked piece measuring 27 x 18 x 15 mm
- Red banded chert flaked piece measuring 20 x 16 x 4 mm

The twenty five artefacts were found in an area measuring 15 m x 25 m (375 m²). Ground exposure within that area is estimated to be 40% with ca. 80% of that exposure assessed to be archaeological visibility. Based on surface indicators artefact density at the artefact locale is therefore calculated to be 25/120 m² (0.21 artefacts per m²). However, artefact density across the wider Survey Unit is calculated to be significantly less: 0.02/m² (see Table 3).

It is probable that additional artefacts are present across Survey Unit 8, however it is predicted that any additional artefacts will be present in extremely low numbers and density. Given the very shallow and rocky soil, the Survey Unit will, if at all, contain artefacts in a very shallow subsurface context (<10 cm) only.

This artefact recording is situated within a general area in which an access track is proposed and may therefore be subject to impacts relating to the wind farm proposal.

Cullerin Survey Unit 9/Locale 1 grid reference: Hand GPS (Aust 66): 719359. 6144869 (AMG)

This recording consists of three stone artefacts found on a knoll of a ridge crest in Survey Unit 9 (Plate 5). The site location has an open aspect and a gradient of between 0-3º. Soils in the area are skeletal with a high shattered shale content. The area is situated at ca. 900 m away from the head of a 1st order stream. The land falls away from the crest at a moderate both to the north and south of the Survey Unit.

In an Aboriginal land use context it is predicted that such an area would have been utilised for low levels of occupation which probably included intermittent hunting and gathering activities conducted away from base camp locations, movement through country and so on. Such landuse is predicted to have resulted in a corresponding low level of artefact discard.

The artefacts are situated in a grassed paddock and were located in exposures of bare earth patches.

The artefacts recorded are described as follows:

- Milky quartz core measuring 32 x 20 x 18 mm; 1 platform, 3 negative scars
- Grey silcrete core measuring 27 x 24 x 11 mm; 1 platform, 6 negative scars
- Grey silcrete flake (blade core fragment) measuring 22 x 17 x 9 mm

The three artefacts were found in an area measuring 15 m x 10 m (150 m²). Ground exposure within that area is estimated to be 40% with ca. 80% of that exposure assessed to be archaeological visibility. Based on surface indicators artefact density at the artefact locale is therefore calculated to be 3/48 m² (0.06 artefacts per m²). However, artefact density across the wider Survey Unit is calculated to be significantly less: 0.002/m² (see Table 3).

It is probable that additional artefacts are present across Survey Unit 9, however it is predicted that any additional artefacts will be present in extremely low numbers and density. Given the very shallow and rocky soil, the Survey Unit will, if at all, contain artefacts in a very shallow subsurface context (<10 cm) only.

This artefact recording is situated within a general area in which a turbine, access track and onsite electrical connections are proposed and may therefore be subject to impacts relating to the wind farm proposal.

Cullerin Survey Unit 22/Locale 1 grid reference: Hand GPS (Aust 66): 719444. 6146556 (AMG)

This recording consists of one stone artefact found on a small saddle of a ridge crest in Survey Unit 22 (Plate 11). The site location has an open aspect and a gradient of 3º. Soils in the area are skeletal with a high shattered shale content. The area is situated at ca. 700 m away from a 1st order stream. The land falls away from the crest at a moderate gradient to the east of the Survey Unit.

In an Aboriginal land use context it is predicted that such an area would have been utilised for low levels of occupation which probably included intermittent hunting and gathering activities conducted away from base camp locations, movement through country and so on. Such landuse is predicted to have resulted in a corresponding low level of artefact discard.

The artefacts are situated in a grassed paddock and were located in exposures of sheet erosion.

The artefacts recorded are described as follows:

- Orange fine grained quartzite flake measuring 35 x 22 x 7 mm

The artefact was found in an area of exposure measuring 25 m x 20 m (500 m²). Ground exposure within that area is estimated to be 50% with ca. 75% of that exposure assessed to be archaeological visibility. Based on surface indicators artefact density at the artefact locale is therefore calculated to be 1/500 m² (0.002 artefacts per m²). However, artefact density across the wider Survey Unit is calculated to be significantly less: 0.0002/m² (see Table 3).

It is probable that additional artefacts are present across Survey Unit 22, however it is predicted that any additional artefacts will be present in extremely low numbers and density. Given the very shallow and rocky soil, the Survey Unit will, if at all, contain artefacts in a very shallow subsurface context (<10 cm) only.

This artefact recording is situated within a general area in which a turbine, access track and onsite electrical connections are proposed and may therefore be subject to impacts relating to the wind farm proposal.

8.2 Survey Coverage Variables

Survey Coverage Variables are a measure of ground surveyed during the study and the type of archaeological visibility present within that surveyed area. Survey coverage variables provide a measure with which to assess the effectiveness of the survey so as to provide an informed basis for the formulation of management strategies.

Specifically, an analysis of survey coverage is necessary in order to determine whether or not the opportunity to observe stone artefacts in or on the ground was achieved during the survey. In the event that it is determined that ground exposures provided a minimal opportunity to record stone artefacts it may be necessary to undertake archaeological excavation for determining whether or not stone artefacts are present. Conversely, if ground exposures encountered provided an ideal opportunity to record the presence of stone artefacts, the survey results may be considered to be adequate and accordingly no further archaeological work may be required.

Two main variables were used to measure ground surface visibility during the study; the area of ground exposure encountered and the quality and type of ground visibility (archaeological visibility) within those exposures.

The two survey coverage variables estimated during the survey are defined as follows:

Average Ground Exposure – a percentage estimate of the total area of ground inspected which contained exposures of bare ground; and

Average Archaeology Visibility – a percentage estimate of the average levels of potential archaeological surface visibility within those exposures of bare ground.

Based on the two visibility variables as defined above, a net estimate (Net Effective Exposure) of the archaeological potential of exposure area within a survey unit or set of units has been calculated. The Effective Survey Coverage (ESC) calculation is defined and required by the NPWS. The ESC provides an estimate of the proportion of the total study area which provided a net 100% level of ground surface visibility (with archaeological potential).

Thirty six Survey Units was defined and recorded during the study. The Survey Units are described in Table 2 and Table 3 below; there location is shown on Figure 4.

The total survey area measured ca. 117.9 hectares and approximately 92.3 hectares of that area was traversed and inspected during the survey. The survey transects conducted across each Survey Unit included the inspection of exposures such as erosional features, vehicle tracks, animal tracks and burrows, and bare earth patches. Generally ground exposures were relatively sparse given that the proposal area is grassed; ground surfaces are covered with vegetation and in woodland areas, leaf and bark litter.

Within ground exposures archaeological visibility was generally very high given the skeletal nature of soils present.

It is estimated that ground exposure actually inspected across the study area measured ca. 6.9 hectares. Of that ground exposure it is calculated that ca. 5.6 hectares inspected provided potential archaeological visibility (the potential artefact bearing soil profile). Effective survey coverage achieved during the study is calculated to have been 4.8 % of the entire proposal area.

Effective survey coverage achieved during the survey is low to moderate and a better than expected result in grassed country. The survey coverage encountered is assessed to be reasonably adequate for providing an indication of the density of any archaeological material which may be present across the study area. The survey results are therefore assessed to a reasonably accurate reflection of the archaeological potential of the proposal area.

8.3 Discussion

Effective survey coverage achieved during the survey is assessed to have been adequate for the purposes of providing a reasonably reliable indication of the archaeological status of the proposal area. Four locales containing stone artefacts were recorded. Artefact density calculations based on surface indicators indicate that all artefact locales, and the Survey Units in which they are situated, contain low density artefact distributions.

The survey results are in keeping with the predictive model of site location relevant to the proposal area.

The Survey Units present in the study area are each assessed to be of low or very low archaeological potential based on various factors including steep gradients, the distance from reliable water and the shallow or skeletal soils which are present across the proposal area.

Given the absence of a reliable fresh water source in the proposal area and the limited resources that would have been present in the former woodland zone, it is predicted that the area was not likely to have been subject to sustained Aboriginal habitation. Aboriginal habitation sites are expected to be present closer permanent watercourses and in areas where there was a confluence of resources represented.

Instead, it is predicted that the land occupied by the proposal area is likely to have been utilised for hunting and gathering forays conducted away from base camps. Such short term events are unlikely to result in the formation of large, high density or complex archaeological sites. It is predicted instead that such land usage would result in low to very low levels of artefactual discard.

The proposal area is assessed to be of low archaeological potential and sensitivity.

Survey Unit	Landform element	Vegetation	Geology/ soils	Landuse impacts	Proposed Impacts
SU1 (Plate 1)	Ridge crest; Open aspect; 0-3º gradient	Grassed (native and exotic) with scattered trees	Skeletal soil with shattered shale; some low outcrops; quartz present in bedrock	Original clearance; grazing; fencing	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU2	Simple slope; aspect: 240º; 8º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; some low outcrops; quartz present in bedrock	Original clearance; grazing; fencing; dam construction	Turbine area (access track, on-site electrical and communications underground cabling)
SU3	Saddle on ridge crest; Open aspect; 0-5º gradient	Grassed	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing	Turbine area (access track, on-site electrical and communications underground cabling)
SU4 (Plate 2)	Knoll on ridge crest; Open aspect; 1-5º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU5	Ridge crest; aspect 290º; 8º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU6 (Plate 3)	Knoll on ridge crest; Open aspect; 0-3º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing	access track
SU7 (Plate 4)	Ridge crest: aspect 320º; 7º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing	access track
SU8 (Plate 4)	Shoulder on ridge crest; Open aspect; 0-3º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing; track and hut	access track
SU9 (Plate 5 & 7)	Knoll on ridge crest; Open aspect; 0-2º gradient	Grassed	Skeletal soil with shattered shale; some low outcrops; quartz present in bedrock	Original clearance; grazing; fencing; communications tower construction	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU10	Spur crest; aspect: west 7º gradient	Grassed	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing; fencing	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU11 (Plate 6)	Saddle on spur crest; Open aspect; 0-3º gradient	Grassed	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing; fencing	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU12 (Plate 6)	Knoll on spur crest; Open aspect; 1-4º gradient	Grassed with regrowth forest	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing; fencing	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU13 (Plate 7)	Ridge crest; aspect to north; 7º gradient	Grassed	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing; fencing; communications tower and formed access road	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU14 (Plate 7)	Saddle on ridge crest;	Grassed	Skeletal soil with shattered shale and	Original clearance; grazing; fencing	Turbine area (turbine, access track, on-site electrical and

Survey Unit	Landform element	Vegetation	Geology/ soils	Landuse impacts	Proposed Impacts
	open aspect; 0-3º gradient		cobbles; quartz present in bedrock	and formed access road	communications underground cabling)
SU15	Ridge crest; aspect to south; 12º gradient	Grassed	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing; fencing and formed access road	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU16	Knoll on ridge crest; open aspect; 0-3º gradient	Grassed	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing; fencing, wind mast and Trig and formed access road	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU17 (Plate 8)	Ridge crest; open aspect; 0-3º gradient	Grassed; scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing; fencing; ploughed paddocks	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU18 (Plate 9)	Simple slope off ridge crest; aspect to 300º; 8º gradient	Grassed	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing; fencing and track	Turbine area (access track, on-site electrical and communications underground cabling)
SU19 (Plate 9)	Ridge crest; open aspect; 0-3º gradient	Grassed	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU20 (Plate 10)	Ridge crest; open aspect; 3-5º gradient	Grassed with regrowth woodland	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing; fencing and track	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU21	Knoll on ridge crest; open aspect; 0-3º gradient	Grassed with regrowth woodland	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing; fencing; stock yards and track	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU22 (Plate 11)	Ridge crest; aspect to north; 5º gradient	Grassed with regrowth woodland	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing; fencing and track	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU23	Knoll on ridge crest; open aspect; 3-6º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing; fencing and track; overhead transmission line	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU24 (Plate 12)	Ridge crest; aspect to south; 5º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing and fencing	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU25	Knoll on ridge crest; open aspect; 2-5º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing and fencing	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU26	Ridge crest; aspect to north west; 7º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing and fencing	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU27	Ridge crest; open aspect; 3-6º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing and fencing	Turbine area (turbine, access track, on-site electrical and communications underground cabling)
SU28	Ridge crest; open aspect; 2º gradient	Grassed with scattered trees	Deep soil; bedrock cobbles	Original clearance; grazing and fencing	Turbine area (turbine, access track, on-site electrical and communications underground cabling)

Survey Unit	Landform element	Vegetation	Geology/ soils	Landuse impacts	Proposed Impacts
SU29 (Plate 14)	Spur crest; aspect to north; 8-12º gradient	Grassed with regrowth woodland	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing and fencing	On-site electrical cabling
SU30	Drainage depression; aspect to north east; 4-6º gradient	Grassed with regrowth woodland	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing and fencing	On-site electrical cabling
SU31	Spur crest; aspect to east; 6-10º gradient	Grassed (pasture) with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing and fencing	On-site electrical cabling
SU32	Flat; open aspect; 0º gradient	Grassed (pasture)	Alluvial and colluvium	Original clearance; grazing and fencing	On-site electrical cabling
SU33	Spur crest; aspect to north; 8-12º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing and fencing	Alternative substation site
SU34 (Plate 15)	Simple slope off ridge crest; aspect to north; 4-7º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing and fencing; access track; dam construction; water diversion channels	Access track
SU35	Simple slope off ridge crest; aspect to east; 10º gradient	Grassed with scattered trees	Skeletal soil with shattered shale; quartz present in bedrock	Original clearance; grazing and fencing	Access track
SU36 (Plate 13)	Basal slope; aspect to east; 0-1º gradient	Grassed with scattered trees	Silty colluvial soil	Original clearance; grazing and fencing	Access track

Table 2: Description of Survey Units

Plate 1. Survey Unit 1 looking 45º.

Plate 2. Survey Unit 5 looking west from Survey Unit 4.

Plate 3. Survey Unit 6 looking west; Location of stone artefacts (SU6/L1) denoted by paper.

Plate 4. Survey Unit 8 in foreground; Survey Unit 7 in mid distance: looking east; East end of SU8/L1 in foreground.

Plate 5. Survey Unit 9: looking east; Location of SU9/L1.

Plate 6. From Survey Unit 9: looking west to Survey Units 11 and 12.

Plate 7. From Survey Unit 14: looking south to Survey Units 13 and 9. Note communications tower in Survey Unit 9.

Plate 8. Looking north to Survey Unit 17.

Plate 9. Looking 60º from Survey Unit 19.

Plate 10. Looking 330º to Survey Unit 20.

Plate 11. Looking south east to north end of Survey Unit 22 and SU22/L1.

Plate 12. Looking north to Survey Unit 24.

Plate 13 Survey Unit 36 looking east.

Plate 14 Survey Unit 29 looking north.

Plate 15 Survey Unit 34 looking south.

Survey Unit	Exposures	Survey Unit Area	Area surveyed	Ave. ground exposure	Ave. arch visibility %	Net effective exposure	Effective survey coverage	Artefacts recorded	Potential density of undetected artefacts
SU1	bare earth patches; exposures under trees; animal tracks	600 x 200 = 120,000 m²	65% 78,000 m²	1% 780 m²	40%	312 m²	0.26 %	-	low
SU2	bare earth patches; animal tracks	200 x 150 = 30,000 m²	85% 25,500 m²	5% 1,275 m²	70%	892.5 m²	3 %	-	very low
SU3	bare earth patches; animal tracks	150 x 80 = 12,000 m²	85% 10,200 m²	5% 510 m²	70%	357 m²	3 %	-	low
SU4	bare earth patches	150 x 100 = 15,000 m²	85% 12,750 m²	5% 637.5 m²	70%	446.25 m²	3 %	-	low
SU5	bare earth patches	150 x 100 = 15,000 m²	85% 12,750 m²	5% 637.5 m²	70%	446.25 m²	3 %	-	low
SU6	bare earth patches	50 x 75 = 3750 m²	85% 3187.5 m²	10% 318.75 m²	80%	255 m²	6.8%	SU6/L1 2 artefacts	low (density: 0.007/m²)
SU7	bare earth patches; animal tracks	200 x 100 = 20,000 m²	85% 17,000 m²	10% 1,700 m²	80%	1,360 m²	6.8%	-	low
SU8	bare earth patches; track; animal tracks	100 x 100 = 10,000 m²	95% 9,500 m²	15% 1425 m²	80%	1,140 m²	11.4%	SU8/L1 25 artefacts	low (density: 0.02/ m²)
SU9	bare earth patches; animal tracks	200 x 100 = 20,000 m²	80% 16,000 m²	10% 1600 m²	80%	1,280 m²	6.4%	SU9/L1 3 artefacts	low (density: 0.002/ m²)
SU10	bare earth patches	50 x 100 = 5,000 m²	85% 4,250 m²	15% 637.5 m²	80%	510 m²	10.2%	-	low
SU11	bare earth patches; exposures under trees	100 x 100 av. = 10,000 m²	85% 8,500 m²	10% 850 m²	80%	680 m²	6.8%	-	low
SU12	bare earth patches; exposures under trees	100 x 100 = 10,000 m²	65% 6,500 m²	5% 325 m²	60%	195 m²	1.95%	-	low
SU13	bare earth patches	150 x 150 = 22,500 m²	80% 18,000 m²	1% 180 m²	80%	144 m²	0.6%	-	low
SU14	bare earth patches; track	150 x 150 = 22,500 m²	80% 18,000 m²	15% 2,700 m²	85%	2,295 m²	10.2%	-	low
SU15	bare earth patches; track	175 x 175 = 30,625 m²	75% 22,968 m²	5% 1,148 m²	85%	976 m²	3.19%	-	low
SU16	bare earth patches; track	200 x 100 = 20,000 m²	85% 17,000 m²	10% 1,700 m²	85%	1,445 m²	7.2%	-	low
SU17	bare earth patches; animal tracks	200 x 200 = 40,000 m²	55% 22,000 m²	1% 220 m²	80%	176 m²	0.44%	-	low
SU18	bare earth patches; animal tracks	200 x 75 = 15,000 m²	85% 12,750 m²	15% 1912.5 m²	85%	1,625.6 m²	10.8%	-	low
SU19	bare earth patches; animal tracks	200 x 100 = 20,000 m²	85% 17,000 m²	10% 1,700 m²	85%	1445 m²	7.2%	-	low
SU20	bare earth patches; animal and vehicle	300 x 100 = 30,000 m²	85% 25,500 m²	15% 3825 m²	85%	3251.3 m²	10.8%	-	low

Survey Unit	Exposures	Survey Unit Area	Area surveyed	Ave. ground exposure	Ave. arch visibility %	Net effective exposure	Effective survey coverage	Artefacts recorded	Potential density of undetected artefacts
	tracks								
SU21	bare earth patches; vehicle track	100 x 100 = 10,000 m²	85% 8,500 m²	15% 1275 m²	85%	1083.8 m²	10.8%	-	low
SU22	bare earth patches; vehicle track	400 x 100 = 40,000 m²	85% 34,000 m²	15% 5,100 m²	85%	4,335 m²	10.8%	SU22/L1 1 artefact	low (density: 0.0002/m²)
SU23	bare earth patches; vehicle track	375 x 150 = 56,250 m²	85% 47,812.5 m²	5% 2,390.6 m²	85%	2,032 m²	3.6%	-	low
SU24	bare earth patches	300 x 150 = 45,000 m²	85% 38,250 m²	5% 1,912.5 m²	85%	1,625.6 m²	3.6%	-	low
SU25	bare earth patches; animal tracks	175 x 175 = 30,625 m²	85% 26,031 m²	2% 520.6 m²	85%	442.5 m²	1.4%	-	low
SU26	bare earth patches; animal tracks	250 x 200 = 50,000 m²	85% 42,500 m²	3% 1,275 m²	85%	1083.8 m²	2.2%	-	low
SU27	bare earth patches; animal tracks	300 x 200 = 60,000 m²	85% 51,000 m²	2% 1,020 m²	85%	867 m²	1.4%	-	low
SU28	bare earth patches	450 x 150 = 67,500 m²	85% 57,375 m²	1% 573.8 m²	60%	344.3 m²	0.5%	-	low
SU29	bare earth patches	300 x 120 = 36,000 m²	75% 27,000 m²	50% 13,500 m²	85%	11,475 m²	31.9%	-	low
SU30	bare earth patches; creek channel; sheet, rill and gully erosion	150 x 120 = 18,000 m²	85% 15,300 m²	60% 9,180 m²	85%	7,803 m²	43.4%	-	low
SU31	bare earth patches; animal tracks	300 x 120 = 36,000 m²	55% 19,800 m²	0 m²	0%	0 m²	0%	-	low
SU32	bare earth patches; creek channel	200 x 120 = 24,000 m²	75% 18,000 m²	1% 180 m²	70%	126 m²	0.5%	-	low
SU33	bare earth patches	250 x 150 = 37,500 m²	85% 31,875 m²	2% 637.5 m²	85%	541.9 m²	1.4%	-	low
SU34	bare earth patches; vehicle and animal tracks; sheet and rill erosion; dam exposures	700 x 200 = 140,000 m²	75% 105,000 m²	5% 5,250 m²	85%	4,462.5 m²	3.2%	-	low
SU35	bare earth patches; vehicle and animal tracks; sheet, rill and gully erosion	275 x 120 = 33,000 m²	75% 24,750 m²	5% 1237.5 m²	85%	1051.9 m²	3.2%	-	low
SU36	bare earth patches; sheet erosion	200 x 120 = 24,000 m²	75% 18,000 m²	5% 900 m²	45%	405 m²	1.7%	-	low
Total		**117.925 ha**	**92.2549 ha**	**6.9034 ha**		**5.6911 ha**	**4.826% ave**	**31 artefacts**	

Table 3: Survey Coverage Data.

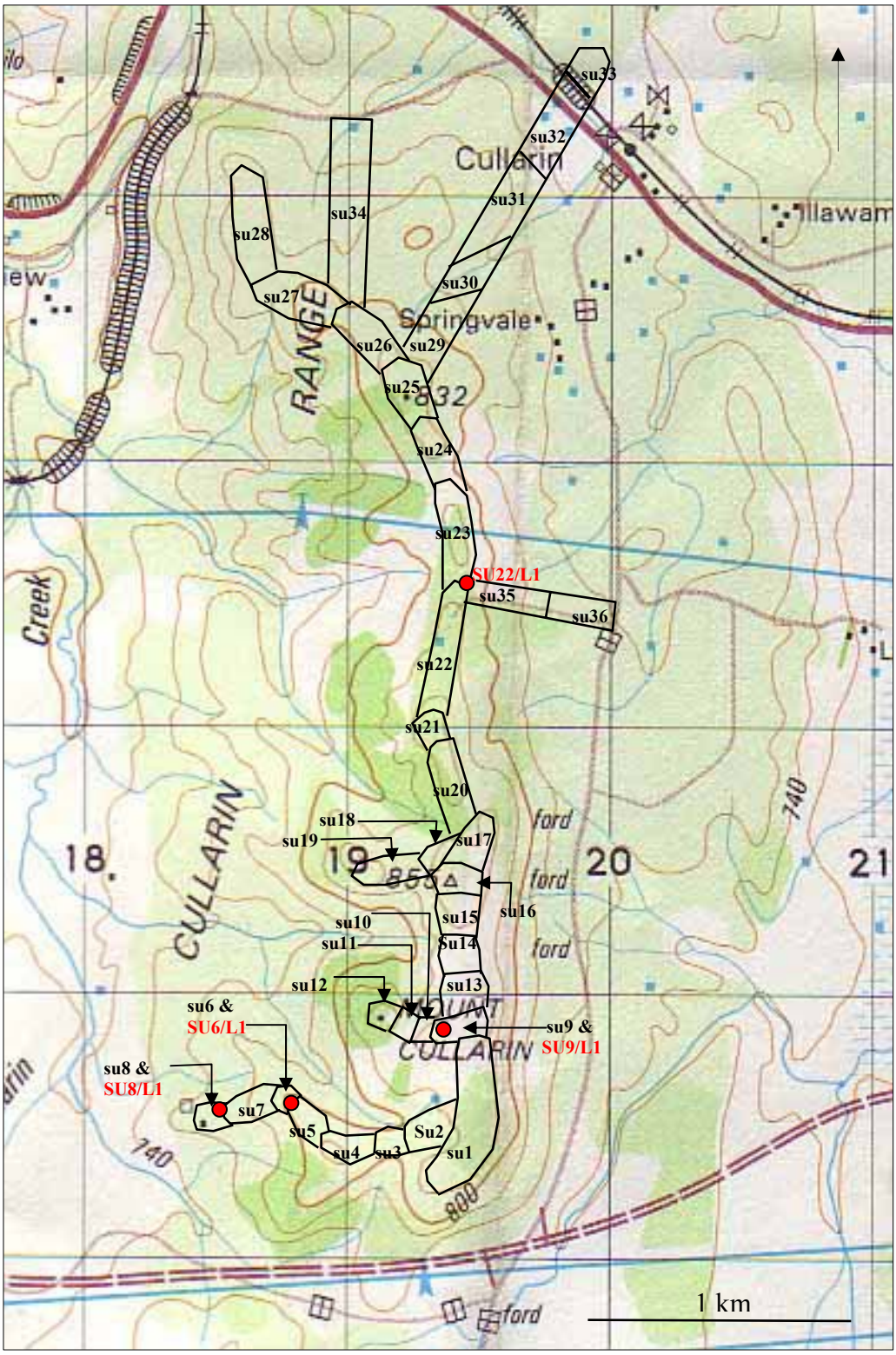

Figure 4. Location of survey units and recorded Aboriginal artefact locales.

9. STATUTORY CONTEXT

Two pieces of legislation provide the primary basis for Aboriginal heritage management in NSW, the National Parks and Wildlife Act 1974 (NPW Act) and the Environmental Planning and Assessment Act 1979 (EP&A Act) (NPWS 1997).

The Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 (EP&A Act), its regulations, schedules and guidelines provides the context for the requirement for environmental impact assessments to be undertaken during land use planning (NPWS 1997).

Part 3A of the Environmental Planning and Assessment Act 1979

On 9 June 2005 the NSW Parliament passed the Environmental Planning and Assessment Amendment (Infrastructure and Other Planning Reform) Bill. The Act was assented to on 16 June 2005 and commenced on 1 August 2005. This amendment contains key elements of the NSW Government's planning system reforms and makes major changes to both plan-making and major development assessment.

A key component of the amendments is the insertion of a new Part 3A (Major Projects) into the EP&A Act. The new Part 3A consolidates the assessment and approval regime for all major developments which previously were addressed under Part 4 (Development Assessment) or Part 5 (Environmental Assessment).

Part 3A applies to all major State government infrastructure projects, developments previously classified as State significant and other projects, plans or programs of works declared by the Minister. The amendments aim to provide a streamlined assessment and approvals regime and also to improve the mechanisms available under the EP&A Act to enforce compliance with approval conditions of the Act.

Under Part 3A Major infrastructure and other projects, the following relevant definitions apply:

approved project means a project to the extent that it is approved by the Minister under this Part, but does not include a project for which only approval for a concept plan has been given.

critical infrastructure project means a project that is a critical infrastructure project.

development includes an activity within the meaning of Part 5.

major infrastructure development includes development, whether or not carried out by a public authority, for the purposes of roads, railways, pipelines, electricity generation, electricity or gas transmission or distribution, sewerage treatment facilities, dams or water reticulation works, desalination plants, trading ports or other public utility undertakings.

project means development that is declared under section 75B to be a project to which this Part applies.

proponent of a project, means the person proposing to carry out development comprising all or any part of the project, and includes any person certified by the Minister to be the proponent.

The current report has been compiled for inclusion within an Environmental Assessment Report

Under the terms of Part 3A of the Environmental Planning and Assessment Act 1979 the following authorizations are not required for an approved project (and accordingly the provisions of an Act that prohibit an activity without such an authority do not apply):

- a permit under section 87 or a consent under section 90 of the National Parks and Wildlife Act 1974

10. SIGNIFICANCE ASSESSMENT

The information provided in this report and the assessment of significance of Aboriginal objects provides the basis for the proponent to make informed decisions regarding the management and degree of protection which should be undertaken in regard to the Aboriginal objects located within the study area.

10.1 Significance Assessment Criteria

The NPWS (1997) defines significance as relating to the meaning of sites: "meaning is to do with the values people put on things, places, sites, land". The following significance assessment criteria is derived from the relevant aspects of ICOMOS Burra Charter and NSW Department of Urban Affairs and Planning's 'State Heritage Inventory Evaluation Criteria and Management Guidelines'.

Aboriginal archaeological sites are assessed under the following categories of significance:

- cultural value to contemporary Aboriginal people,
- archaeological value,
- aesthetic value,
- representativeness, and
- educational value.

Aboriginal cultural significance

The Aboriginal community will value a place in accordance with a variety of factors including contemporary associations and beliefs and historical relationships. Most heritage evidence is valued by Aboriginal people given its symbolic embodiment and physical relationship with their ancestral past.

Consultation with the local Aboriginal community is necessary to identify the cultural significance attached to heritage sites and the broader landscape.

Archaeological value

The assessment of archaeological value involves determining the potential of a place to provide information which is of value in scientific analysis and the resolution of potential archaeological research questions. Relevant research topics may be defined and addressed within the academy, the context of cultural heritage management or Aboriginal communities. Increasingly, research issues are being constructed with reference to the broader landscape rather than focusing specifically on individual site locales. In order to assess scientific value sites are evaluated in terms of nature of the evidence, whether or not they contain undisturbed artefactual material, occur within a context which enables the testing of certain propositions, are very old or contain significant time depth, contain large artefactual assemblages or material diversity, have unusual characteristics, are of good preservation, or are a part of a larger site complex. Increasingly, a range of site types, including low density artefact distributions, are regarded to be just as important as high density sites for providing research opportunities.

Representativeness

Representative value is the degree to which a "class of sites are conserved and whether the particular site being assessed should be conserved in order to ensure that we retain a representative sample of the archaeological record as a whole" (NPWS 1997). Factors defined by NPWS (1997) for assessing sites in terms of representativeness include defining variability, knowing what is already conserved and considering the connectivity of sites.

Educational value

The educational value of cultural heritage is dependent on the potential for interpretation to a general visitor audience, compatible Aboriginal values, a resistant site fabric, and feasible site access and management resources.

Aesthetic value

Aesthetic value relates to aspects of sensory perception. This value is culturally contingent.

10.2 Significance Value of the Aboriginal Site in the Study Area

Stone artefact scatters are a common site type in the local area and wider region. Stone artefacts can be expected to be distributed in a virtual continuum across most landscape element contexts. The density of this background artefact scatter will be related to factors such as the nature of the terrain (landform element, gradient and slope), the permanence of the local water source and the proximity of other resource features. Open artefact scatters will contain differences in terms of their artefact density and composition. These differences will potentially reflect differences in site function ie different activities undertaken in different places. Therefore, these site types, while common, will each have the potential to provide unique archaeological data and hence interpretive value within a research context.

The scientific significance of the recorded sites is listed in Table 4. Aboriginal heritage sites often have high cultural value to the local Aboriginal community given that they provide direct physical and symbolic linkages to their ancestral past and to the landscape.

Name	Significance	Criteria
Survey Unit 6/Locale 1	Low local scientific significance	Common site type Low educational value Low aesthetic value Low research potential: low density; negligible potential for subsurface deposit
Survey Unit 8/Locale 1	Low local scientific significance	Common site type Low educational value Low aesthetic value Low research potential: low density; negligible potential for subsurface deposit
Survey Unit 9/Locale 1	Low local scientific significance	Common site type Low educational value Low aesthetic value Low research potential: low density; negligible potential for subsurface deposit
Survey Unit 22/Locale 1	Low local scientific significance	Common site type Low educational value Low aesthetic value Low research potential: disturbed by sheet erosion; low density; negligible potential for subsurface deposit

Table 4. Scientific significance of Aboriginal objects recorded during the survey

11. MITIGATION AND MANAGEMENT STRATEGIES

The aim of this study has been to identify Aboriginal objects and to predict the archaeological potential of the Survey Units, to assess site significance and thereafter, to consider the potential impact of the proposal upon this heritage. Four locales containing stone artefacts have been identified to be located within the proposal area; no Survey Units have been assessed to contain subsurface artefacts in anything other than low density. In the following sections a variety of strategies that can be considered for the mitigation and management of development impact to Aboriginal objects is listed and discussed.

11.1 Management and Mitigation Strategies

Further Investigation

The current field survey has been focused on recording artefactual material present on visible ground surfaces. Further archaeological investigation entails subsurface excavation which is generally undertaken as test pits for the purposes of identifying the presence of artefact bearing soil deposits and their nature, extent, integrity and significance.

Further archaeological investigation in the form of sub-surface test excavation can be appropriate in certain situations. Such situations generally arise when the proposed development is expected to involve ground disturbance in areas which are assessed to have potential to contain moderate to high density artefactual material. Additionally subsurface investigation is increasingly being undertaken for the purposes of characterising spatial variation in subsurface deposits across a range of landform elements. Subsurface investigation provides a level of surety in regard to the archaeological status of a place so that informed management decisions can be duly made.

Test excavation can be undertaken in a variety of ways including hand excavation, shovel pits, auger holes, mechanically excavated trenches or surface scrapes. Generally sub-surface test excavation can only be carried out after a s87 Permit is issued to an archaeologist by the Director-General, NSW DEC. Such a strategy is pro-active and enables the proponent to properly manage archaeological sites prior to development activity occurring.

No Survey Units have been identified in the proposal area to warrant further archaeological investigation. The proposal area is predicted to be of low archaeological potential and sensitivity. Furthermore the survey results are assessed to have provided a reasonably reliable indication of the archaeological status of the area.

Conservation

Conservation is a suitable management option in any situation however, it is not always feasible to achieve. Such a strategy is generally adopted in relation to sites which are assessed to be of high cultural and scientific significance, but can be adopted in relation to any site type.

When conservation is adopted as a management option it may be necessary to implement various strategies to ensure sites and 'Aboriginal objects' are not inadvertently destroyed or disturbed during construction works or within the context of the life of the development project. Such procedures are essential when development works are to proceed within close proximity to identified sites.

In the case at hand, conservation of the artefacts locales is considered to be desirable if at all possible. However, given the nature and density of the stone artefacts recorded in the proposal area and the low scientific significance rating each artefact locale has been accorded, none are assessed to warrant conservation if impacts are proposed.

Mitigated Impacts

Mitigated Impacts usually takes the form of partial site impact and/or salvage prior to impact. Such a management strategy is appropriate when sites are assessed to be of moderate or high scientific significance to the scientific and/or Aboriginal community and when avoidance of the site is not feasible. Salvage can include the surface collection or sub-surface excavation of artefacts, usually as a condition of a s90 Consent issued by the Director-General, NSW DEC.

From a scientific perspective none of the artefact locales recorded in the proposal area warrant mitigation of impacts.

Unmitigated Impacts

Unmitigated Impacts to Aboriginal objects can be given consideration when they are assessed to be of low or low/moderate archaeological and cultural significance and otherwise in situations where conservation is simply not feasible. In order to conduct unmitigated impacts to a site the proponent usually applies for and obtains a s90 Consent from the Director-General, NSW DEC. s90 Consent applications must be accompanied by supporting documentation from the local Aboriginal community.

Given the nature and density of the stone artefacts recorded in the proposal area and the low scientific significance rating each artefact locale has been accorded unmitigated impacts would be appropriate if impacts are proposed.

11.2 Management options - Summary

The following summary of suitable management strategies are outlined below in Table 5.

Name	Significance	Recommended Management Strategy
Survey Unit 6/Locale 1	Low local scientific significance	If impacts proposed unmitigated impacts appropriate (this would usually entail s90 Consent application to the NSW DEC)
Survey Unit 8/Locale 1	Low local scientific significance	If impacts proposed unmitigated impacts appropriate (this would usually entail s90 Consent application to the NSW DEC)
Survey Unit 9/Locale 1	Low local scientific significance	If impacts proposed unmitigated impacts appropriate (this would usually entail s90 Consent application to the NSW DEC)
Survey Unit 22/Locale 1	Low local scientific significance	If impacts proposed unmitigated impacts appropriate (this would usually entail s90 Consent application to the NSW DEC)

Table 5. Summary of management recommendations in regard to the recorded Aboriginal objects in the proposal area.

12. RECOMMENDATIONS

The following recommendations are made on the basis of:

- A consideration of the Part 3A amendment to the Environmental Planning and Assessment Act (see Section 9 Statutory Information).
- The results of the investigation as documented in this report.
- Consideration of the type of development proposed and the nature of proposed impacts.

It is recommended that:

- The proponent should give due consideration to the discussion in regard to management and mitigation of Aboriginal objects outlined in Section 11 of this report.
- The proposal area is assessed to be of low archaeological potential and sensitivity. Accordingly, no further archaeological assessment is considered necessary in relation to the proposed Taurus Energy wind farm at Cullerin.
- The four locales containing Aboriginal stone artefacts recorded in the proposal area do not surpass any scientific significance thresholds which would act to preclude impacts which may ensue as a result of the construction of the proposed wind farm.

  Accordingly, if impacts to any of the four stone artefact locales recorded in the proposal area are proposed unmitigated impacts are justified.
- It is recommended that the proponent consult with the Aboriginal communities who have participated in the assessment in regard to impacts to the Aboriginal objects in the proposal area.
- Copies of the report should be forwarded to:
  Dr Phil Boot
  Environment and Protection Branch
  Department of Environment and Conservation
  PO Box 2115
  Queanbeyan NSW
- Copies of this report should be forwarded to:

  Onerwal Local Aboriginal Land Council
  Pejar Local Aboriginal Land Council
  Buru Ngunawal Aboriginal Corporation

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