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Liverpool Range Wind Farm Stage 1

Aboriginal Cultural Heritage Assessment Report

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Author: Dr Julie Dibden
Proponent: Epuron Pty Ltd
Local Government Area: Liverpool Plains, Warrumbungle, Upper Hunter Shire Councils and Mid-Western Regional Council

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TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF PLATES

LIST OF TABLES

SUMMARY

New South Wales Archaeology Pty Ltd has been commissioned by Epuron Pty Ltd to undertake an Aboriginal cultural and archaeological heritage assessment in relation to the proposed Liverpool Range Wind Farm Stage 1. This report documents the proposed impact areas, the assessment process, findings, interpretation of results and recommendations.

The assessment has been conducted in accordance with the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (NSW DEC July 2005), the NSW Office of Environment and Heritage's *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) and the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (NSW DECCW 2010a).

A process of Aboriginal community consultation has been undertaken in accordance with the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (NSW DEC July 2005) and OEH's *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW DECCW 2010b).

The study has sought to identify and record Aboriginal cultural areas, objects or places, assess the archaeological potential of the subject areas, and to formulate management recommendations based on the results of the community consultation, background research, field survey and a significance assessment.

The proposed Liverpool Range Wind Farm is defined as a Transitional Part 3A project. This Aboriginal Cultural Heritage Assessment Report (ACHAR) has been prepared to form a component of an Environmental Impact Assessment which addresses the NSW Planning & Infrastructure, Director General's environmental assessment requirements (DGRs).

For heuristic purposes the project is defined as two subject areas: the proposed wind farm area where turbines would be built; and the transmission line which would transport the electricity to the grid.

The wind farm subject area has been found to be of generally very low cultural and archaeological potential and significance. There are no previously recorded sites known to be present, however, three Aboriginal object locales (stone artefact sites) were recorded during the field survey. Micro-siting of turbines, roads etc, to avoid impacts is a potential management strategy in respect of these. Undetected or subsurface stone artefacts are predicted to be present in densities which range from low to very low/negligible. Five European heritage items have been recorded in the wind farm area. None of these warrant heritage listing, however, micro-siting to avoid impacts is recommended.

At this time, there are two options for the route of the proposed transmission line. One of these, the *Preferred* route, was surveyed during the assessment, while the other has been subject to a desk top assessment only. Previously recorded Aboriginal objects sites are

located along both routes, and several new recordings (3 stone artefact sites and a rock shelter with potential archaeological deposit) were made during the field assessment. Micro-siting of power poles to avoid impacts is recommended. Two European heritage items were recorded in the transmission line option surveyed. They do not warrant heritage listing, but micro-siting to avoid impacts is recommended. When a final transmission line route is selected, and if it differs to that surveyed during this assessment, it is recommended that a field survey of the alignment is undertaken in order to formulate detailed management strategies in respect of micro-siting power pole locations, as required.

A total of 170 kilometres of proposed turbine alignments, access tracks, electrical connections and transmission lines was surveyed (walked) during the field inspection. The coverage achieved is considered sufficient to characterise the nature of Aboriginal object distribution. The survey results are therefore assessed to be a relatively accurate reflection of the archaeological status and artefact density in the two subject areas. Accordingly, based on the relevant predictive model of site distribution and the results of the field survey, the proposed impacts are assessed to be of generally low potential to cause harm to cultural and archaeological values. This assessment forms the basis for the formulation of recommendations relating to the proposal.

The Aboriginal object locales (and any undetected and subsurface artefacts) and heritage values do not surpass archaeological and cultural significance thresholds which would act to preclude the construction of the proposed wind farm.

Based on a consideration of the predictive model applicable to the environmental context in which impacts are proposed, the results of the study, and the nature of proposed impacts, the following conclusions are provided in summary form (see Section 9):

1. There are no identified Aboriginal and historic heritage constraints relating to the proposal.
2. Based on a consideration of the small and discrete nature of proposed impacts and the identified archaeological and cultural values, the subject areas do not warrant subsurface test excavation. The level of assessment achieved during the field survey is considered to have been adequate for the purposes of determining the cultural and archaeological status of the proposal area.
3. Micro-siting of development components to avoid impacts to all identified heritage is recommended.

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Archaeological evidence confirms that Aboriginal people have had a long and continuous association with the Liverpool Range for thousands of years. We would in particular like to acknowledge and pay our respects to the traditional owners of the country which is encompassed by the proposal.

1. INTRODUCTION

NSW Archaeology Pty Ltd has been commissioned by Epuron Pty Ltd to conduct an Aboriginal and historic heritage assessment in relation to a proposed wind farm on the Liverpool Range, east of Coolah and west of Cassilis. The area in which impacts are proposed is shown on Figures 1 and 2.

The Liverpool Range Wind Farm Stage 1 proposal would involve the construction and operation of up to 288 wind turbine generators. The turbines would be placed along a series of ridgelines on properties currently used for agriculture. The wind farm would produce up to 864 Megawatts (MW) of clean renewable energy.

The project would be assessed under Part 3A of the EP&A Act (MP10_0225). This report addresses the Director-General's Requirements (DGRs) relating to archaeology and cultural heritage for the preparation of the Environmental Assessment (EA) for the project. The DGRs require that the EA must include an assessment of the impacts on Aboriginal and historic heritage. It is required that the EA:

- Must include sufficient information to demonstrate the likely impacts of the project on Aboriginal heritage values/items (archaeological and cultural) and outline proposed mitigation measures (including consideration of the effectiveness and reliability of the measures);
- It must demonstrate effective consultation with Aboriginal communities in determining and assessing impacts, developing options and selecting options and mitigation measures (including the final proposed measures): *and*
- Provide sufficient information to demonstrate the likely impact of the project on historic heritage values (including heritage vistas) and, where impacts to State or local historic heritage items are proposed, a statement of heritage significance must be included.

The project site is located in the Liverpool Plains, Warrumbungle, and Upper Hunter Shire Councils, as well as the Mid-Western Regional Council.

The proposal is comprised of the installation, construction, operation and decommissioning of the following infrastructure:

- Up to 288 wind turbine generators (wtgs);
- Electrical connections between wind turbines using a combination of underground cabling and overhead power lines;
- Underground communications cabling;
- Substations and transmission connections linking the wind turbines;
- Temporary construction facilities, site compounds, storage areas and batching plants;
- Access roads for the installation and maintenance of wind turbines; and

- Onsite control rooms and equipment storage facilities.

In addition, a transmission line is proposed which would transport electricity from the wind farm, south to the existing Transfield 330kV Wollar to Wellington transmission line, located at Ulan.

While the assessment is compliant with the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (NSW DEC July 2005), the content and format of this report is set out in accordance with the NSW OEH (2011) *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* document. The report aims to document:

- The Aboriginal objects and declared Aboriginal places (as relevant) located within the area of the proposed activity;
- The cultural heritage values, including the significance of the Aboriginal objects and declared Aboriginal places that exist across the whole area that will be affected by the proposed activity, and the significance of these values for the Aboriginal people who have a cultural association with the land;
- How the requirements for consultation with Aboriginal people have been met (as specified in clause 80C of the NPW Regulation);
- The views of those Aboriginal people regarding the likely impact of the proposed activity on their cultural heritage (if any submissions have been received as a part of the consultation requirements, these would be included and our response outlined);
- The actual or likely harm posed to the Aboriginal objects or declared Aboriginal places from the proposed activity, with reference to the cultural heritage values identified;
- Any practical measures that may be taken to protect and conserve those Aboriginal objects or declared Aboriginal places; *and*
- Any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm, or, if this is not possible, to manage (minimise) harm.

The cultural heritage assessment has been managed by Dr Julie Dibden, NSW Archaeology Pty Ltd (ANU: BA honours; PhD). The field work component has been conducted by Julie Dibden and Andrew Pearce (UNE: BA [Archaeology]), NSW Archaeology Pty Ltd, and representatives of the Registered Aboriginal Parties as acknowledged on page 3.

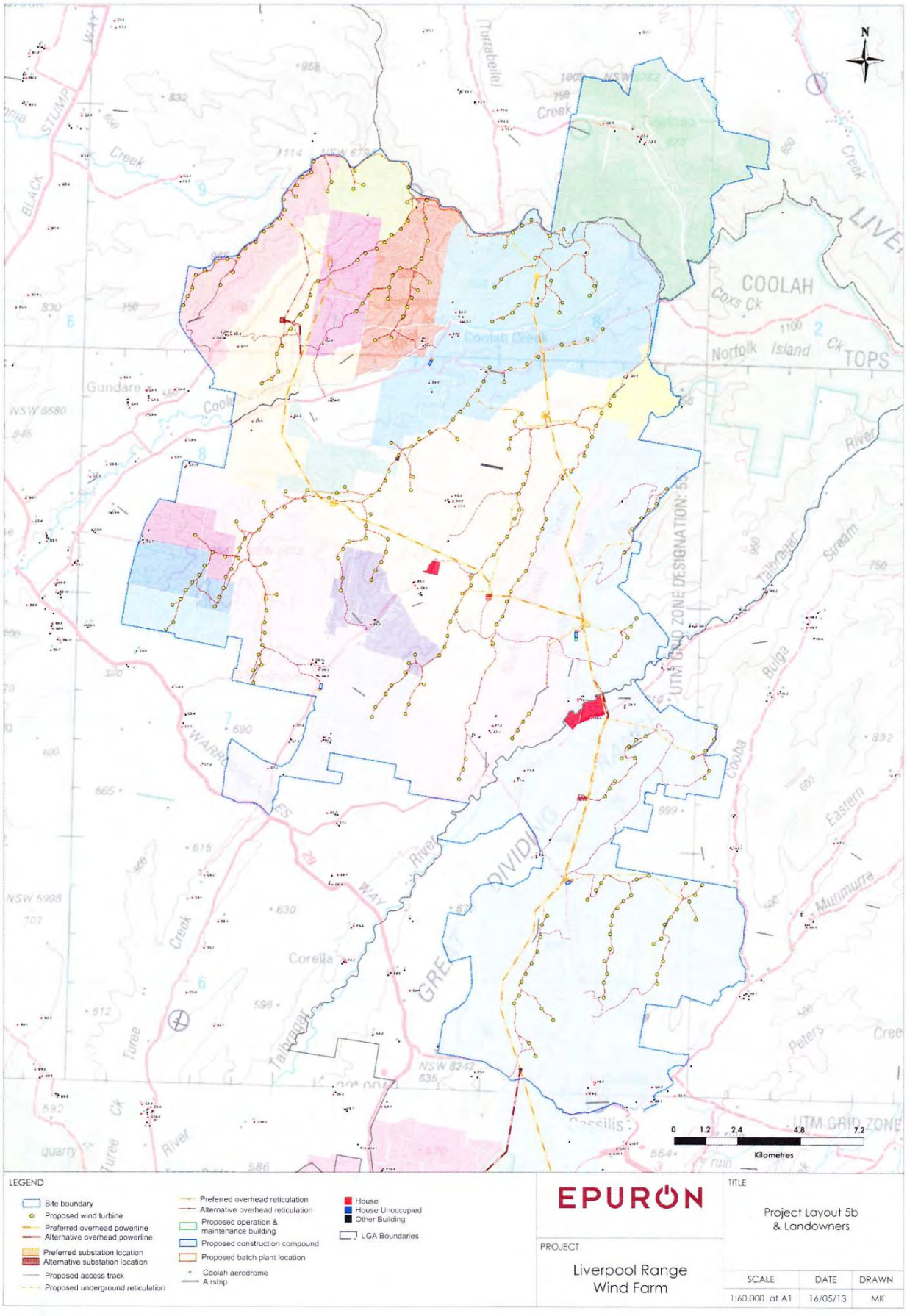

Figure 1 The location of the proposed Wind Farm (source: Epuron Pty Ltd).

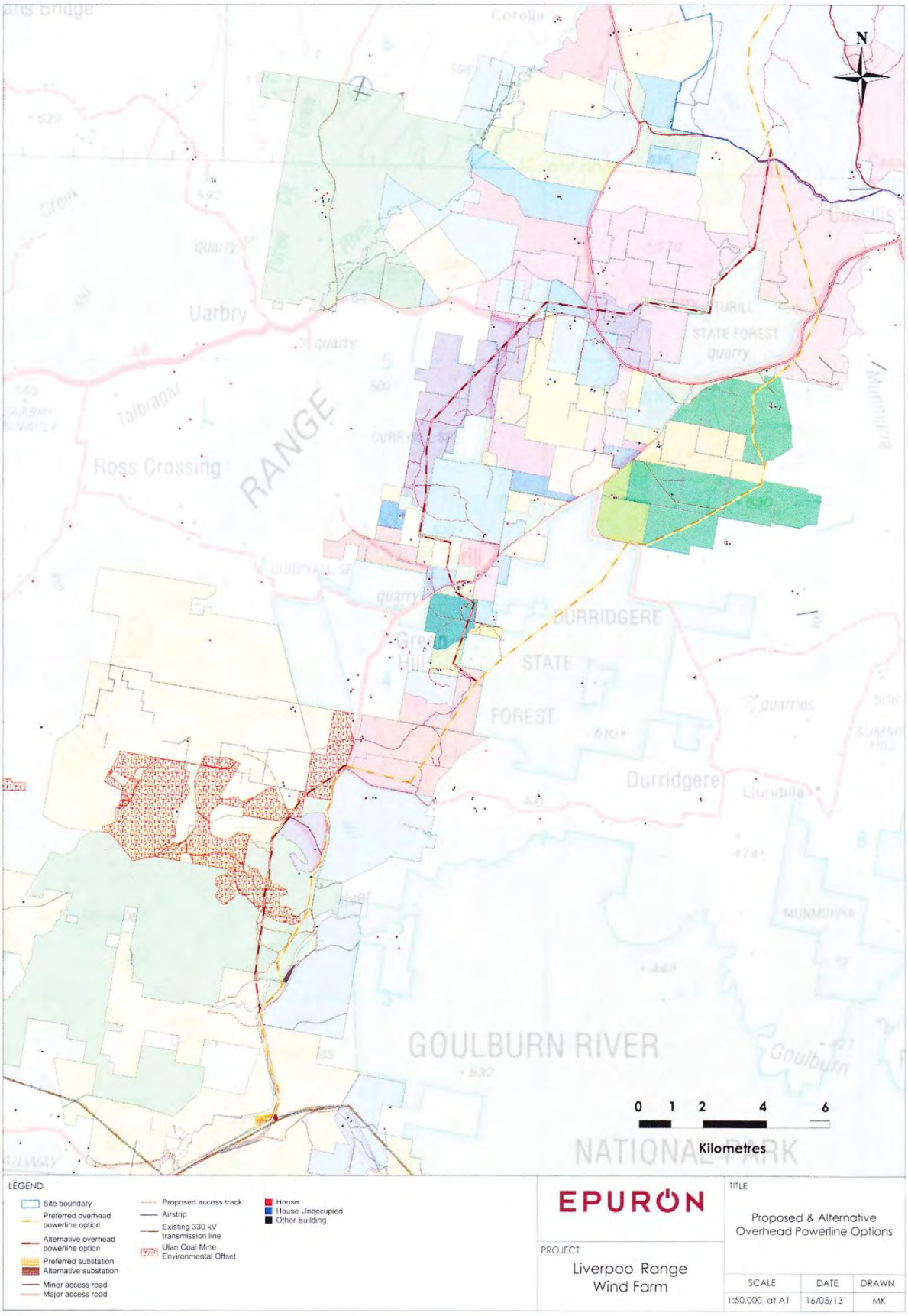

Figure 2 The location of the proposed transmission line options (source: Epuron Pty Ltd).

2. DESCRIPTION OF THE AREA – BACKGROUND INFORMATION

In this section, background and relevant contextual information is compiled, analysed and synthesised. The purpose of presenting this material is to gain an initial understanding of the cultural landscape. The following topics are addressed (*cf.* OEH 2011: 5):

- The physical setting or landscape;
- History of peoples living on that land; *and*
- Material evidence of Aboriginal land use.

2.1 The Physical Setting or Landscape

A consideration of landscape is necessary in archaeological work in order to characterise and predict the nature of Aboriginal occupation across the land. 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 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 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 and geomorphologically stable will prevent the detection of archaeological material, while places which have suffered disturbance may no longer retain artefacts or stratified deposits. A consideration of such factors is necessary in assessing site significance and formulating mitigation and management recommendations.

The following information describes the landscape context of the study area.

The proposed wind farm would be located on the Liverpool Range (the wind farm subject area), north-east of Coolah and north-west of Cassilis. The wind farm site (area in which turbines are proposed) is located in an area measuring approximately 30 kilometres by 16 kilometres along a series of generally parallel ridgelines. The site has been selected for its windy ridges and cleared grazing land (for example, see Plate 1). The proposal would be located on a number of privately owned properties currently used for sheep and cattle grazing. Much of the proposed transmission line route likewise traverses farmland,

however, in its southern extent, the land is forested and given over to either conservation or mining.

Plate 1 Typical cleared ridge on which turbines are proposed: Landform Unit 12.

The subject area is on the Weetaliba 8834-N 1:50,000 (Aug 2012) topographic map; and the Booyamurna 8834-2-N 2nd ed., Turee 8834-2-S 2nd ed., Omaleah 8934-111-N 2nd ed., Berenderry 8934-111-S 2nd ed., Cassilis 8833-1-N 1st ed., Durridgere 8833-1-S 1st ed., Wollar 8833-2N 1st ed., Home Rule 8833-3-S 1st ed., and Gulgong 8833-3N 1st ed. 1:25,000 topographic maps. For mapping purposes the area is located in Zone 55.

The wind farm subject area is located on the Warrumbungle and Liverpool Ranges (their junction is at Coolah Tops National Park) which are a part of the Great Dividing Range. The area includes the plateau of the dividing range and, as well, heavily dissected plateau/crest landforms, ridges and spurs, which trend to the south from the range.

The wind farm area is situated in the south-eastern section of the Brigalow Belt South bioregion. This bioregion is located within the eastern subhumid region of Australia and, in the south-eastern part, the bioregion is characterised by a subhumid climate with a hot summer and no dry season, with some areas falling within the temperate zone, having no dry season and a warm summer. Within the bioregion, the areas of higher rainfall occur around the Liverpool Ranges and the higher outcrops of the Warrumbungles. Temperatures throughout the bioregion have a large daily variation and also vary with altitude. This variation with altitude occurs throughout the Liverpool and Warrumbungle Ranges, which have lower annual mean temperatures than the rest of the bioregion. Overall, monthly mean temperatures for the bioregion range from a maximum of 33°C in January to a minimum of 3°C in July, but daily maxima can reach 45°C and stay above 40°C for several days. Minimum temperatures can be as low as -9°C. Within the study area frosts are common, with up to 100 days of frost each winter and occasional snowfalls on the range (NSW NPWS 2002a; NSW NPWS no date).

The province within the Brigalow Belt South bioregion in which the study area falls is the Liverpool Range. The Liverpool Range is the largest lava field province in NSW, dated between 32 and 40 million years, with basalt up to 400 metres thick covering an area of over 6,000 km^2. The lava field did not originate from a central volcanic vent but was extruded from multiple fissures. These volcanic flows overlie a pre-existing topography containing buried river gravels and lake sediments, that as a result of erosion, is now being exposed. Rock types are olivine basalt and dolerite with occasional sediment interbeds (NSW NPWS 2002b). These sediment interbeds are rare in the subject area, but do occur, and appear superficially to resemble mudstone or tuff.

Coolah Tops National Park occupies the highest point in the local area (NSW NPWS 2002b). The plateau rises steeply above the surrounding lands and is flanked by cliffs along its northern edge. The Liverpool Range is rugged on the northern edge with slopes up to 45 degrees and altitude from 600 to 1,200 m above sea level. Columnar basalt formations are found scattered along the northern escarpment of the plateau. To the north, the range drops steeply to the Liverpool Plains and the drainage flows northwards, ultimately draining into the Namoi River. The range falls away to the south with a more moderate gradient. The southern streams, including Gundare Creek, Coolaburragundy River, Turee Creek and Talbragar River, drop from the range into deep narrow valleys and eventually drain into the Macquarie or Goulburn Rivers (Plate 2). The range is generally comprised of undulating plateau tops with steep margins, grading to long foot slopes (NSW NPWS 2002a; NSW NPWS no date).

Plate 2 The upper reaches of the Coolaburragundy River valley taken from near Pandoras Pass on the Warrumbungle Range.

While many of the southern flowing streams pass through narrow valleys, some, such as the lower sections of the Coolaburragundy and Talbragar Rivers, and Turee and Norfolk Island Creeks, are wider (especially at their southern extent). These areas are likely to have been the focus of Aboriginal occupation while people inhabited the local area (see, for example Plate 3). They afford a generally favourable amenity, including reasonably abundant and reliable fresh water.

Plate 3 Turee Creek valley; photo taken from Landform Unit 16 looking south.

The landforms present in the wind farm subject area include crests, simple slopes, flats and drainage depressions. Ridges on which wind turbine generators are proposed, extend generally southward from the ranges as a parallel series of long linear landforms (see Figure 1). Frequently ridge crests are broad and plateau like at their northern end (for example, Plate 4) and narrow as they gradually descend in elevation to the south (Plate 5). Simple slopes which fall either side from the crests are long and typically of moderate or steep gradient (Plates 6 & 7).

Plate 4 Plateau like ridge crest: Landform Unit 6 looking south.

Plate 5 Narrow ridge crest: Landform Unit 22 looking south.

The landforms in the wind farm area are very rocky generally. Low outcrops are common, particularly on crests and hillslopes where, in many cases, bedrock is present at greater than 50 per cent which is technically rockland (Plates 8 & 9). The excessively rocky nature of much of the ridge crests is likely to have made these landforms unfavourable camp locations for Aboriginal people.

Plate 6 Looking west towards Landform Unit 18.

Plate 7 Note steep slopes from crest of Landform Unit 17.

Plate 8 Typical rocky ridge crest (south end of Landform Unit 1) on which wind turbine generators are proposed.

Plate 9 Landform Unit 26 illustrating the typically rocky nature of ridge crests.

The long history of erosion of the landscape of the Brigalow Belt South bioregion has resulted in the development of a variety of soils types. The soils of the Liverpool Ranges are predominantly comprised of stony red brown loams on ridges, shallow stony clay soils on steep slopes, grading to thicker deep black earths and self mulching clays on lower slopes. These soils, which have developed directly on the basic basalt igneous rock, are generally finely textured with uniform to gradational profiles. The distribution of sediment from the basalt within the study area has had a major impact on soil quality and vegetation, given its high nutrient value (NSW NPWS 2002a; NSW NPWS no date).

The first Europeans to negotiate the Liverpool Range and travel onto the Liverpool Plains below, made record of the nature of the vegetation which typified those areas at that time. Oxley observed that much of the region was dominated by grassland and woodland. He noted that generally the Liverpool Plains were naturally treeless, made up of '… hills, dales and plains of the richest description', with the rest comprised of open woodland. The Liverpool Range is indicated to have been partially made up of open woodland, with thicker scrubby forest present on hilly points and the main ranges (O'Rourke 1993: 5).

The wind farm area can therefore be characterised as a woodland resource zone. The ridge crests, however, covered with relatively thick scrubby forest, would have possessed limited biodiversity and a general lack of water. All the Aboriginal field assistants who participated in the field survey have indicated the ridges are likely to 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 very low levels of artefact discard. The nature of stone artefacts discarded can be expected to have been correspondingly limited in terms of artefact diversity and complexity.

By comparison, the wider valleys between the ridges and hills are likely to have possessed greater levels of biodiversity given the likely presence of chains of ponds and, possibly also, occasional swamp features along drainage lines. In addition, a more reliable source of water is likely to have been present in valleys for much of the year. Such areas are likely to have been utilised more frequently and possibly by greater numbers of individuals at any one time; certainly the valleys are likely to have been the favoured camp locations while people occupied the broader local area. Accordingly, the levels of artefact discard in valleys can be predicted to be correspondingly higher; artefact diversity and complexity is also likely to be greater.

A comparable scenario is likely to have obtained for the land traversed by the proposed transmission line. Generally, the landforms are broad and amorphous, without focal elements which may have been frequently occupied. Such areas are of very low archaeological potential. The exception, however, would be places adjacent to reliable water sources, especially where exposed sandstone such as shelters suitable for occupation or fine grained exposures in creekbeds suitable for grinding tools or food occurred.

2.2 History of Peoples Living on the Land

Aboriginal people have occupied Australia for at least 40,000 years and possibly as long as 60,000 (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 (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 metres below present and, accordingly, the continent was correspondingly larger. With the cessation of glacial conditions, temperatures rose with a concomitant rise in sea levels. By c. 6,000 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[1] 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.*

[1] Sahul is the name given to the single Pleistocene era continent which combined Australia with New Guinea and Tasmania.

As far as possible, an ethnographic and historical review of Aboriginal life in the region will be outlined below. However, our ethnographic understanding of Aboriginal people in this area, and the historical dimension of the colonial encounter, has been reconstructed from scant historical records produced during a context of death and dispossession (Swain 1993: 115), and is sketchy and severely limited. Stanner (1977) has described the colonial and post-colonial past as a 'history of indifference', and this portrays both the substantive situation which prevailed and the general lack of regard for this history. For a considerable period of time after Europeans arrived in Australia, no concerted ethnographic investigations were undertaken to learn about the customs, practices, arts, or life ways of Aboriginal people. As a result, in trying to reconstruct the complex traditional cultures of varying Aboriginal groups, investigators of today are necessarily required to piece together, as best as possible, fragmentary information derived from the incidental annotations of disparate early observers. As elsewhere, this applies also to the Aboriginal groups who occupied the country in the region of the study area.

Michael O'Rourke (2009) has investigated in depth the cultural boundaries between the two principal Aboriginal networks of the region, they being the Gamilaraay (often earlier referred to as the Kamilaroi) and the Wiradjuri peoples. O'Rourke (2009: 3-7) indicates that the people of the Gamilaraay language group occupied the inland Liverpool Plains and almost all of the Upper Hunter Valley. Meanwhile, the country of the Wiradjuri lay predominantly to the south, with the Wiradjuri language being spoken by groups who occupied the Warrumbungle Mountains and lands extending west to present-day Dubbo and Wellington. These two overarching groups were in turn subdivided into numerous smaller local bands who were united by way of a common language. In broad reconstruction, the boundary between the Gamilaraay and Wiradjuri fell along an approximate line extending from Coolah to Coonabarabran. The language group to which the Upper Goulburn River or Cassilis tribe belonged is not known for certain, but through recourse to historical records and the study of place names, O'Rourke (2009: 4-5) asserts that in all probability they spoke the Gamilaraay language.

There is strong evidence of contact between the Gamilaraay of the Liverpool Plains and the Aborigines of the Upper Hunter. That this contract was not always friendly is instanced by Breton's 1833 account of an affray which took place on the Wollombi, at which 'four men and two women of the Comleroy (sic) tribe were slain'. The contact seems chiefly to have been affected through what is known as Cassilis Gap. Howitt states that they came through the Goulburn Valley, 'across from the Talbragar to the Nunmurra waters', adding that a section of the Kamilaroi 'occupied the upper water flowing into the Hunter River, and those watercourses which formed the heads of the Goulburn River such as Nunmurra Creek' (Brayshaw 1986: 38).

While it is difficult to reconstruct the population size of these two groups at the time of European colonisation, some estimates place the number of both Gamilaraay and Wiradjuri speaking peoples at 10,000 individuals. Similarly, there is limited information with regard to the patterns of movement of the Gamilaraay and the Wiradjuri over the course of the year. It is suggested, however, that landuse varied according to the season. Major watercourses are understood to have formed the core of a group's territory. O'Rourke (2009: 13) proposes a model wherein each community's land may have

encompassed an area of some 4-5,000 square kilometres, taking in some 60 km of reliable watercourses and abutted on either side with a hinterland extending for 30 km. From various sources, O'Rourke (2009: 13) has determined that in an environment such as the southern extent of the Brigalow Belt South bioregion, a group's territory could conceivably be between 50 by 50 kilometres and ranging up to 85 by 85 kilometres.

The early explorers and settlers noted considerable variation in the numbers of Aborigines that would gather for food procurement in the area during the different months of the year (Haglund 1985). The major rivers and associated tributaries were the focus of livelihood and supplied a variety of reliable and plentiful food including fish, water fowl and shellfish. On August 22 1817, John Oxley, the first European to travel up the Macquarie River from the Wellington Valley, observed 'an abundance of fish and emus … swans and ducks', as well as very large mussels growing among the reeds in many stretches of the river (Oxley 1820). Riverine resources were supplemented with kangaroos and emus. According to Thomas Mitchell, Surveyor-General of the Colony of NSW, possums formed a significant part of people's diet, as well as being used for making warm winter cloaks, arm bands and other items of clothing. Mitchell, who conducted several expeditions into the area in the 1830s and1840s, wrote that possums were found in the hollow trunks of upper branches of tall trees which were climbed by cutting notches into the trunks.

Plant foods formed a significant part of the diet. The daisy yams (*Microseis scapigera*) and a range of other roots and tubers, including lily and orchid tubers and Kurrajong roots (*Brachychiton populneum*) were important foods (Gott 1983, White 1986: 57-58). Kurrajong and Acacia seeds would be ground for flour, as would certain grass seeds, such as oat grass or kangaroo grass (*Themeda australis*). Kurrajong trees, while not abundant, are ubiquitous across the study area (Plate 10). With short hunting forays away from the base camp, foods such as honey and possum could be readily obtained, while predominantly it was the women who would spend their time gathering plant foods. Grass seed from "native millet", *Panicum* species, was a major staple food source in inland NSW. *Panicum* and other seeds were gathered and threshed in a communal effort, before then being ground on grindstones and cooked in the form of tiny loaves (O'Rourke 1993: 13). In the warmer part of the year, it is understood that aligned Aboriginal groups totalling several hundred people would congregate beside major watercourses to conduct ceremonial business and to exploit the fish, yabbies and mussels that were available. Fish net-traps, often very large, were fashioned from the fibre obtained from the bark of the Kurrajong tree. Bucknell (in O'Rourke 1993:13), an early settler, observed that at times a single net-haul caught enough fish to feed 40 people for a day.

In the autumn and winter, the large congregations separated into small 'hearth-groups' comprised of one or two families only, some ten people or less, and went their own way. Travelling into the 'back-country', the men would hunt land mammals and the bigger birds for the group to subsist, while women collected reptiles and small animals, as well as harvesting plant foods, including roots and yams (O'Rourke 1993: 13-14).

Plate 10 Kurrajong trees are common and often found on rocky knolls such as this located in Landform Unit 12.

Memoirs of some of the early pioneers of the Coolah district are retained in Cameron's (N.D.) papers. In relation to the traditional ways of the Aboriginal people who inhabited the region immediately near to the study area, a number of earlier European inhabitants of the district have recorded their various recollections. Some of these are reproduced below.

Ziegler and Keane (1949) described in their book, 'Valley of the Winds', how the Gamilaraay:

> ... dwelt in the valley of the Coolaburragundy (River) ... roaming among the tall grasses and forests, carving slim shields from living trees, sharpening their spears and cutting their axe heads and knives from traditional 'workshops' that have been used by their fathers, and their father's fathers; leaving as legacy, year after year, the ever deepening grooves in the stone where the weapons had been rubbed to a shining sharpness. In caves they set the enigmatic sign of the red hand, and on the rock face carved their totems. The bark of the tree had many uses -- the coogee, for carrying honey or cooking food over a fire, was got by carefully removing the bark that lay like a cup over the burl or hump of the tree. Then too, the stringy bark first rubbed between the hands, made thread for sewing the robes of possum skins (Ziegler and Keane 1949).

In 1948, one pioneer informant recalled:

> I remember when there would be as many as three hundred Aborigines over there on the rise above the Coolah Golf Links. They used to corroboree there. All hours of the night they went on, dancing, singing ... and beating sticks and rattling bones. ... They used to come in from Booyamurra, Butheroe, Mumbedah and Queensborough stations. One night they held corroboree when one of them died. They buried him in the night, under a tree where Binnia Street passes the Presbyterian Church. Buried sitting out, he was. The tattoo marks on his body were carved into the trunk of the tree, but has long since gone. The Aborigines went away from a long time after that (Cameron: N.D.).

In the Sydney Mail one reporter, under the pseudonym 'Pioneer', gave an extensive description of the Aborigines of the Coolah district, observing:

> The Aborigines aim in throwing a spear was very true. Once the writer saw King Togee throw a boomerang at a large eagle perched on a high tree, and cut its head off. The Eagle was soon cooking for the old man's next meal! They used to set fire to the end of a boomerang, sometimes at night and the throw it. This would look very uncanny as it whirled through the darkness, and then turn and come back to its owner (Sydney Mail 17 September 1913 in Cameron: N.D.).

James Patrick Tuckey (1899 - 1997) remembered that:

> … in the 1870s there were a lot of ... Aborigines living in bush humpeys (sic) in the scrub of the present Charles Street, Coolah. They held their corroborees on what today is the Coolah Golf Links ground. The poor unfortunates were starving and died by the dozens during the winter. They were buried in mass graves between the now Convent School playground and the Coolah Cemetery. The surviving natives were sent to a camp at Turill, later to Wollar and finally to Warren. Prior to white settlement the natives existed on fish in the Coolaburragundy River, fauna and birdlife from the valleys and the seeds of the Coolah grass which grew on the flats. These seeds were ground into powder by a kind of stone and mortar mill. The delicacies, honeycomb and native berries were sought. Tens of native cherry trees are still growing in the Coolah Tops. The fruit on these being minute (Cameron: N.D.). Grinding beds where the warriors made and sharpened their tomahawks may still be seen on sandstone in several streams that lead to the Coolaburragundy River. Hands on rocks, within the Coolah area, are few and far between. An interesting native made water trap in a small sandstone cliff exists north of Coolah, no doubt once used by the members of the Butheroe tribe.
>
> For the offence of insulting a girl of the tribe, an Aborigine was placed on a kind of trial, and if pronounced guilty he was given a shield about two and a half feet long and eight inches wide, with a handhold at the back. With this he had to defend himself against the spears of the girl's relations who each had the privilege of each throwing a certain number at the accused. If he managed to save himself that ended the trouble (Sydney Mail 12 September 1913 in Cameron: N.D.).
>
> In sickness the Aborigines often gave a hot (waterless) bath. They would scoop out an oblong hole, and line it with stones; then light a fire, and when they deemed the stones hot enough would remove the fire and put an opossum rug over the stones, lay the patient on the rug, and cover him over quickly with another rug. The leaves of the gum trees they used to bruise and bind over a wound to heal. The girls used to make net bags (in which to carry their babies) out of the white inner bark of the Kurrajong trees which they made into threads. These bags were slung over their shoulders, and the babies carried comfortably on their mother's backs. In the winter time these bags are made of skins. The manner in which they cooked a bird was to cover it, feathers and all, with clay, and put it in the hot ashes, and when cooked feathers etc would all come away with the clay, leaving the flesh nice and white. Fish went through the same process. They used to grind grass seed and 'nardo' on hard basalt stones, using a small flat stone as a middle. The resultant flower they mixed with water, and cooked on the coals. Their method of getting the fire was by rubbing two sticks together. An old grass tree was favourite kindling. Honey was collected in a 'koojle' a dish-like piece of bark taken off a tree. 'Koojles' were also used for various other purposes as we use basins' (Sydney Mail 12 September 1913 in Cameron: N.D.).

When James Vincent arrived in the district, he selected land which he named 'Butheroe'. The Butheroe property extended from the Coolah Range to the Castlereagh River.

Phelps (1935) recalls the traditional practices of Aboriginal people who lived on or visited the property:

> For an ordinary burial a hole deep enough for the departed to sit up straight was dug; deceased was then wrapped in his 'possum skin rug and buried. A warrior had his weapons buried with him. Around their burial grounds the Aborigines carved symbols on the tree trunks; and some of these markings can be seen on Butheroe, between the Mudgee and Coolah roads. Also on Butheroe there are many rocks with grooves carved in them; these indicate how and where the Aborigines sharpened their stone axes. When travelling, the Butheroe Aborigines at their camps made tent shaped 'gunyahs' of bark; they were about three feet in height, and were set around a place where a fire was made. All slept with their feet towards the warmth' (Phelps 1935).

Such sleeping huts, as described by Threlkeld, were constructed on a frame of boughs of trees, on which sheets of bark supported by stakes were placed upright. In the upper Hunter it was observed that gunyas were made by sticking three sticks, each about 3 feet long, in the ground and bringing these together at the top in a triangular form. The two sides which faced towards the prevailing wind were covered by long sheets of bark, and the third sheltered side was left open. If the wind changed direction the bark coverings were rearranged accordingly (Brayshaw 1986).

One observer wrote that in the Wollemi Brook area the bark for gunyah construction was cut from either Box or stringy bark trees, stripped off in one unbroken piece which, when stretched out flat, formed a sheet from 6 to 12 feet square, depending on the size of the tree. In order to climb the tree to prise off the bark, a forked pole was rested against the trunk, and the end of a spearthrower was then used to lever off the bark. Thereafter, to prevent the bark from cracking when it was straightened out, the sheets were heated on the inside with fire. When they were dry these sheets of bark, which were an inch to an inch and a half thick and impervious to rain, retained their flat shape (Brayshaw 1986).

Clarence Paget Bayly (1841 - 1926) recalled:

> I have seen in my days hundreds of natives, during the winter, when they wore nothing but strips of kangaroo skin front and back, fastened to a band around the waist. Now, some of them were fine fellows, over six feet in height, and as straight as a whipping post. Beaudesert and Guntawang, near Gulgong, were both favourite places of theirs for camping and hunting. It seems most astonishing how these unfortunate natives have all died out in a short number of years. Now, notwithstanding all the tribes I knew, namely Mudgee, Talbragar, Coolah, Castlereagh, Baradine and others, I don't think there is a solitary one left, either men or women of these tribes (Cameron: N.D.).

Given the estimates for Gamilaraay and Wiradjuri pre-European populations as possibly being in the vicinity of 10,000 individuals for both groups (O'Rourke 2009:4), the question arises as to how these numbers could be so swiftly reduced following the arrival of European people. The scant number of Aboriginal people encountered also puzzled early settlers, such as Clarence Paget Bayly, as quoted above.

John Oxley was the first of a succession of explorers who wondered why a region so rich with abundance as the Liverpool Plains would have an Aboriginal population that was so small. In 1818, he and his party were the first Europeans to arrive at those plains, before then travelling over 90 kilometres across them to an area near present day Tamworth.

During this journey, not a single Aboriginal person was seen or met, and the only sign of life was smoke from three fires observed at a distance. As a result, Oxley was left with the firm impression that the whole of this country appeared to be very sparsely populated (O'Rourke 2009: 10-11).

In 1825, while Cunningham was also exploring the Liverpool Plains, he encountered a small number of Aborigines, even surprising a group of some fifteen Gamilaraay people in an area near to present day Boggabri, who did not see his party approach. He also came across a group of gunyahs arranged like a settlement, but these were deserted and had not been used for some time. It was apparent to Cunningham that there were few people on the Plains. He wrote 'It is curious that I should have met with only one small group of native women and children and seven males who were prowling about in quest of the scanty subsistence in grubs and kangaroos or opossums afforded by the surrounding country and from the boundary heights only perceived two distinct smokes of the fires of the Aborigines' (Lee 1925).

Various causes may be attributed for the apparent sparseness of the Aboriginal population throughout the district at this time. Cunningham believed it may have been due, at least in part, to the activities of parties of soldiers and settlers from the Bathurst and Mudgee regions, who had made 'sweeps' on the Indigenous population in 1824. These sorties were conducted by four separate posses. The party that went north in the direction of the Liverpool Plains, travelling for a total of 10 days, was comprised of army commander Major James Morisset, two or three mounted civilians, one or two Aboriginal guides and some 10 infantrymen. At the end of the day, none of the four parties inflicted any injury to any Aborigines. Indeed, as it turned out, only one party even saw an Aborigine (O'Rourke 2009: 12).

O'Rourke (2009: 12) suggests that smallpox first impacted the Indigenous population with an outbreak in 1830-32, and as such, only after Oxley and Cunningham had made their tours of the Liverpool Plains. However, this occurrence was at least the third epidemic to sweep through Indigenous groups, and it is most probable that the sparseness of the Aboriginal population throughout the district when these explorers arrived may to a large degree be attributed to an earlier spread of smallpox which had severely depleted the Indigenous population by that time. By the 1830s, explorers Charles Sturt and Sir Thomas Mitchell found evidence of large-scale mortality on the Darling and Murray river systems. Indeed, Sturt and Beveridge came across large numbers of skeletons. Both Mitchell and Sturt held the same opinion as to the enormity of the mortality rate which smallpox had wreaked amongst the tribes when it '... absolutely raged through the whole of them', with Mitchell also declaring that its effect was '... almost depopulating the Darling' (Mear 2008).

As indicated by Edward M. Curr, who wrote as early as 1877 in the Argus, Captain Collins of the First Fleet had observed in April 1788 that the Aborigines in the Sydney area were being swept away by smallpox. 'It may be noticed that in addition to Collins, Hunter, Barrington and Wentworth give more or less full accounts of the horrors which occurred on the occasion and of how such of the Aboriginals as had not yet been stricken down fled to the interior to escape the destroyer, bearing about them inevitably the seeds

of a wider destruction. With the flight of the survivors, however, we lose for the time all traces both of them and the disease, our countrymen at the period not having yet left the margin of Sydney Bay' (The Argus 1877 p.7).

Curr's recollections and conclusions, in combination with the accounts given by Mitchell, Sturt and Beveridge, add to the evidence that smallpox had travelled down the Murray in the period just after the First Fleet arrived, causing massive depopulation and disruption to the surviving inhabitants. From this, it is reasonable to assume that the disease had also significantly depleted the Gamilaraay and Wiradjuri populations north of the Goulburn River, spread by fleeing survivors of the Sydney outbreak even before Europeans had set foot in their country.

There is no indication that smallpox was deliberately imported by the British into Sydney. Neither was it introduced by the French, who Captain Phillip nevertheless chose to blame for causing the outbreak, even though such an allegation has no foundation. Meanwhile, Tench and other First Fleet journal writers were either apologetic, or incredulous that the disease could have possibly been introduced by their party. Nevertheless, it is apparent that by some means the British brought smallpox with them on the First Fleet and that it was introduced into the Aboriginal community in 1788, wreaking havoc and initiating destruction and dislocation throughout the Aboriginal societies of Australia (Mear 2008).

With their population drastically reduced, both the domestic and broader social functioning of Aboriginal groups would have been placed under immense stress. It was at this time that settlers first moved into their country. The first Europeans to travel north from Mudgee to the Coolah district and beyond to the Upper Hunter River, arrived at random, with the aim of securing pasture on the unsurveyed areas of the frontier (see also Appendix 3). The strategy of such settlers was to occupy a desirable portion of 'vacant' land and sometime later to apply to the Governor for that land to be granted to them. Beyond the limits of settlement, there were no limits to avarice, so that often as not the area of the land taken up by individuals was of an immense size. Nowhere in this process was any serious consideration given to the Aboriginal owners of the country, as all gave way to the push for personal gain and agricultural advancement.

But as Europeans moved in, skirmishes began to take place. Henry Dangar and his party were attacked by an estimated 150 Aboriginal warriors west of Murrurundi while they were exploring near the top of the Liverpool Range. One of the party was wounded by a spear and some shots were fired in response, but apparently without inflicting injury (O'Rourke 2009: 22). Within a year of Dangar's exploration of the area, almost the whole of the Upper Hunter River area had been pegged out and either granted, sold or reserved for individuals or institutions.

While the Gamilaraay did not react to the first small groups of land selectors, they began to take exception when pastoralists started to arrive in large numbers, with their numerous convict workers, sheep and cattle, to take over lands in the Upper Hunter and beyond. However, even then it appears that the Gamilaraay only attacked colonists who had provoked such a response, leaving other settlers in peace. Both the Sydney Gazette

and the missionary Reverend Lancelot Threlkeld considered that a great deal of the animosity was provoked by convict workers mistreating Aboriginal women.

The first settlers to be killed by the Gamilaraay, on 28 October 1825, were Robert Grieg and a convict worker, at James Grieg's farm (Robert's cousin) 'Martindale', near present-day Denman. Two other stockmen were also speared. A magistrate later attributed the attack to James Grieg's 'known aversion to having the Natives about him', and accordingly he had slighted the Aborigines by refusing to allow them to come on what he regarded as his land. While the incidents were rare, it was generally observed that if Aborigines did kill Europeans, they rarely killed strangers. The injustices which provoked such a response were most usually personal. Captain Foley, the military commander based at Newcastle, indicated something similar when in 1826 he informed the Governor 'All those acts of outrage have been committed without exception by Natives who are domesticated on the very estates where they occurred and not by the incursions of unknown or wild tribes' (O'Rourke 2009: 42).

When Governor Darling took up his post in 1825, he saw the two main challenges to British law as being the threat from escaped convicts called 'bushrangers', and also from hostile Aborigines. Shortly before he arrived in the colony, Acting Governor Stewart had set up two mounted police patrols, recruited from among veteran soldiers. Called police, they were in reality mounted infantry, armed with short-barrel muskets. One patrol was posted to Bathurst, and the other was sent to the Hunter Valley (O'Rourke 2009: 42). The mounted police later assisted with the establishment of the Border Police (Cameron 1993: 106).

In his work, O'Rourke (2009) documents the conflicts that hereafter took place between the colonists and the Aboriginal groups of the Mudgee/Merriwa/Musswellbrook area. As British law and order was imposed over this district, Reverend Threlkeld was at one point provoked to decry '... war has commenced and still continues against the Aboriginals of this land' (O'Rourke 2009: 52). However, while the historical record holds relatively clear detail on the raids and attacks mounted by the Indigenous population, the responses and reprisals enacted by official and unofficial parties appear less well documented.

The observations of District Commissioner Graham Hunter, who oversaw the operations of the Border Police for the Squatting District of Bligh, first from Cassilis, commencing in 1837, and thereafter from the township of Coolah from 1839 to 1851, may well chart the condition of the Aboriginals of the district at this time. Amongst the responsibilities of the Border Police was the protection of Aborigines residing beyond the Limits of Settlement, and it appears that Hunter was considerate to and concerned about the Indigenous population under his charge. When he first left Sydney to take up his post at Coolah in 1839, Hunter requested 400 blankets, 50 cotton shirts, 50 tomahawks, one keg of tobacco and a gross of pipes. The order was so large that the Colonial Storekeeper declined to issue the goods until assurances were gained from the Colonial Secretary (Cameron 1993: 105).

As part of his duties, Hunter was required to regularly submit reports with regard to,

amongst other things, 'Native' welfare. In his report of 1839 he documented that some 300 Aborigines lived in the district. Of great concern to Hunter was the seizing and holding of Aboriginal women by European settlers. On occasions he returned women to their tribe, only to learn later that they had been again abducted (Cameron 1993: 106-107).

In 1843, Hunter wrote:

> I have had several times this last year to be called upon when the natives, in the distant part of the district, have been imposed upon and when they have come in collision with the Settler. But in no case have I been able to prove to my satisfaction that the natives were not in the first instance the party grieved. During this past year a new tract of land has been occupied by the Settler: and, as on all such occasions the natives are inclined to be hostile ... until natives become acquainted with our habits, it cannot be expected but they will use every means to destroy Stock of those occupying distant parts. As to numbers, in all new located parts (such as the Barwon or Darling, 250 miles from this in the interior) they are found in large bodies; in long inhabited parts they are less numerous; to what cause I am to attribute this, *I am not at present prepared to state* (Cameron 1993: 108-109, emphasis added).

It was, however, Hunter's general observations over time that the Aboriginal population of the district was in decline, although as above, he remained reluctant to attribute this to any particular reason. In 1847, his report said '... I still find the Aborigines decreasing in number; there does not appear but a few instances that the natives have children; this I must attribute to the great intercourse they have with the white men, which there can be little doubt is carried on to some extent. More and more, the remaining Indigenous population were drawn to the stations and given employment'. In 1845 Hunter had observed '... at almost every station, there will be found a few of the natives employed which has been the case for many years. The longer they are employed at these stations, the more useful they become, provided they are treated kindly and without abuse ...' (Cameron 1993: 109-110).

However, although Aboriginal people became more and more dependent on and enmeshed in the colonial system, they were nevertheless regarded as less than equals with their white counterparts. Jimmy Governor was born on the Talbragar River in 1875, the son of a bullock-driver father, and his wife Annie, née Fitzgerald. Short, good-looking, of Aboriginal appearance but with red hair, Jimmy attended the mission school at Gulgong before starting work as a police tracker at Cassilis in 1896. He then tried jobs as a woodcutter and a wool-roller, before marrying Ethel Page, a 16-year-old woman of European extraction in 1898, at Gulgong (Walsh 1983).

After a variety of jobs, Jimmy got a fencing contract for John Mawbey at Breelong, near Gilgandra, while Ethel did housework for Mrs Mawbey. Jimmy was conscientious and concerned to prove himself in white society, at the same time being touchy about his colour. When he learned that Mrs Mawbey and schoolteacher Helen Kerz had taunted his wife Ethel for having married a 'blackfellow', Jimmy and friend Jacky Underwood confronted the women who on the night of 20 July 1900 were alone in the house with seven children. When the women laughed at him and Helen Kerz taunted: 'Pooh, you black rubbish, you want shooting for marrying a white woman', Jimmy flew into a rage.

Losing all control, he and Underwood killed the two women and three of the children with nulla-nullas and a tomahawk (Walsh 1983).

Underwood was quickly caught, but Jimmy and his brother Joe Governor, calling themselves 'bushrangers', went on a rampage for fourteen weeks. Covering 3,000 km, they terrorised a wide area of north-central New South Wales. Seeking revenge on persons who had wronged them, they killed Alexander McKay near Ulan, Elizabeth O'Brien and her baby son at Poggie, near Merriwa, and Keiran Fitzpatrick near Wollar. Pursued by Queensland black trackers, bloodhounds and hundreds of police and civilians, they moved into the rugged headwater country of the Manning and Hastings rivers. After several close escapes, Jimmy was shot in the mouth near Wingham, and Joe was shot dead at a place just north of Singleton. Jimmy stood trial in Sydney for the murder of Helen Kerz and was convicted and hanged. His story was retold in the context of Aboriginal dispossession and white racism in Thomas Keneally's 1972 novel, 'The Chant of Jimmy Blacksmith', later made into a film in 1978 (Walsh 1983).

Gambu Ganuurru, also known as Red Kangaroo and the Red Chief, was a Gamilaraay leader, who in the eighteenth century, lived in the area of present day Gunnedah. He was a warrior and wise leader of the Gunn-e-darr tribe. As it was the tradition of that tribe to never speak about the deceased, the legend of Gambu Ganuurru could easily have become forever lost. Because of this custom of silence, the last full blooded Gunn-e-darr Aborigine, 'Old Joe' Bungaree, who was born about 1817, was averse to talking about his great leader. However, just before he died, 'Old Joe' made the decision to confide in his friend, J P Ewing, the local Police Sergeant, and relate the life story and exploits of Gambu Ganuurru. The Police Sergeant's son, Stan Ewing, recorded the information and passed it on to other historians, and Ion Idriess in turn wrote a bestselling book about the warrior whom he called Red Chief (Idriess 1953: 225).

The story of Gambu Ganuurru centres around his quest to strengthen the Gunn-e-darr tribe, who were dwindling in number compared to surrounding groups. One of the core accounts of the narrative details Red Chief's brave and clever leadership when countering an attack by their worst enemies, the Cassilis tribe. With far fewer men, Red Chief led the Gunn-e-darr warriors to a resounding victory, and ensured the continued survival of the tribe. It is indicated that Gambu Ganuurru was buried in about 1750 in a manner befitting a respected and important Gamilaraay elder, in a seated position and backed by a tree carved with totemic designs (Idriess 1953; O'Rourke 2005).

2.3 Material Evidence

Numerous searches of the NSW OEH Aboriginal Heritage Management Information System (AHIMS) have been conducted for this project. The division between zones 55 and 56 occurs at the eastern end of the wind farm subject area, and accordingly two searches have been conducted (Client Service ID: 80370 and 80371, see Appendix 1). The most recent search for the proposed transmission line was conducted by AHIMS staff on the 12th November 2013 based on a GIS shape file with a buffer of 500 metres (a table with the list of these sites is included in Appendix 1).

No previously recorded AHIMS sites are located within the wind farm subject area. However, numerous sites are located near to, or within the options of the transmission line subject area (see mapping in Appendix 3 and, as relevant, these are discussed further below in Section 2.3.4). The AHIMS register only includes sites which have been reported to NSW OEH. Generally, sites are only recorded during targeted surveys undertaken in either development or research contexts. Accordingly, the search results cannot be considered to be an actual or exhaustive inventory of Aboriginal objects situated within the local area or indeed within the subject areas.

The most common Aboriginal object recordings in the region are distributions of stone artefacts. Rare site types include rock shelters, scarred trees, quarry and procurement sites, burials, stone arrangements, contact sites, carved trees and traditional story or other ceremonial places. The distribution of each site type is related, at least in part, to variance in topography and ground surface geology.

Searches have been conducted of the NSW State Heritage Inventory and the Australian Heritage database (see Appendix 2). No Aboriginal heritage sites are listed on these as being in the wind farm or transmission line subject areas. However, two rock shelters with art (Hands on Rock) listed on the Register of the National Estate are located c. 400 metres away from the nearest transmission line option and would not be impacted by the proposal. The AHIMS grid references for these is incorrect; they are located at the point indicated by the boomerang symbol on the topographic map. This site is described as follows:

> Variations in the size of the hand stencils indicates participation by both adults and children in the execution of the motifs. As well as the numerous hand stencils one other type of motif is represented, a few bird tracks. Sandstone rubble is deposited on the floor on which isolated stone flakes are visible.

In the Register of the National Estate the Official Statement of Significance reads:

> Known locally as Hands on the Rocks, the walls and roof of this large sandstone overhang are covered in hand stencils executed in red ochre. The site is of major significance because of the large number of hand stencils, some 150 to 200 extending over a distance of approximately 90m, visible on the walls, and because the motifs represented are almost exclusively hand stencils. At other known sites the hand stencils are usually fewer in number and in association with other types of motifs.

While not listed on any heritage registers, three ‘cultural landscapes’ are present in the Ulan area. These were identified while the proposed Moolarben Coal Mine Stage One Environmental Assessment was on exhibition and a number of submissions were made to the Minister for Planning, including some relating to Aboriginal heritage in the Ulan area. The Minister convened an autonomous group, the Independent Hearing and Assessment Panel, to scrutinize the main features of the project in more detail, including Aboriginal heritage. Emerging from this ongoing consultation process, Hamm (2006b) noted that three 'cultural landscapes' had been identified by the Aboriginal stakeholders, these being the Bora Creek alluvial flats, the Goulburn River, and 'The Drip'. These are all located away from the transmission line options and would not be affected by the proposal.

The following discussion in Section 2.3.1 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.

2.3.1 Previous Archaeological Research

The primary focus of archaeological research in Australia throughout the 1960s, 1970s and 1980s was the examination of the relationship between Aboriginal people and their environment, and the mechanisms of adaptation in what was apparently a land of harsh conditions and scanty, or at best, seasonal resources. The bulk of archaeological research that has been undertaken in the region has been focused on examining these issues. Prior to the 1960s, most archaeological research was aimed at defining change in the archaeological record. This was before direct dating techniques became available and, accordingly, the issue of time was handled by identifying differences in materials in archaeological deposit – specific artefacts in different layers of deposits were used to define different cultural periods (for example, McCarthy 1964, see below). With the application of direct dating techniques in the 1960s, research shifted away from the use of artefacts for defining different time periods, towards seeking to explain the nature of different artefacts, and assemblages of artefacts and food remains, in terms of adaptation to the environment. The 1960s also saw a shift towards the use of explicit scientific methods of reasoning in archaeological practice. This impetus influenced archaeologists to focus on research topics which were believed to be answerable within a scientific methodology. Topics dealing with site locational models, subsistence, technology and environmental adaptation were addressed. The following section outlines research conducted within the region.

A basic chronological sequence of human occupation in south-east Australia is the Eastern Regional Sequence, proposed by McCarthy (1964), and more recently refined by Lampert (1971: 68), Stockton and Holland (1974: 53), Attenbrow (2004: 72) and McDonald (1994; 2008). McCarthy's (1964) three-phased sequence extends from the Pleistocene through to the late Holocene, and is based on observed changes over time in stone artefact assemblages. The phases identified by McCarthy were the Capertian, the Bondaian and Eloueran (the latter being the most recent). Later researchers such as Lampert (1971: 64), and others, have found a general agreement with McCarthy's sequence. However, the sequence has undergone revision (Lampert 1971: 68). At the Upper Mangrove Creek Catchment (UMCC), Attenbrow (2004: 72) identified four cultural phases based on changes in artefact typology and raw material in the stone artefact assemblages from four radiocarbon dated sites. These changes were considered with reference to other studies conducted in the south-east in defining the phases and assigning dates to them.

Attenbrow (2004: 72-75) identified the following broad sequence of change in the Upper Mangrove Creek catchment:

- Phase 1 (Capertian): ca. 11,200 – ca. 5,000 years BP: Assemblages consist primarily of flakes, cores and flakes pieces. Implements include amorphous flakes with retouch/usewear, dentated saws and small numbers of backed artefacts. Fine grained siliceous stone and quartz dominate assemblages.

- Phase 2 (Early Bondaian): ca. 5,000 – ca. 2,800 years BP: Backed artefacts become more archaeologically visible and ground-edge implements appear at ca. 4,000 years BP. Fine grained siliceous stone and quartz dominate assemblages.
- Phase 3 (Middle Bondaian): ca. 2,800 - ca. 1,600 years BP: Backed artefacts reach a peak in abundance. During this time quartz dominates assemblages.
- Phase 4 (Late Bondaian): ca. 1,600 years BP through to just after European occupation: Backed artefacts are rare, bipolar artefacts and ground-edge implements continue to increase in abundance; quartz continues to dominate raw material categories.

Regional, and sometimes local, variations in the assemblages of each phase of the regional sequence have been identified and, furthermore, each phase has been found to begin at slightly different times in different regions (Attenbrow 2004: 219). Attenbrow argues that these differences are possibly due to local environmental conditions and local responses to climatic change, as well as to regional variations in social organisation, territoriality and subsistence patterns. In consideration of the absence of detailed archaeological investigation of the study area, extrapolating the evidence from elsewhere for use in this assessment necessarily requires caution.

While supporting the general sequence of change, archaeological enquiry undertaken since McCarthy proposed his regional sequence now considers the behavioural and demographic implications of observed change. Much attention has also been given to explaining phenomena such as the timing of initial site occupation and other indicators, such as changes in artefact numbers in sites. A picture of apparent intensity of site occupation during the mid to late Holocene has been explained in terms of a corresponding population increase (Hughes and Lampert 1982), and this notion gained currency in the literature (see, however, Hiscock 1981, 1986; Attenbrow 1987, 2004; Boot 1994, 1996, 2002). Attenbrow (2002: 21; 2004) has devoted considerable attention to this issue, and concludes that distinguishing between behavioural (such as changes in technology or mobility patterns), and geomorphological and demographic change to account for observed changes in the archaeological record, is not straightforward. She argues that answers to these questions are still unresolved, and that at this time it is not known how populations may have grown or changed from the time of initial occupation.

A new adaptive model, based on analyses of backed artefacts, has also been proposed which has implications for behavioural change during the late Holocene. Backed artefacts have been made and deposited in south-east Australia since 9,500 years ago (Hiscock and Attenbrow 1998). They dramatically peaked in abundance after 3,500 years ago, which was maintained until 2,000 years ago when their number began to decline. Hiscock (2008: 156, 158) has hypothesised that the backed artefact proliferation was a response to economic risk associated with the onset of drier and more variable climatic conditions in southern Australia related to the intensification of the El Niño system. Additional factors, which may have triggered higher foraging risk, have been posited, including landscape colonisation, redefinition of social space, landscape change, reduction of resources and greater foraging mobility (Hiscock 2008: 158). It is noted also that ground-edge hatchets were adopted as a new technology in south-eastern Australia at c.

3,500 years ago at the same time as the backed artefact proliferation (Dibden 1996; 2011). This technology is also likely to have helped deal with foraging risk.

There have been no previous archaeological investigations conducted within the proposed wind farm area and few have been undertaken within the immediate Coolah/Cassilis area. However, several assessments have been undertaken within or at least very near to the southern end of the proposed transmission line. The following discussion includes a review of archaeological work and its results conducted within the broader local area.

Isabel McBryde conducted an archaeological survey in the Dunedoo, Gulgong, Wollar and Coolah region which sampled portions of a 5000 km² area as part of research into rock art located within the western slopes of the New England region (*cf.* Haglund 1981a.) A total of 30 aboriginal heritage sites were located during the investigation, half of which were rock shelters with art, while the remainder comprised shelters with deposit, grinding grooves and quarries.

At this early time, surveys were conducted in the region by the Australian Museum between 1965 - 1967. The rock shelter BOB/1, situated on Bobadeen Creek and to the north of where that watercourse joins the Goulburn River, was excavated in 1967. The results of the excavation, reported by Moore (1970), indicated that a total of 16,609 artefacts were retrieved from this relatively small shelter which measured some 5 x 3 metres in size.

The deposit was excavated to a depth of some 1.2 metres, with radiocarbon dating of the basal layers furnishing a date of 7,750±120 BP. Subsequent further dating (Moore 1981) provided additional dating results of 5,150±170 BP and 4,120±175 BP, so that Moore (1981) concluded that occupation of the shelter had began at about 6,000 years BP.

The retrieved assemblage was comprised of 13,552 small waste flakes, 1,900 large waste flakes, 175 small cores, 75 large cores, and in addition, a variety of implements. Stone tools retrieved were 249 Bondi points, 166 side and end scrapers, 47 eloueras, 223 other microliths/backed artefacts, 48 points, 72 utilised flakes, 22 utilised cores, 2 ground-edged 'axes', 3 utilised pebbles and other items (Moore 1970: 49). The dominant raw material type was quartz (55%), with fine-grained grey chert forming the next largest component of the assemblage (Moore 1970).

In addition to stone artefacts, a total of 69 bone implements were recovered. Moore (1970) attributed their function as possibly being scribers for incising marsupial skin cloaks. Wallaby, possum, bandicoot and bettong bones were also retrieved, as well as emu eggshell and freshwater shells (Moore 1970). In all, an area of some 140 cubic feet was excavated, with artefact density being some 118 artefacts per cubic foot, or some 4189 artefacts per cubic metre.

Moore (1970) compared the retrieved BOB/1 stone assemblage with two other sites excavated in the upper Hunter Valley - Milbrodale 1 and Sandy Hollow 1. He determined that because the Bondi point tool type did not make up as high a proportion of the artefactual material at BOB/1, backed artefact production was more generalised there

than in the upper Hunter Valley sites. In addition, he (Moore 1970) concluded that artefact production at the BOB/1 site had conspicuously higher levels of microlithic stone working, though acknowledging that a higher percentage of quartz in the BOB/1 shelter assemblage may have influenced this result.

Pearson (1981) completed a regionally based investigation of Aboriginal and early European settlement patterns in the Upper Macquarie River region. He excavated three rock shelters (one of which is discussed further below) which revealed Aboriginal occupation of the area dating from 7,000 years BP.

Pearson (1981) conducted sample surface surveys for Aboriginal sites at a number of locations including the Mudgee/Cooyal areas. Pearson (1981) paid particular attention to the factors which influenced occupation as reflected by means of site location and site distribution. He (Pearson 1981) observed that across all regions it was apparent that accessibility to water, good drainage, level ground for sleeping, elevation above areas of winter cold air pooling, sufficient exposure to cooling summer breezes, a sunlit leeward aspect and access to adequate fuel were significant influencing factors in the choice of campsite locations. In the sample survey, areas which afforded such conditions were noted as being located on gentle hillslopes and undulating ground, flat sections on ridges particularly at lower elevations, and thereafter creek banks and river flats which, although they had ready access to water, possessed no other discernible advantageous features. In relation to preferred vegetation zones, Pearson's (1981) investigation identified open woodland as being favoured for occupation.
Pearson characterised Aboriginal site patterning as follows:

- Aboriginal sites were strongly related to water sources. Distance to water varied from 10 to 500 m and generally the average distance to water decreased as site size increased;
- Sites were located on hilly and undulating landforms rather than on river flats or the banks of waterways. However, the regional incidence of landform variation biased this sample;
- Site location was influenced by good drainage and views over water courses and river flats;
- Most sites were located in open woodland contexts with smaller numbers being present in grassland or forest contexts;
- Burial sites and grinding grooves were situated close to habitation areas;
- Ceremonial sites were located away from habitation areas;
- Stone arrangements were located away from campsites in isolated places; they are associated with small hills and knolls or flat land;
- Quarry sites were located where suitable sources were present and reasonably accessible.

Based on an examination of early historical material, Pearson (1981) argued that the region was inhabited by a small number of clan groups each of which were comprised of 80 to 150 people. These groups were divided into smaller 'daily' units of up to 20 people.

Pearson (1981) suggests that the 'daily' units made short moves between camp sites which resulted in elongated site formation such as continuous artefact scatters along creeks. Pearson presented ethnographic evidence which suggested that camp sites were not used for longer than three nights and that large sites therefore probably represented accumulations of short term visits.

Pearson (1981) also considered the issue of the reliance upon food staples. He argued that rather than a reliance on a singular food type, a wider based economy was practised with the implication that such a non-specialised economy would probably not have been affected by periodic shortfalls in certain foods and that human movement would have been similarly unaffected. In addition to surface surveys, Pearson (1981) also undertook subsurface investigation, excavating the Botobolar 5 rock shelter, near to Bara Creek and some 15 kilometres east of Mudgee. This shelter is located about 40 metres from Bara Creek and about 100 metres from an extensive grinding groove site on that creek. It is 12 metres long, 5 metres high and 4 metres deep, with an easterly aspect. The shelter itself has extensive art in the form of a large frieze of engravings across a 12 x 1.5 metre panel on the wall, which includes over 123 pecked motifs, primarily of 'animal track' design. In addition there are four white and one red hand stencils plus, immediately to the south of the main shelter, a rock slab which features more engravings and grinding grooves. Extending across the widest section of the shelter, Pearson (1981) excavated a 3 x 1 metre trench. Cultural material was found to a depth of 0.55 metres, with one excavation unit extending to a depth of 0.7 metres. Radiocarbon dating obtained by Pearson (1981) gave dates of 5,590±190 BP and 5,770±100 BP.

A total of some 2,975 stone artefacts were retrieved in the excavation, which Pearson (1981) subdivided into Bondaian and pre-Bondaian assemblages. The assemblage characterised as Bondaian, as it contained microliths, was located in the uppermost 0 - 0.15 or 0.2 metres of deposit, with the pre-Bondaian assemblage, lacking microliths, located below. The 5,590 BP date was obtained from the pre-Bondaian deposit, while the only date acquired from the Bondaian deposit was 1,170±60 BP. Quartz dominated the assemblage, making up in excess of 50% of the items. A high proportion of the retrieved material was small flaking debitage, while implements comprised a low proportion, but included Bondi points, an elouera, geometric microliths, thumbnail scrapers, utilised cores, utilised flakes and pieces, a ground edged flake and a grinding slab. Other material recovered from the excavation included kangaroo, wallaby, possum, bandicoot and reptile bone in the upper levels, as well as macrozamia pods, gum nuts, geebung and some mussel shell fragments. Emu egg shell was also present, and from this Pearson (1981) believed there was the inference that occupation of the shelter, at least at the time this material was laid down, was in late winter and/or early spring.

Koettig (1985) undertook a comprehensive study relating to Aboriginal occupation of the Dubbo area. Following a desktop review, Koettig (1985) commenced a systematic survey of a variety of landform units and stream orders so as to ascertain the relationship of site type and site location to specific environmental settings within three principal physiographic zones. As a result of this study Koettig (1985) proposed that:

- Aboriginal sites will be distributed throughout all landscape units;

- Open artefact scatters, scarred or carved trees and grinding grooves are the most common site types;
- The location and comparative size of sites is principally determined by environmental and social influences. While site location dictated by social determinants cannot be predicted, some modelling of site type and site location in relation to environmental factors may be made. Those factors include:
    - Proximity to water: - although sites were found in all landscape settings including hills and ridges distant from water, the largest campsites were located close to permanent watercourses.
    - Availability of food resources: - While the widest range of foods was found along major watercourses in association with the available permanent water, some foods were seasonal and located away from permanent watercourses.
    - Geological formation: - Certain site types occur in particular settings. Grinding grooves are located where there are suitable sandstone outcrops, while quarries are found where there is a useable and accessible stone resource. Burials are most likely to be found in sandy deposits such as those that exist on alluvial flats.

Cubis (1981) conducted a pedestrian survey of the route of a 132 kV power easement that extended some 35 km between Beryl and Ulan, terminating at the Ulan substation. While several artefact scatters and isolated finds were located, along with a number of historic relics, no Aboriginal objects were recorded in the immediate vicinity of Ulan.

Haglund (1980b, 1981b) undertook a heritage study in relation to the proposed Kerrabee Dam, which was anticipated to be constructed on the Goulburn River at the junction of the Merriwa River, some 50 km south-east of Cassilis, but which was later shelved. Haglund (1980b, 1981b) conducted surveys that were focused on sampling a representative selection of the alluvial flats and lower slopes associated with major watercourses that were proposed to be inundated by the dam. In all, a total of 343 Aboriginal sites were recorded, including artefact scatters, grinding grooves and rock shelters with deposits and/or art. In addition, a number of rock shelters were excavated which held deposits containing an array of organic material including macropod, potoroo, rat, skink, bird, and bandicoot bones, as well as fish, shell, fur and burnt wood remnants (Haglund 1981b).

Haglund (1985) conducted a desktop study of the Aboriginal heritage resources of the Mudgee shire, collating information from previous archaeological assessments, as well as information available in the OEH sites register. While noting the limited number of investigations which had been carried out to that date, Haglund (1985) indicated that some 70 sites were recorded on the register as being located within the Mudgee Shire. Of these, 29 were listed as open sites, 20 were identified as being rock shelters, including two which contained both art and deposit, and 15 which had art only. Other sites included two quarries, two wells, 11 grinding groove sites, three stone arrangements, four scarred trees, two bora grounds and one burial.

A desktop study was conducted by Navin (1990) in relation to three prospective sites selected for the purpose of power generation, located at Broke, Gunnedah and Ulan. Navin (1990) collated information available from previous archaeological assessments, combined this with information available from the OEH sites register, and constructed a predictive model of site location for each of the three areas. Navin (1990) found that 580 Aboriginal sites had been identified within a 50 km radius of Ulan, of which 47% were rock shelters with archaeological deposit. Thereafter, 30% of sites were artefact scatters, 11% rock shelters with art, 9% grinding grooves, and 3% scarred trees. Those site types which formed the least common (less than 1%) of those recorded were bora grounds, rock engravings, burial sites, carved trees, quarries, fish traps, stone arrangements and waterhole/well sites. Navin's (1990) predictive model for the region identified as high, the likelihood for artefact scatters to occur on flats associated with valley corridors and adjacent sandstone slopes that occur within sandstone ranges, as well as along adjoining watercourses - particularly alongside those which are reliable water sources. Thereafter, Navin (1990) predicted the potential for artefact scatters to exist along ridge crests as moderate, with shelter sites expected to potentially occur in the same landform element. Navin (1990) proposed that the comparatively high quantity of rock art sites in the Ulan/Gulgong area was maybe the product of a regionally specific art site tradition. Also observed was the chance for ceremonial sites and carved trees to occur.

OzArk (2005) surveyed the proposed route for the Transgrid 330 kV transmission line between Wellington and Wollar. A section of this route runs parallel to the Ulan Road and adjacent to the Ulan airstrip before, at a point north-west of Ulan village, heading towards Gulgong. The transmission line which would transport electricity from the wind farm would hook up to this line immediately to the south of the Ulan mine site. OzArk (2005) inspected proposed access tracks and tower sites, although some were unable to be surveyed because of restricted property access. A total of 19 artefact scatters and seven isolated finds were recorded, two of which, isolated find SCH IF6 (#36-3-654) and artefact scatter MC OS 19 (#36-3-656), are situated near to Ulan.

Navin Officer Heritage Consultants (2005) conducted an extensive Aboriginal heritage assessment in relation to the Wilpinjong Coal Mine, located some 15 kilometres south-east of Ulan. A total of 235 Aboriginal object locations were recorded. These included several artefact scatters comprised of over 500 artefacts, many other less abundant artefact scatters, isolated finds, rock shelters with artefacts, potential archaeological deposit (PAD) and/or rock art, as well as scarred trees and other places of cultural significance.

Hamm (2006a) conducted an archaeological survey in relation to Stage One operations at the proposed Moolarben Coal Mine at Ulan. Covering an area of approximately 34.8 km^2 (3,480 hectares), Hamm (2006a) recorded 222 Aboriginal heritage sites, comprised of 156 isolated finds and 47 artefact scatters. The number of stone artefacts recorded totalled 1,298, with quartz (81.6%) being the dominant raw material, and thereafter tuff (10.6%). Silcrete, siltstone, quartzite, chert, mudstone, chalcedony and porcellanite were represented in low frequencies. The stone artefact types recorded were dominated by flakes, flake portions and flaked pieces, with cores, hammerstones and backed artefacts also found to be present. In addition to stone artefacts, 17 rock shelters with artefacts

and/or rock art were recorded, as well as one scarred tree, one grinding groove site and 12 areas of potential archaeological deposit.

Hamm (2008) thereafter conducted an assessment in relation to the 2nd Stage of the Moolarben Coal Project. In this subsequent assessment, which was a sample survey, Hamm (2008) identified a total of 258 Aboriginal sites in addition to a re-recording a number of previously identified sites. Stone artefact sites were comprised of 102 isolated finds and 150 artefact scatters. A total of 4,825 stone artefacts were recorded, with quartz being the most common material (76%), followed by tuff (19%). Thereafter, silcrete, quartzite, chert, sandstone and fine grained volcanics were also represented, but in low frequencies. The stone artefact types which made up this assemblage were dominated by flakes, flake portions and flaked pieces, with cores, hammerstones, axes, anvils, grindstones and backed artefacts also found. In addition to stone artefact sites, Hamm (2008) recorded five rock shelters with artefacts, one grinding groove site, and 33 areas of potential archaeological deposit.

Since 1980, a number of surveys have been carried out at the Ulan coal mine site. These have been comprehensively reviewed by Peter Kuskie (2009), and here will be summarised briefly. Laila Haglund has undertaken the bulk of this work until South East Archaeology Pty Ltd took over the project in approximately 2000. Prior to 2000 numerous surveys were conducted, as well as the excavation of a number of rock shelters (see Kuskie 2009). Details are apparently scant for most of these excavations (*cf.* Kuskie 2009: 38). However, one (AHIMS #36-3-177) was subject to a salvage excavation and has been reported in more detail. A total area of 20 m^2 was excavated both in and out of the shelter. Artefacts were retrieved at a relatively low density of 139 artefacts per cubic metre (*cf.* Kuskie 2009: 39). As appears to be typical for the region, quartz was the most common raw material (68%), with chert (fine grained siliceous) being the next most abundant. The assemblage was comprised predominantly of flakes and flake fragments.

Witter (1994) proposed an occupation model for a rock shelter at Ulan (ID# 116) which involved one or more of three possible functions:

- Transient overnight camp – for small groups of people; such a site function would result in an artefact assessmblage of debitage with a wide range of sizes, mostly resharpening flakes and possibly some flake tool production.
- Day camp/foraging station – utilised as a daytime base for operations away from the domestic camp; this function would entail casual maintenance of equipment and would result in the production of abundant resharpening flakes and implements with little reduction and the production of medium and light duty flakes for brief use.
- Vantage points/crafts stations – for monitoring game movements and in addition the repair or maintenance of equipment; this function would entail casual to intensive manufacturing of artefacts including microblade core reduction, resharpening and reduction of nuclear tools to produce large amounts of small debitage.

Accordingly, Haglund (1996) suggested that the evidence conformed to a vantage point/crafts station site, but that in reality it possessed attributes indicative of all three models. To be frank, like many archaeological models, as an explanatory tool, it was overly simplistic and somewhat less than useful.

Of particular relevance to the current study, Haglund (cited in Kuskie 2009) conducted another salvage excavation of a shelter (AHIMS #36-3-1488) in 1998. This site is situated approximately 400 metres west of the Transmission Line *Preferred* route. A total area of 37 m² was excavated. Age determination by radiocarbon dated varied between recent to c. 4,000 years BP. A total of 10,002 artefacts were retrieved. Quartz and chert dominated the assemblage which was comprised predominantly of debitage. The site was initially interpreted as a domestic base camp, but subsequent analysis revealed temporal variability in site use. Usewear observed on artefacts indicated women's and men's activities and from this family occupation was inferred.

Kuskie (2009) conducted a comprehensive assessment of the then proposed Ulan Coal – Continued Operations. This assessment provides a significant contribution to the understanding of the local heritage context. Kuskie surveyed approximately 88% of an overall study area measuring 5,431 hectares. Some 709 Aboriginal heritage sites were recorded including:

- 558 open artefact sites;
- 9 grinding groove sites;
- 128 rock shelters with artefacts, art and/or grinding grooves;
- 5 scarred trees;
- 5 stone arrangements;
- 2 ochre quarries;
- 1 waterhole/well;
- 1 combined grinding groove and artefact site.

Kuskie (2009) produced a detailed occupation model of site location for Ulan. He argues that artefacts occur at the very low mean density of 0.0176 artefacts per square metre of effective survey coverage, which is consistent with background discard, and interspersed by occasional focalised areas of higher artefact density where activities or repeated activities occurred. This indicates that Aboriginal use of the area was generally of low intensity which, Kuskie argues, is probably the product of a lack of higher order water courses.

Based on the above review and a consideration of the topography, geomorphology and hydrology 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 described in Section 2.3.2 below.

2.3.2 Predictive Model of Aboriginal Site Distribution

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 will be widely distributed across the landscape in a virtual continuum, with significant variations in density in relation to different environmental factors. As a general rule, artefact density and site complexity can be 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 surface wash can act to obscure artefact scatter presence.

Given the different environmental contexts present within the proposed activity area, stone artefacts are predicted to be present in variable densities across the landscape. On ridge crests in the wind farm area, artefacts are likely to be present in very low densities only. It is predicted that on crests, artefact discard is likely to have occurred as a result of discrete events such as knapping activity and implement repair, or otherwise, simply random loss or disposal. On simple slopes between valleys and ridge crests, the majority of which are of moderate or steep gradient, artefact density is predicted to be negligible. Because of the nature of the steep, high ridge landforms, camping areas are most likely to have been focused on flats or basal slopes within valleys of higher order streams. Accordingly, in open valleys on elevated lower slopes or flats near to creeks, it is predicted that artefact density is likely to be higher and also, artefacts can be expected to be distributed as continuous occurrences across discrete landform elements. In the sandstone country nearer to Ulan, higher artefact density is likely to be tethered to higher order streams and otherwise, very low or negligible in the expansive, generally amorphous landforms through which these flow. Stone artefacts are most likely to be made from quartz (c. 73% of assemblages), especially in the sandstone country near Ulan (*cf.* Kuskie 2009), with tuff, chert and other materials occurring less frequently.

Grinding Grooves

Grinding groove sites contain grooves in rock surfaces that are produced through the shaping and/or sharpening of ground-edge stone hatchet heads or other tools (Attenbrow 2004). Groove size and morphology is known to be variable in the broader Sydney Basin which suggests that they can result from the sharpening of a variety of different tools, and the preparation of food (Attenbrow 2004: 43). Generally, groove dimensions indicate that grinding grooves result for the sharpening of stone hatchet heads.

A broad temporal framework for the age of grinding groove sites can be inferred on the basis of the age of ground-edge hatchet heads found within archaeological deposits. Across Australia, there is significant variation in the timing of the introduction of ground-edge hatchet technology, and in the south-east, the earliest hatchet heads date to the fourth millennium BP (Dibden 1996: 35; Attenbrow 2004: 241), and no earlier than

3,500 years ago (Hiscock 2008: 155). Grinding groove sites in the local area can be no older than 3,500 years. Given that hatchets were used at the time of European occupation, the use of some grinding groove sites may have spanned this temporal range.

Grinding hatchet heads on stone creates indelible marks on the rock surface and land. Grinding groove sites may have become significant and meaningful locales over time given their reference to an important item of material culture and their strong material presence in the landscape. Sites containing high groove counts are now visually significant marked locales. While the original motivation which led people to choose to grind hatchet heads at a specific place is now not well understood, it is possible over time and as a place became increasingly embellished with grooves, that the meaning and significance of that locale was changed correspondingly. Grinding groove sites may have provided a physical and conceptual reference to the ancestral past and activities of previous generations (Dibden 2011). Because of the enduring materiality of grinding groove sites they may have been meaningfully constituted expressions of place and mnemonic of past events and personal and group history (*cf.* Peterson 1972: 16).
Grinding grooves are only found on abrasive sedimentary rocks such as sandstone. Given the absence of suitable rock exposures in the wind farm subject area, grinding groove sites are unlikely to be present. Grinding groove sites are, however, a common feature in the sandstone country around Ulan; there is therefore high potential for grinding grooves to be present in the vicinity of the proposed transmission line either in open contexts such as creek beds, or, on bedrock/roof fall in rock shelters.

Burials Sites

The potential for burials to be present is always possible, especially in deep sandy soils, including deposits in rock shelters. Given the nature of this site type they are rarely located during field survey.

Rock Shelter Sites

Rock shelters sites are unlikely to be present in the wind farm subject area given the absence of large vertical stone outcrops. Shelters are, however, a common site in the sandstone country around Ulan; there is therefore high potential for shelters to be present in the vicinity of the proposed transmission line.

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 its 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 vast majority of live trees are young. While not impossible this site type is unlikely to have survived and therefore be present.

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. Basalt is a highly suitable material for stone hatchet heads, given its toughness and ability to withstand the stress of impact (Dickson 1978; Dibden 1996). Accordingly, there is some potential for quarries or procurements areas to exist in the wind farm area. Ochre and tuff quarries have been recorded at Ulan (Kuskie 2009).

Ceremonial Places and Sacred Geography

Bora and ceremonial sites are places which were used for ritual and ceremonial purposes. Possibly the most significant ceremonial practices known were those which were concerned with initiation and other rites of passage such as those associated with death. Sites associated with these ceremonies are bora grounds and burial sites. Additionally, secret rituals were undertaken by individuals such as clever men. These rituals were commonly undertaken in 'natural' locations such as water holes. Pearson (1981) made the following predictions in regard to ceremonial site patterning in the region:

- Burial sites were situated close to habitation areas;
- Ceremonial sites were located away from habitation areas;
- Stone arrangements were located away from campsites in isolated places; they are associated with small hills and knolls or flat land.

In addition to site specific types and locales, Aboriginal people invested the landscape with meaning and significance; this is commonly referred to as a sacred geography. Natural features are those physical places which are intimately associated with spirits or the dwelling/activity places of certain mythical beings.

Knight's (2001) Masters research conducted in the area of the Weddin Mountains examined the cultural construction and social practice of inhabiting a sacred landscape. This approach is a departure from a consideration of the land and its resources as being a determinant of behaviour, to one in which land is regarded as a *text* – within this conception, land and its individual features, are redolent with meanings and significances which are religiously and ritually centred, rather than economically based.

Knight's (*cf.* 2001:1) work was possible in great measure by the historical record which explicitly defines Weddin as a site of ritual significance. However, the research was additionally driven by a theoretical approach to 'cultural landscapes'. Landscape is redefined away from considerations of its material features which provide a backdrop to human activity, towards a view that a landscape *is rather*, a conceptual entity. According to this view the natural world does not exist outside of its conceptual or cognitive apprehension. The landscape becomes known within a naming process or narrative; thus the landscape is brought into being and understanding – within this process: - '… explanatory parables…' such as legends and mythology are the embodiment of the landscape narrative (Knight 2001: 6).

These narratives are relative to a particular culture, and it is this, which makes an archaeological investigation of the cultural landscape such a thorny one. At distance in time and cultural geography, and especially in the absence of specific ethnographic information, how can the archaeologist attempt to investigate and know these narratives? Knight (2001: 11) employed the concept of the landscape as *mentifact,* whereby archaeological interpretation is concerned with the reconstruction of the landscape as a reflection of prehistoric cosmologies. He argued that this can be reconstructed by exploring the systematic relationships between sites and their topographic setting. This is defined as an *inherent* approach as it is concerned with the role of landscape in both everyday and sacred life. This view is concerned with an integration of the sacred and profane rather than their existence as separate categories of social life: - where "Cult activity may have existed as an inextricably 'embedded' component of daily life, where significant locations and ritual aspects of material culture were thoroughly incorporated into secular ranges and uses" (Knight 2001:13). In this regard Knight (2001: 14) correctly points out that no dichotomy between the material and ideational world existed within Aboriginal life.

Knight (2001: 15) argued that the notion of sacred space is of central concern within an inherent perspective on interpreting cultural landscape. Within human cosmologies locales within the landscape are constructed as being sacred space; this process of the construction of sacred space has been termed *hierophany* by Eliade (1961 in Knight 2001: 15). However, while Knight (2001: 15) suggests that physical entities such as stones, trees, or topographic features such as mountains, caves and rocky outcrops may be subject to such processes of transformation or construction, in reality in Aboriginal society any natural feature of less obvious significance can and should be included within this listing. Aboriginal constructions of heirophany can include the most insignificant landscape feature and objects of less fixed temporal existence such as animals and plants. While the outside observer readily 'sees' and apprehends mountains and rocky features, more subtle elements of the natural world are easily passed 'unseen'. This point is one which suggests that the personal cultural geography of the archaeologist can severely impact upon the interpretation of the sacred landscape. Knight (2001) does acknowledge this to some extent, illustrating the issue by referring to the example of "Jump Up Rock" situated north of Weddin. This place is only understood to have been an important landscape feature by recourse to prior knowledge regarding the meaning of the site name; the hill itself is insignificant and therefore not readily apprehended through an outsiders gaze as being of special significance.

Knight (2001: 16) refers to the issue of peculiarities of form (eg shape, colour, size or texture) and natural distinctiveness (e.g. isolated mountains or rocky features within a plains context) as being an important distinguishing feature of sacred locales. Knight (2001: 16) argues that the construction of sacred space in such a manner is particularly relevant to people for whom the natural domain is the dwelling place of/or the manifestation of their deities. Knight (2001: 16) again draws from Eliade (1964) to suggest that it is at the sacred place that the three fundamental cosmological worlds, the everyday, the upper and underworld may converge; typically the upper world will be associated as a point of 'access' with tall things such as trees while the underworld will be associated with pools and caves. Eliade contends that places where all three worlds can possibly connect, the *axis mundi*, are of a heightened order of sacredness. Hierophanies are therefore natural features which are ascribed sacredness. Additionally, Knight (2001: 17) refers to their ability to provide a landscape based opportunity for people to commune with other worldly deities and associated power because they may constitute spatial access between worlds via ritual.

Guided by these theoretical considerations Knight (2001: 20) engaged with Bradley's (cited in Knight 2001) model of the 'archaeology of natural places' in order to provide guidance for investigating the cultural landscape of the Weddin Mountains and its environs. Bradley (2000) has argued that natural places can be explored archaeologically in order to determine the nature of their role in human cosmologies by attending to four archaeological categories: - Votive offerings, rock art, production sites and monuments. This model was developed within a European context, with its attendant biases of concepts and archaeological categories; plainly not all concepts, some of which are clearly Eurocentric, will be applicable in Australia. Nor will all these data sets be found within the Australian context.

Knight (2001) gives consideration to the types of natural places which might be ascribed sacred significance. These include mountains, woodlands and groves, springs pools and lagoons, rock outcrops and caves and sinkholes. He argues that Aboriginal cosmology is expressed via the natural landscape and sacred places were those which were directly related to the Dreaming. He says that these sacred sites typically are those which are remarkable or important physiographically such as caves, rocks and so on.

Given the potential for natural features to have been important places within an Aboriginal cosmological frame of reference, the survey has sought to identify outstanding natural features present in the study area. It is, however, noted that the landscape of the entire proposal area is expressed as an abundance of hills and ridges and that, therefore, high places are unlikely to standout as unusual or particularly significant.

Contact Sites

These sites are those which contain evidence of Aboriginal occupation during the period of early European settlement in a local area. Evidence of this period of 'contact' could potentially be Aboriginal flaked glass, burials with historic grave goods or markers, and debris from 'fringe camps' where Aborigines who were employed by, or traded with, the white community may have lived or camped. The most likely location for contact period occupation sites would be camp sites adjacent to permanent water, and located in

relative proximity to centres of European habitation such as towns and homesteads. The potential for such sites to be present in the proposal area is possible, however, considered to be unlikely given the location of impacts away from towns or homesteads.

2.3.3 Field Inspection – Methodology

The methodological approach adopted in this assessment attends particularly to location and relationality as a means of contextualising the material evidence of cultural practice across space. Given the nature of the physiography, different places within the region are likely to have been utilised for different purposes, and also by different categories of people. Landscape is more than a set of 'objective' topographic features. Landscapes are constructed out of cultural and social engagement; they are '... topographies of the social and cultural as much as they are physical contours' (David & Thomas 2008: 35). The conceptual approach to understanding landscape in this assessment is based on a concern with experience, occupation and bodily practice (*cf.* Thomas 2008: 305). The location of material evidence in different environmental and topographic contexts across the study area has the potential to be informative of different activities and social contexts. Landform and environmental elements, as measurable empirical space, will be employed methodologically to explore landuse, occupation and the nature of both recorded and unseen (ie subsurface) material evidence. Given the vast space encompassed by the study area, this methodology allows for the identification, at a fine level of spatial resolution, of elements representative of the patterns of social life and how these may vary over space.

The practical methodology for the field survey entailed a pedestrian traverse of a representative sample of the proposed activity areas. The field survey was aimed at locating Aboriginal objects. 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 (*cf.* Dunnell 1993; Shott 1995). 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, Landform Units are utilised as a framework of recording, analysis (*cf.* Wandsnider and Camilli 1992) and ultimately, the formulation of recommendations. The Landform Units variables recorded are described below.

Landform Unit Variables

Landscape variables utilised are conventional categories taken from the *Australian Soil and Land Survey Field Handbook* (McDonald *et al.* 1998): Landforms form the primary basis for defining survey unit boundaries.

The following landform variables were recorded:

Morphological type:

- Crest: - element that stands above all or almost all points in the adjacent terrain – smoothly convex upwards in downslope profile. The margin is at the limit of observed curvature.
- Simple slope: - element adjacent below crest or flat and adjacent above a flat or depression.
- Flat: - planar element, neither crest or depression and is level or very gently inclined.
- Open depression: - extends at same elevation or lower beyond locality where it is observed.

Slope class and value: Level: 0 - 1%.

- Very gentle: 1 - 3%.
- Gentle: 3 - 10%.
- Moderate: 10 - 32%.
- Steep: 32 - 56%.

Geology

The type of geology was recorded and as well the abundance of rock outcrop – *as defined below*. The level of visual interference from background quartz shatter was noted.

- No rock outcrop: - no bedrock exposed.
- Very slightly rocky: - <2% bedrock exposed.
- Slightly rocky: - 2-10% bedrock exposed.
- Rocky : - 10-20 % bedrock exposed.
- Very rocky: - 20-50% bedrock exposed.
- Rockland: - >50% bedrock exposed.

Soil

Soil type and depth was recorded. The potential for soil to contain subsurface archaeological deposit (based on depth) was recorded as Low, Moderate or High. This observation is based solely on the potential for soil to contain artefacts; it does not imply that artefacts will be present or absent.

Geomorphological processes

The following gradational categories were recorded:

- eroded
- eroded or aggraded
- aggraded

Geomorphological agents

The following geomorphological agents were recorded:

- gravity: *collapse or particle fall*
- precipitation: *creep; landslide; sheet flow*
- stream flow: *channelled or unchannelled*

- wind
- biological: *human; nonhuman*

Survey coverage variables were also recorded; these are described further below.

Aboriginal Object Recording

For the purposes of defining the artefact distribution in space it has been labelled as a locale (eg. Landform Unit 1/Locale 1). The measurable area in which artefacts are observed has been noted and if relevant, a broader area encompassing both visible and predicted subsurface artefacts has been defined. In addition, locale specific assessments of survey coverage variables have been made. The prior disturbance to the locale has been noted. Artefact numbers in each locale have been recorded and a prediction of artefact density noted, based on observed density taking into consideration Effective Survey Coverage, and a consideration of environmental context.

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 test 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 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 survey coverage variables estimated during the survey are defined as follows:

- *Ground Exposure* – an estimate of the total area inspected which contained exposures of bare ground; and
- *Archaeology Visibility* – an estimate of the average levels of potential archaeological surface visibility within those exposures of bare ground. Archaeological visibility is generally less than ground exposure as it is dependent on adequate breaching of the bare ground surface which provides a view of the subsurface soil context. Based on subsurface test excavation results conducted in a range of different soil types across New South Wales it is understood that artefacts are primarily situated within 10 - 30 cm of the ground profile; reasonable archaeological visibility therefore requires breaching of the ground surface to at least a depth of 10 cm.

Based on the two visibility variables as defined above, an estimate (Net Effective Exposure) of the archaeological potential of exposure area within a survey unit has been calculated. The Effective Survey Coverage (ESC) calculation is a percentage estimate of the proportion of the Survey Unit which provided the potential to view archaeological material.

The data collected forms the basis for the documentation of survey results outlined in the section below.

2.3.4 Field Inspection – Results

The survey results are described below. The location of Landform Unit areas and Aboriginal object and historic item site recordings are shown in Appendix 4.

Survey Coverage

During the field assessment, the wind farm and much of the *Preferred* transmission line subject areas were found to have undergone relatively high levels of prior disturbance associated with agriculture. Original land clearance and subsequent farming practices, including follow-up clearance (for example, Plate 11), have impacted the entire proposal area. These impacts include, amongst others, cultivation, fencing (Plate 12), dam construction (Plate 13), and grazing by hard hoofed animals. Because of the excessively rocky nature of the basalt country, many properties have been graded for the purposes of removing cobbles from the paddocks (Plate 14). Graded water diversion channels are also common. These features act to control water flow across crests and slopes to mitigate erosion and/or direct runoff into dams. Graded tracks are common for providing access within properties. Previous farming practices are assessed to have caused reasonably high levels of impact to ground surfaces and to any Aboriginal objects which may once have been present.

Plate 11 Landform Unit 6 looking 155°; note example of piles of pushed up timber frequently encountered illustrating disturbance to ground surfaces.

Plate 12 An example of recently graded fence line depicting disturbance and types of ground exposure encountered; Landform Unit 22 looking south.

Plate 13 Dam in Landform Unit 7 exemplifying both disturbance and good ground exposure and archaeological visibility.

Plate 14 Piles of graded cobbles in Landform Unit 23 looking west.

A total of 170 kilometres of linear impact areas including proposed turbine ridge alignments, access tracks, electrical connections, other components (substations, compounds etc) and the majority of the *Preferred* transmission line route were surveyed during the field work; the area actually inspected measures c. 847 hectares (Table 1). Ground exposures inspected are estimated to measure 23 hectares in area. Of that ground exposure area, archaeological visibility (the potential artefact bearing soil profile) is estimated to have been seven hectares. Effective Survey Coverage is calculated to have been 0.9%.

Generally, ground exposure was uniformly low across both the wind farm and transmission line subject areas. As a result of two previous years of good rain, ground surfaces were well covered with pasture, albeit much of which was heavily grazed and/or dead or dying. Ground exposures included grader scraps, animal and vehicle tracks, bare earth patches, dams, excavated contour channels for water diversion, wombat holes and pads, and so on. Archaeological visibility within many areas of ground exposure was low because the ground surface had not been sufficiently breached to expose the potential artefact bearing soil layer. Nevertheless, in many instances, while isolated, numerous large areas of exposure with good archaeological visibility were encountered and normally found to be totally devoid of artefacts. When artefacts were recorded, their numbers also indicated a very low density distribution.

In summary, while Effective Survey Coverage was low, it is nevertheless concluded that the areas of exposure and visibility which were inspected were adequate in size to allow for a reasonably accurate assessment of artefact presence and density.

The trees in the proposal area and its surrounds are predominately regrowth, likely to be around 50 years old (or less). All trees located within areas of direct impact were inspected during the survey. While scars were frequently encountered, there was no

evidence of Aboriginal scarring on any trees, and given their estimated age, none were expected.

A total of 170 kilometres of linear impact areas have been surveyed. This represents approximately 56% of turbine alignments (including turbine sites, access tracks, underground electrical), other access tracks and infrastructure, and the *Preferred* Transmission Line. Given the small number of site recordings, despite surveying enormous areas of land, and the predictions of generally low archaeological and cultural sensitivity, a total survey was not considered to be warranted. However, the survey results can be reasonably confidently extrapolated to any unsurveyed areas (see Landform Unit descriptions below and Table 2), and it is concluded that the proposed wind farm subject area is generally of low archaeological and cultural potential and sensitivity. The majority of internal overhead electricity lines have not been surveyed. At this time, the location of individual power poles is not known. The impact areas in which they would be constructed are steep, simple slope landforms, with either very low or negligible archaeological potential.

Two route options are currently under consideration for the proposed transmission line, only one of which was surveyed during the field assessment. Because of access issues to many areas, the *Alternative* option (west route) was unable to be surveyed. Accordingly, the *Preferred* option (east route) was subject to a comprehensive survey. A total of 38 kilometres was surveyed along the route of the *Preferred* option. It traverses landforms which are assessed to be generally of low heritage potential. However, the sandstone country in the southern end is a sensitive landscape with its potential host rock shelters and open grinding groove sites.

Table 1 Survey coverage variables.

Landform unit	Length (metres)	Area (L x 50m)	Ground exposure %	Ground exposure sq m	Archaeological visibility %	Archaeological visibility sq m	Effective Survey Coverage
LU1	10418	520900	1	5209	20	1041.8	0.2
LU2	6053	302650	2	6053	20	1210.6	0.4
LU3	1492	74600	2	1492	20	298.4	0.4
LU5	3903	195150	2	3903	20	780.6	0.4
LU6	13169	658450	3	19753.5	40	7901.4	1.2
LU7	10828	541400	3	16242	30	4872.6	0.9
LU8	1716	85800	1	858	20	171.6	0.2
LU9	2288	114400	1	1144	20	228.8	0.2
LU10	1882	94100	2	1882	20	376.4	0.4
LU11	2824	141200	1	1412	20	282.4	0.2
LU12	3123	156150	3	4684.5	40	1873.8	1.2
LU15	8817	440850	1	4408.5	20	881.7	0.2
LU16	3356	167800	2	3356	20	671.2	0.4
LU17	2443	122150	1	1221.5	20	244.3	0.2
LU18	5425	271250	1	2712.5	20	542.5	0.2
LU19	1373	68650	1	686.5	20	137.3	0.2
LU22	7628	381400	5	19070	60	11442	3
LU23	1648	82400	5	4120	30	1236	1.5

Landform unit	Length (metres)	Area (L x 50m)	Ground exposure %	Ground exposure sq m	Archaeological visibility %	Archaeological visibility sq m	Effective Survey Coverage
LU24	516	25800	10	2580	30	774	3
LU26	13664	683200	5	34160	60	20496	3
LU27	3339	166950	5	8347.5	60	5008.5	3
LU28	13888	694400	1	6944	20	1388.8	0.2
LU29	1152	57600	1	576	20	115.2	0.2
LU30	6276	313800	1	3138	20	627.6	0.2
LU31	1547	77350	1	773.5	20	154.7	0.2
LU32	1560	78000	5	3900	60	2340	3
TLLU1	16551	827550	2	16551	20	3310.2	0.4
TLLU2	22572	1128600	5	56430	20	11286	1
Total	169451	8472550		231608		79694.4	0.940619

Each landform unit in which impacts are proposed is described in detail below.

Landform Unit 1 (LU1)

LU1 is a long ridge crest which extends from LU2, south-southwesterly between Coolaburragundy River and Turee Creek (Plate 15). The landform is generally gently undulating with wide flat plateau like expanses, interspersed by minor knolls and saddles. The crest measures c. 100 metres wide of average, but with significant variability, with saddles being narrow and other areas being much wider ie c. 200-300 metres. The geology is basalt which outcrops as surface cobbles scattered at varying densities, increasing in frequency to edges of the landform (ie the break of slope). Some occasional bedrock is present usually on knolls or elevated rises. The soil is dark brown basaltic derived loam. The vegetation is sparse Eucalypts, some Kurrajong, native and pasture grasses, tussock, thistle and other assorted weeds. There is no evidence of water sources such as springs. This LU was inspected on foot with people spread out across the width of the crest. There is very little ground exposure on the crest which was usually limited to occasional vehicle and animal tracks, bare earth patches under trees associated with animal (pigs) disturbance and other minor areas of bare ground. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses, tussocks and weeds and apparently low levels of breaching of the ground surface.

Plate 15 Landform Unit 1 at northern end looking 210°.

Landform Unit 2 (LU2)

LU2 is a long ridge crest which extends from Coolah Tops, westward along the southern side of the Coolaburragundy River (Plate 2). The landform is generally flat/very gently undulating with flat plateau areas and knolls. The crest measures c. 100 metres wide of average. This landform has for the most part undergone high levels of prior disturbance. Significant disturbance has been incurred through the construction of the existing road, which has been cut, benched, graded, drained and had road base applied. Graded contour drainage channels for erosion control and/or water diversion are present. As well, numerous former, old roads/track features are evident. An underground Telstra cable traverses the southern side of the crest. In summary, the ground surface is highly disturbed with a corresponding implication for the integrity or otherwise of the archaeological deposit. There is a high likelihood that large flat expanses have had surface cobbles mechanically removed, probably to the edges of the landform which they now occur in abundance. The area is currently used for grazing cattle and the road to the Coolah Tops National Park runs along the landform. The geology is basalt which outcrops as surface cobbles scattered at varying densities, increasing in frequency on most narrow sections of crest and knolls. The soil is dark brown basaltic derived loam. The vegetation is sparse Eucalypts, some Kurrajong, native grasses, tussock (thick in some areas), thistle and other assorted weeds. There is no evidence of water sources such as springs and all drainage is first order streams which would not hold water at any time. This LU was inspected on foot with people spread out across the width of the crest. There is very little ground exposure which was usually limited to patches of bare earth associated with localised agricultural disturbance, animal tracks, the edge of road cutting, bare earth patches under trees. The impediment to archaeological visibility was a consistent ground cover of grasses, tussocks and weeds.

Plate 16 Landform Unit 2 looking 190° in the western section.

Landform Unit 3 (LU3)

LU3 is a spur crest which extends from the ridge landform of LU1, south-easterly to the valley of Turee Creek (Plate 17). The landform is gently undulating and the crest is relatively wide. The geology is basalt. The landform is cleared and used for grazing. The landform is comparable to others such as LU5 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Plate 17 Landform Unit 3 in middle distance; photo taken from SU1 looking 120°.

Landform Unit 4 (LU4)

LU4 is a spur crest which extends from the ridge landform of SU1, south to the valley of Turee Creek (Plate 18). The landform is gently undulating and the crest is relatively wide. The geology is basalt. The landform is cleared and used for grazing. The landform is comparable to others such as LU5 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Plate 18 Landform Unit 4 in middle distance; photo taken from LU5 looking 120°.

Landform Unit 5 (LU5)

LU5 is a spur crest which extends from the ridge landform of LU1 south to the valley of Turee Creek (Plate 19). The landform is gently undulating as a series of relatively flat benches. The crest measures between c. 50 and 100 metres wide. The geology is basalt which outcrops as surface cobbles scattered at varying densities and being rocky at breaks of slope and on knolls. The soil is dark brown basaltic derived loam. The vegetation is comprised of scattered Eucalypts and pasture grasses, with occasional relatively thick stands of Eucalypt regrowth. There is no evidence of water sources such as springs. This LU was inspected on foot with people spread out across the crest. There was very little ground exposure which was limited to occasional animal tracks, bare earth patches under trees, dams and other minor areas of bare ground. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and apparently low levels of breaching of the ground surface.

Plate 19 Landform Unit 5 looking 180°.

Landform Unit 6 (LU6)

LU6 is a western arm of a long ridge crest which extends from LU2, south-southwesterly between Coolaburragundy River and Turee Creek (Plate 20). The landform is very gently undulating with wide flat plateau like expanses, interspersed by minor knolls and saddles. The crest measures c. 200 metres wide of average, although some areas are narrower. The geology is basalt which outcrops as surface cobbles scattered at varying densities. Large bedrock pavements are exposed in numerous areas. The soil is dark brown basaltic derived loam. The vegetation is sparse Eucalypts, some Kurrajong, native and pasture grasses. There is no evidence of water sources such as springs. There are high levels of disturbance with extensive evidence of trees and rocks having been graded into piles and large holes where trees have been bulldozed from the ground. Water diversion channels which direct water to dams occur across the crest. The majority of this LU was inspected on foot (as mapped in Appendix 4). Ground exposure was usually limited to occasional vehicle and animal tracks, bare earth patches and other areas of bare ground, in particular areas which are now exposed bedrock pavement. Where bedrock pavements occur, archaeological visibility is high. Generally, however, the impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and apparently low levels of breaching of the ground surface.

Landform Unit 6a (LU6a) *not surveyed*

LU6a is a simple slope which extends from the ridge landform of SU6, eastward to the valley of Turee Creek. The landform is of moderate to gentle gradient. The geology is basalt. The landform is cleared and used for grazing and traversed by an existing track. On the lower slope, the area is grossly disturbed by tracks and agricultural activities. The landform is assessed to be of very low cultural and archaeological potential.

Plate 20 Landform Unit 6 looking 200°. Note exposure in sheep tracks.

Landform Unit 7 (LU7)

LU7 is a ridge/watershed crest of the Warrumbungle Range which extends from LU2, north and north-westerly (Plate 21). The landform is gently undulating (and occasional moderate gradient slopes) with wide flat plateau like expanses, interspersed by minor rocky knolls and saddles. The crest measures c. >200 metres wide of average, although some areas are narrower. The geology is basalt which outcrops as surface cobbles scattered at varying densities. Bedrock platforms are exposed in numerous areas. The soil is dark brown basaltic derived loam. The vegetation is comprised of Eucalypts, which is places are relatively thick regrowth, tussocks, native and pasture grasses. There is no evidence of water sources such as springs. The landform drops away to the north very steeply to the Liverpool Plains and some areas provide spectacular views to the north. This SU was inspected on foot. There is very little ground exposure which was usually limited to occasional vehicle and animal tracks and burrows, bare earth patches and other areas of bare ground. Where bedrock platforms occur (some of which are extensive), exposure and archaeological visibility is high. Generally, however, the impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and low levels of breaching of the ground surface.

Landform Unit 7a (LU7a) *not surveyed*

LU7a is an upper slope/crest landform of the Warrumbungle Range. The landform is of gentle gradient. The geology is basalt. The landform is cleared and used for grazing. The landform is comparable to others such as LU8 which has been surveyed and is assessed to be of low cultural and archaeological potential.

Plate 21 Landform Unit 7.

Landform Unit 8 (LU8)

LU8 is a series of upper slopes of gentle gradient on the southern side of the Warrumbungle Range (Plate 22). The geology is basalt which outcrops as surface cobbles scattered at varying densities and the soil is dark brown basaltic derived loam. The vegetation is comprised of pasture. There is no evidence of water sources such as springs. The area has been cleared and trees are bulldozed into piles. The area is disturbed. This LU was inspected on foot. There was very little ground exposure which was limited to occasional animal tracks and minor areas of bare ground. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and apparently low levels of breaching of the ground surface.

Plate 22 Landform Unit 8 looking 240°.

Landform Unit 9 (LU9)

LU9 is a part of the ridge/watershed crest of the Warrumbungle Range (Plate 23). The landform is moderately undulating. The geology is basalt which outcrops as surface cobbles scattered at varying densities, but is generally, very rocky. The soil is dark brown basaltic derived loam. The vegetation is comprised of Eucalypts, which in places are relatively thick regrowth, tussocks, native and pasture grasses. There is no evidence of water sources such as springs. The landform drops away to the north very steeply to the Liverpool Plains. This SU was inspected on foot. There is very little ground exposure which was limited to vehicle and animal tracks, bare earth patches and other areas of bare ground. Generally, the impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and low levels of breaching of the ground surface.

Plate 23 Landform Unit 9; note abundant cobbles.

Landform Unit 10 (LU10)

LU10 is a series of upper slopes of very gentle to gentle gradient which fall southward from the ridge/watershed crest of the Warrumbungle Range (Plate 24). The geology is basalt which outcrops as surface cobbles scattered at varying densities and the soil is dark brown basaltic derived loam. The vegetation is comprised primarily of pasture and native grasses/tussocks. There is a spring near this LU which would have provided Aboriginal land users with potable water. This LU was inspected on foot. There was very little ground exposure which was limited to a vehicle track and minor areas of bare ground. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and apparently low levels of breaching of the ground surface.

Plate 24 Landform Unit 10 looking 260°.

Landform Unit 11 (LU11)

LU11 is a spur crest which extends from the ridge/watershed crest of the Warrumbungle Range (Plate 25). The landform is gently undulating. It is a broad and plateau like crest, c. c. 200 metres wide. The geology is basalt which outcrops as surface cobbles scattered at relatively low density. The soil is dark brown basaltic derived loam. The vegetation is comprised of scattered Eucalypts, pasture and native grasses. There is no evidence of water sources such as springs. This LU was inspected on foot with people spread out across the crest. There was very little ground exposure which was limited to occasional animal tracks, bare earth patches under trees, a dam and other minor areas of bare ground. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and low levels of breaching of the ground surface.

Plate 25 Landform Unit 11 looking 330°.

Landform Unit 12 (LU12)

LU12 is a ridge crest which extends from the ridge/watershed crest of the Warrumbungle Range south-westerly to the valley of Coolaburragundy River (Plate 26). The landform is gently undulating with occasional moderate gradient slopes. The landform is broad (c. 200-300m wide) and plateau like crest at the northern end, but narrows significantly as it descends towards the valley. The geology is basalt which outcrops as surface cobbles and occasional bedrock pavements. The soil is dark brown basaltic derived loam. The vegetation is comprised of scattered Eucalypts, pasture and native grasses. There is no evidence of water sources such as springs. This LU was inspected on foot with people spread out across the crest. Ground exposure included a vehicle track, occasional animal tracks, bare earth patches under trees, and other minor areas of bare ground. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and apparently low levels of breaching of the ground surface.

Plate 26 Landform Unit 12.

Landform Unit 13 (LU13)

LU13 is a ridge crest which extends from the ridge/watershed crest of the Warrumbungle Range south-westerly to the valley of Coolaburragundy River (Plate 27). The landform is gently undulating with occasional moderate gradient slopes. The landform is broad (c. 200-300m wide) and plateau like crest at the northern end, but narrows significantly as it descends towards the valley. The landform is comparable to others such as LU12 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Plate 27 Landform Unit 13 in middle distance looking 300°.

Landform Unit 14 (LU14)
LU14 is a ridge crest which extends from the ridge/watershed crest of the Warrumbungle Range south-westerly to the valley of Coolaburragundy River. The landform is gently undulating. The landform is comparable to others such as LU12 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 15 (LU15)
LU15 is a long ridge crest which extends from the plateau of the Coolah Tops, south-southwesterly on the eastern side of Turee Creek (Plate 28). The landform is very gently undulating with wide flat plateau like expanses, interspersed with occasional minor rocky knolls. The crest measures c. 150 metres wide, with some areas being much wider ie c. 200-300 metres. The geology is basalt which outcrops as surface cobbles scattered at varying densities, increasing in frequency to edges of the landform (ie the break of slope). The soil is dark brown basaltic derived loam. The vegetation is comprised of scattered Eucalypts, rare Kurrajongs, pasture grasses and some thistle. There is no evidence of water sources such as springs. The majority of this LU was inspected on foot (as mapped in Appendix 4). At the northern end, an existing access track which would be used in the proposal, was not surveyed. There was very little ground exposure which was limited to occasional vehicle and animal tracks, wombat burrows, bare earth patches under trees, dams and other minor areas of bare ground. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and apparently low levels of breaching of the ground surface.

Landform Unit 15a (LU15a) *not surveyed*
LU15a is a spur crest which extends from the ridge landform of SU15. The landform is gently undulating and the crest is relatively wide. The geology is basalt. The landform is cleared and used for grazing. The landform is comparable to other spur crests which have been surveyed and is assessed to be of very low cultural and archaeological potential.

Plate 28 Landform Unit 15 looking south.

Landform Unit 16 (LU16)

LU16 is a spur crest which extends from the ridge landform of SU15 west and then south-westerly to the valley of Turee Creek (Plate 29). The landform is gently undulating as a series of benches. The crest measures c. between 50 and 100 metres wide. The geology is basalt which outcrops as surface cobbles scattered at varying densities and being very rocky at breaks of slope and on knolls. The soil is dark brown basaltic derived loam. The vegetation is comprised of scattered Eucalypts, rare Kurrajongs, wattle, pasture grasses and some thistle. There is no evidence of water sources such as springs. This LU was inspected on foot with people spread out across the crest. There was very little ground exposure which was limited to occasional vehicle and animal tracks, bare earth patches under trees, dams and other minor areas of bare ground. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and apparently low levels of breaching of the ground surface.

Plate 29 Landform Unit 16 looking 230°; note rocky outcrop.

Landform Unit 17 (LU17)

LU17 is a ridge crest which extends to the west from the Warrumbungle Range (Plate 30). The landform is generally very gently undulating with flat plateau areas and knolls. The crest measures c. >300 metres wide. The area is grassed and currently used for grazing cattle. The geology is basalt which outcrops as sparse surface cobbles. The soil is dark brown basaltic derived loam. The vegetation is sparse Eucalypts, some Kurrajong, pasture and native grasses and tussock (thick in some areas). The ground surface of the landform is disturbed from previous impacts including grading of water diversion contour lines and grading of rocks into piles. A first order stream which drains to the south has springs in it and these are likely to have been used by Aboriginal land users. This LU was inspected on foot with people spread out across the width of the crest. There is very little ground exposure on the crest which was usually limited to patches of bare earth associated with localised agricultural disturbance, animal tracks and bare earth patches under trees. The impediment to archaeological visibility was a consistent ground cover of grasses, tussocks and weeds.

Landform Unit 17a (LU17a) *not surveyed*

LU17a is a spur crest which extends from the ridge landform of SU17. The landform is very gently undulating and the crest is relatively wide. The geology is basalt. The landform is cleared and used for grazing. The landform is comparable to other spur crests which have been surveyed and is assessed to be of very low cultural and archaeological potential.

Plate 30 Landform Unit 17 looking 260°. Note the Oakey trig in the background.

Landform Unit 18 (LU18)

LU18 is a narrow, undulating ridge crest which extends south-southwesterly as an extension of the LU17 ridge (Plate 31). The landform is gently undulating (with occasional moderate gradients) as a series of minor rocky knolls and undulating saddles. The crest is generally narrow and measures c. 50 metres wide. The geology is basalt which outcrops as surface cobbles scattered at varying densities, increasing in frequency on elevated knolls; some bedrock pavements occur. The soil is dark brown basaltic derived loam. The vegetation is comprised of thick stands of trees, scattered Eucalypts, Kurrajongs, pasture and native grasses. There is no evidence of water sources such as springs. The ground surface of the crest is disturbed by mechanical grading for vehicle access, fencing and general clearing. This SU was inspected on foot with people spread out across the crest. Ground exposure consisted of vehicle and animal tracks, bare earth patches under trees, and other minor areas of bare ground.

Plate 31 Landform Unit 18 looking south.

Landform Unit 19 (LU19)

LU19 is a spur crest which extends from the ridge landform of SU18, south to the valley of Gundare Creek (Plate 32). The landform is very gently undulating as a series of benches. The crest measures c. 100 metres wide. The geology is basalt which outcrops as surface cobbles scattered at varying densities. The soil is dark brown basaltic derived loam. The vegetation is comprised of stands of regrowth and scattered Eucalypts, Kurrajongs, pasture and native grasses. There is no evidence of water sources such as springs. This LU was inspected on foot with people spread out across the crest. There was very little ground exposure. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and apparently low levels of breaching of the ground surface.

Plate 32 Landform Unit 19 looking 200°.

Landform Unit 20 (LU20)
LU20 is a spur crest which extends from the ridge landform of LU18, south-easterly to the valley of Gundare Creek. The landform is gently undulating. The crest is relatively wide. The geology is basalt. The landform is cleared and used for grazing. The landform is comparable to others such as LU19 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 21 (LU21)
LU21 is a simple slope which extends from the crest landform of LU20, easterly, to the valley of Gundare Creek. The landform is cleared and used for grazing. The landform is comparable to others in the project area, such as LU23, which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 22 (LU22)
LU22 is a long ridge crest which extends from the Warrumbungle Range, south-southwesterly on the western side of Gundare Creek to the Coolaburragundy River (Plate 33). The landform is gently undulating (with occasional moderate gradients) as a series of minor rocky knolls and undulating saddles. The crest is narrow and measures c. 30 metres wide, with occasional wider knolls. The geology is basalt which outcrops as surface cobbles scattered at varying densities, increasing in frequency on elevated knolls; some bedrock pavements occur. The soil is dark brown basaltic derived loam. The vegetation is comprised of scattered Eucalypts, Kurrajongs, pasture and native grasses. There is no evidence of water sources such as springs. The ground surface of the crest is highly disturbed by mechanical grading for vehicle access, fencings and general clearing. The majority of this LU was inspected on foot (southern end), as mapped in Appendix 4, with people spread out across the crest. Ground exposure was relatively high and consisted of occasional vehicle and animal tracks, recently graded fence lines, bare earth patches under trees, and other minor areas of bare ground.

Plate 33 Landform Unit 22 looking 240° from near north end.

Landform Unit 22a (LU22a) *not surveyed*
LU22a is a moderate gradient simple slope which extends from the crest landform of LU20, easterly, to the valley of Diana Creek. The landform is cleared and used for grazing. The landform is comparable to others in the project area, such as LU23, which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 22b (LU22b) *not surveyed*
LU22b is a flat in the valley of Diana Creek. The landform is cleared and used for grazing. The landform is comparable to others in the project area, such as LU24, which has been surveyed and assessed to be of low cultural and archaeological potential.

Landform Unit 23 (LU23)
LU23 is a gentle gradient simple slope which extends from the ridge landform of SU22, west to the valley of Gundare Creek (Plate 1). The geology is basalt which outcrops as sparse surface cobbles. The soil is dark brown basaltic derived loam. The vegetation is comprised of pasture grasses and a failed Lucerne crop. The ground surface of the landform has been significantly impacted by various prior works including the construction of deep, wide erosion control contour channels, grading of cobbles into piles and cultivation. This LU was inspected on foot with people spread out across the slope. Ground exposure was relatively high.

Plate 34 Landform Unit 23 looking 290°.

Landform Unit 24 (LU24)
LU24 is a flat/basal slope landform, situated on the west side of Gundare Creek (Plate 35). The underlying geology is basalt and the soils are colluvial/alluvial deep loam. The landform is cleared and used for cultivation. At the time of survey, the landform was lying fallow. Ground exposure was high as bare, crop-free earth. Given the high exposure and absence of recordings, the landform is assessed to be of low archaeological potential.

Plate 35 Landform Unit 24 looking west.

Landform Unit 25 (LU25)

LU25 is a simple slope which extends from the ridge landform of LU22, westerly, to the valley of Gundare Creek. The landform is cleared and used for grazing. The landform is comparable to others in the project area, such as LU23, which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 26 (LU26)

LU26 is a narrow ridge crest which extends southward as an extension of SU27 (Plate 36). The landform is generally gently undulating (with some moderate gradients) and measures c. 30 metres wide on average. The geology is basalt which outcrops as surface cobbles scattered at varying densities, but is generally very rocky. The soil is dark brown basaltic derived loam. The vegetation is comprised of thick stands of regrowth Eucalypts, occasional Kurrajongs, pasture and native grasses. The northern end is mostly treed (regrowth), while the southern end gives way to cleared land and pasture. There is no evidence of water sources such as springs. The land is used for grazing. Prior ground disturbance is relatively high. A recently graded track traverses the length of the northern end of the LU. This LU was inspected on foot with people spread out across the crest. Ground exposure included a graded vehicle track, animal tracks, bare earth patches and other minor areas of bare ground. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and generally low levels of breaching of the ground surface. However, discrete areas of disturbance such as the graded vehicle track provided large expanses of exposure and good archaeological visibility.

Landform Unit 26a (LU26a) *not surveyed*

LU26a is a simple slope which extends from the ridge landform of LU26, easterly, to the valley of Norfolk Island Creek. The landform is cleared and used for grazing. The landform is comparable to others in the project area which have been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 26b (LU26b) *not surveyed*
LU26b is a series of steep simple slopes which extend on either side of the ridge landform of LU26. The landform is cleared and used for grazing. The landform is comparable to others in the project area which have been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 26c (LU26c) *not surveyed*
LU26a is a lower slope/flat landform. The landform is cleared and used for grazing. The landform is comparable to others in the project area which have been surveyed and assessed to be low cultural and archaeological potential. However, there is some uncertainty in regard to this area, and it would to be subject to survey prior to impacts.

Plate 36 Landform Unit 26 looking south.

Landform Unit 27 (LU27)
LU27 is a broad ridge crest which extends south-westerly from the ridge landform of SU15 which is an extension of the Coolah Tops plateau (Plate 37). LU27 is gently undulating and measures c. 250 metres wide. It is one of two long ridges that extend southward between Turee and Norfolk Island Creeks. The geology is basalt which outcrops as surface cobbles scattered at varying densities. Some minor occurrences of inter-bedded sediment rock was also observed. The soil is dark brown basaltic derived loam. The vegetation is comprised of thick stands of regrowth Eucalypts, occasional Kurrajongs, pasture and native grasses. There is no evidence of water sources such as springs. The land is used for grazing and at the time of survey was covered with thick, short, well grazed pasture. Prior ground disturbance from clearing and agricultural activities is relatively high. The ground surface is very uneven where trees have been bulldozed. This LU was inspected on foot with people spread out across the crest. Ground exposure was limited to a graded vehicle track, animal tracks and burrows, bare earth patches, dams and other minor areas of bare ground. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and apparently low levels of breaching of the ground surface. However, discrete areas of disturbance such as

the shallowly graded vehicle track and the dam, provided large expanses of exposure and good archaeological visibility.

Plate 37 Landform Unit 27 looking 190°.

Landform Unit 27a (LU27a) *not surveyed*
LU27a is a moderate/steep gradient simple slopes. The landform is cleared and used for grazing. The landform is comparable to others in the project area which have been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 28 (LU28)
LU28 is a broad ridge crest which extends south-south-westerly from the Coolah Tops plateau (Plate 38). LU28 is gently undulating and measures c. 200 metres wide. It is one of two long ridges that extend southward between Turee and Norfolk Island Creeks. The geology is basalt which outcrops as surface cobbles scattered at varying densities. The soil is dark brown basaltic derived loam. The vegetation is comprised of scattered stands of regrowth Eucalypts, occasional Kurrajongs, pasture and native grasses. There is no evidence of water sources such as springs. The land is used for grazing and at the time of survey was covered with thick, short, well grazed pasture. Prior ground disturbance from clearing and agricultural activities is relatively high. This LU was inspected on foot with people spread out across the crest. Ground exposure was limited to animal tracks and burrows, bare earth patches and other minor areas of bare ground. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and apparently low levels of breaching of the ground surface. However, discrete areas of disturbance provided reasonably large expanses of exposure and good archaeological visibility.

Landform Unit 28a (LU28a) *not surveyed*
LU23a is a moderate gradient, spur crest/simple slope which extends from the ridge landform of LU28, westerly, to the valley of Turee Creek. The landform is cleared with some regrowth and is used for grazing. The landform is comparable to others in the

project area which have been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 28b (LU28b) *not surveyed*
LU28b is a lower slope/flat landform. The landform is cleared and used for grazing. The landform is comparable to others in the project area which have been surveyed and assessed to be low cultural and archaeological potential.

Landform Unit 28c (LU28c) *not surveyed*
LU23c is a moderate gradient, spur crest/simple slope which extends from the ridge landform of LU28, easterly, to the valley of Starkey's Creek. The landform is cleared with some regrowth and is used for grazing. The landform is comparable to others in the project area which have been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 28d (LU28d) *not surveyed*
LU28d is a lower slope/flat landform. The landform is cleared and used for grazing. The landform is comparable to others in the project area which have been surveyed and assessed to be low cultural and archaeological potential. However, there is some uncertainty in regard to this area, and it would to be subject to survey prior to impacts.


Plate 38 Landform Unit 28 looking south.

Landform Unit 29 (LU29)
LU29 is a gentle gradient simple slope which falls from a ridge landform east to Four Mile Creek (Plate 39). The geology is basalt which outcrops as surface cobbles. The soil is dark brown basaltic derived loam. The vegetation is comprised of pasture grasses. The ground surface of the landform has been significantly impacted by various prior works including the grading of cobbles into piles and cultivation. This LU was inspected on foot with people spread out across the slope. Ground exposure was relatively low.

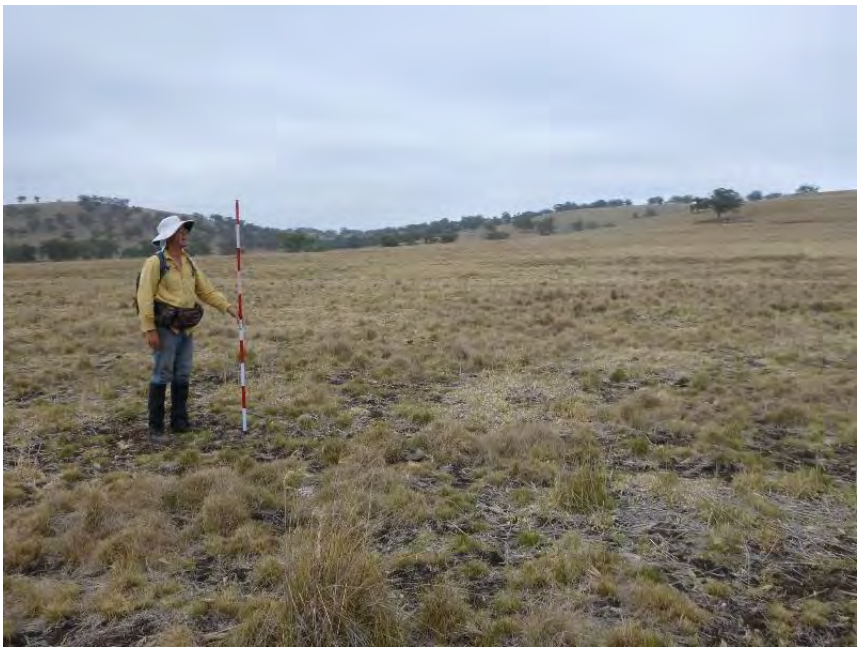

Plate 39 Landform Unit 29 looking 220°.

Landform Unit 30 (LU30)

LU30 is part of the southern end a long ridge crest which extends from the plateau of the Coolah Tops, south-southwesterly between Talbragar River and Four Mile Creek (Plate 40). The landform is very gently undulating with wide flat plateau like expanses, particularly at its northern end. The crest measures c. 150 metres wide on average, with some areas being much wider ie c. 200-300 metres. The geology is basalt which outcrops as surface cobbles scattered at varying densities. The soil is dark brown basaltic derived loam. The vegetation is comprised of scattered Eucalypts, Kurrajongs, pasture and native grasses. There is no evidence of water sources such as springs. This SU was inspected on foot with people spread out across the crest. There was very little ground exposure which was limited to occasional vehicle and animal tracks, bare earth patches under trees and other minor areas of bare ground. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and apparently low levels of breaching of the ground surface. The landform is significantly disturbed by grading cobbles into piles and clearance for a landing strip.

Landform Unit 30a (LU30a) *not surveyed*

LU30a is a moderate gradient, spur crest/simple slope which extends from the ridge landform of LU30, easterly, to the valley of Four Mile Creek. The landform is cleared and is used for grazing; a graded farm track traverses the proposed impact area. The landform is comparable to others in the project area which have been surveyed and assessed to be of very low cultural and archaeological potential.

Plate 40 Landform Unit 30 looking south.

Landform Unit 31 (LU31)

LU31 is a gentle gradient spur crest/simple slope which falls from a ridge landform. The geology is basalt which outcrops as surface cobbles. The soil is dark brown basaltic derived loam. The vegetation is comprised of pasture grasses. The ground surface of the landform has been impacted by various prior works including the grading of cobbles into piles. This LU was inspected on foot with people spread out across the slope. Ground exposure was relatively low.

Landform Unit 32 (LU32)

LU32 is a spur crest which extends from the ridge landform of SU30 east to the valley of Four Mile Creek (Plate 41). The landform is very gently undulating. The crest measures c. 100 metres wide. The geology is basalt which outcrops as surface cobbles and large areas of broken pavement (rockland). The soil is dark brown basaltic derived loam. The vegetation is comprised of stands of regrowth and scattered Eucalypts and native grasses. There is no evidence of water sources such as springs. This LU was inspected on foot with people spread out across the crest. The landform is generally highly disturbed by graded tracks and contours. Ground exposure was moderate in places, however, overall, the impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and generally low levels of breaching of the ground surface.

Plate 41 Landform Unit 32 looking 110°.

Landform Unit 33 (LU33)
LU33 is a ridge crest which extends south between minor creeklines in the eastern section of the wind farm subject area. The landform is undulating and the crest is relatively narrow. The geology is basalt. The landform is cleared and used for grazing. The landform is comparable to others such as LU30 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 34 (LU34)
LU34 is a ridge crest which extends south between minor creeklines in the eastern section of the wind farm subject area. The landform is undulating and the crest is relatively narrow. The geology is basalt. The landform is cleared and used for grazing. The landform is comparable to others such as LU30 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 34a (LU34a) *not surveyed*
LU34a is a moderate/steep gradient simple slope which extends from the ridge landform of LU34, westerly. The landform is cleared and is used for grazing. The landform is comparable to others in the project area which have been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 35 (LU35)
LU35 is a ridge crest which extends south between minor creeklines in the eastern section of the wind farm subject area. The landform is undulating and the crest is relatively narrow. The geology is basalt. The landform is cleared and used for grazing. The landform is comparable to others such as LU30 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 35a (LU35a) *not surveyed*
LU35a is a lower slope landform. The landform is comparable to others in the project area which have been surveyed and assessed to be low cultural and archaeological potential. However, there is some uncertainty in regard to this area, and it would to be subject to survey prior to impacts.

Landform Unit 36 (LU36)
LU36 is a ridge crest which extends south between minor creeklines in the eastern section of the wind farm subject area. The landform is undulating and the crest is relatively narrow. The geology is basalt. The landform is cleared and used for grazing. The landform is comparable to others such as LU30 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 37 (LU37)
LU37 is a ridge crest which extends south between Talbragar River and Norfolk Island Creek. The landform is undulating and the crest is relatively narrow. The geology is basalt. The landform is cleared and used for grazing. The landform is comparable to others such as LU26 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 37a (LU37a) *not surveyed*
LU37a is comprised of moderate gradient simple slopes which extend on either side of the ridge landform of LU37. The landform is cleared and used for grazing. The landform is comparable to others in the project area which have been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 37b (LU37b) *not surveyed*
LU37b is a lower slope/flat landform. The landform is comparable to others in the project area which have been surveyed and assessed to be low cultural and archaeological potential. However, there is some uncertainty in regard to this area, and it would to be subject to survey prior to impacts.

Landform Unit 37c (LU37c) *not surveyed*
LU37c is a lower slope/flat landform. The landform is comparable to others in the project area which have been surveyed and assessed to be low cultural and archaeological potential. However, there is some uncertainty in regard to this area, and it would to be subject to survey prior to impacts.

Landform Unit 38 (LU38)
LU38 is a ridge crest which extends south between Talbragar River and Bounty Creek. The landform is undulating and the crest is relatively narrow. The geology is basalt. The landform is comparable to others which have been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 39 (LU39)
LU39 is a ridge crest which is undulating and relatively narrow. The geology is basalt. The landform is comparable to others which have been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 39a (LU39a) *not surveyed*
LU39a is a moderate/steep gradient simple slope which extends from the ridge landform of LU39, westerly. The landform is used for grazing. The landform is comparable to others in the project area which have been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 39b (LU39b) *not surveyed*
LU39b is a lower slope/flat landform. The landform is comparable to others in the project area which have been surveyed and assessed to be low cultural and archaeological potential. However, there is some uncertainty in regard to this area, and it would to be subject to survey prior to impacts.

Landform Unit 40 (LU40)
LU40 is a spur crest which extends from the ridge/watershed landform of LU8. The landform is gently undulating. The crest is relatively wide. The geology is basalt. The landform is cleared and used for grazing. The landform is comparable to others such as LU11 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 41 (LU41)
LU41 is a ridge/watershed crest of the Warrumbungle Range. The geology is basalt. The landform is comparable to SU7 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 41a (LU41a) *not surveyed*
LU41a is a spur crest which extends south from the major divide of LU41. The landform is cleared and used for grazing. The landform is comparable to others in the project area which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 42 (LU42)
LU42 is a narrow, undulating ridge crest. The landform is comparable to others such as LU22 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 42a (LU42a) *not surveyed*
LU42a is a narrow, undulating ridge crest. The landform is comparable to others such as LU22 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 42b (LU42b) *not surveyed*
LU42b is a steep gradient spur crest which extends east from LU41. The landform is cleared and used for grazing. The landform is comparable to others in the project area which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 42c (LU42c) *not surveyed*
LU42c is a lower slope/flat landform. The landform is comparable to others in the project area which have been surveyed and assessed to be low cultural and archaeological potential. However, there is some uncertainty in regard to this area, and it would to be subject to survey prior to impacts.

Landform Unit 42d (LU42d) *not surveyed*
LU42d is a moderate/steep gradient spur crest which extends southwesterly from LU42. The landform is cleared and used for grazing. The landform is comparable to others in the project area which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 42e (LU42e) *not surveyed*
LU42e is a lower slope/flat landform. The landform is comparable to others in the project area which have been surveyed and assessed to be low cultural and archaeological potential. However, there is some uncertainty in regard to this area, and it would to be subject to survey prior to impacts.

Landform Unit 43 (LU43)
LU43 is a ridge crest comparable to others such as LU6 which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 43a (LU43a) *not surveyed*
LU43a is a spur crest which extends westerly from LU43. The landform is cleared and used for grazing. The landform is comparable to others in the project area which has been surveyed and assessed to be of very low cultural and archaeological potential.

Landform Unit 43b (LU43b) *not surveyed*
LU43b is a series of steep simple slopes. The landform is comparable to others in the project area which has been surveyed and assessed to be of very low cultural and archaeological potential.

Transmission Line Landform Unit 1 (TL LU1)
TL LU1 traverses the proposed *Preferred* transmission line route and is comprised of a series of gently to very gently undulating simple slopes and crests of low local relief. The bedrock geology is basalt which outcrops as surface cobbles. The soil is dark brown basaltic derived loam. The vegetation is comprised of stands of regrowth and scattered Eucalypts, Kurrajongs, pasture and native grasses. Several higher order streams occur, such as Four Mile Creek, which would have provided a reasonably reliable source of water to Aboriginal land users. This LU was inspected on foot. The landform is generally highly disturbed by previous cultivation, grading of basalt cobbles, grazing and so on.

Ground exposure was generally low. The impediment to ground exposure and archaeological visibility was a consistent ground cover of grasses and generally low levels of breaching of the ground surface.

Transmission Line Landform 1a (TL L1a) *not surveyed*
TL L1a traverses the proposed *Alternate* transmission line route and is comprised of a series of gently to very gently undulating simple slopes and crests of low local relief. The bedrock geology is basalt which outcrops as surface cobbles. The landform is comparable to the TL LU1 (*Preferred* route) which has been surveyed and assessed to be of very low cultural and archaeological potential.

Transmission Line Landform Unit 2 (TL LU2)
TL LU2 traverses the proposed *Preferred* transmission line route and is comprised of a series of gently to very gently undulating simple slopes and crests of low local relief. This LU was inspected on foot. The bedrock geology is sandstone. While some areas are cleared, the majority of this LU is forested. Several higher order streams occur, including the headwaters of the Goulburn River. These would have provided a reasonably reliable source of water to Aboriginal land users. Ground exposure was generally low. The impediment to ground exposure and archaeological visibility was a consistent ground cover of vegetation, leaf litter, and so on, and generally low levels of breaching of the ground surface. Kuskie (2009) has characterised the sandstone country at Ulan as possessing low density stone artefact distribution, however, in addition, bedrock features and rock shelters have been assessed to be of high cultural and archaeological significance.

Much of this LU traverses country assessed previously for coal mine related development at Ulan and Moolarben, and a large number of previously recorded sites exist within or near the LU. Most of these have been subject to mine related impacts in accordance with relevant permits and so on. Those sites located within the alignment include artefact scatters #36-3-1138, #36-3-1139 (located immediately adjacent to Ulan Road) and 36-3-0709 (located at the Transgrid 330kV line). Several other artefact scatter sites are located near to the route in the southern area near Ulan and Moolarben and most of these have effectively been destroyed by previous impacts. AHIMS #36-3-203 is located near to, but outside the *Preferred* route (reference: AHIMS site card map). Further to the north along the *Preferred* route option, a tree with a scar, 36-3-0107, is near to, but away from the alignment, and also, a grinding groove site, 36-3-0107 (see below in results). At the southern end of the *Alternative* route (which was not surveyed at this time due to access constraints), many previously recorded sandstone based sites including rock shelters and grinding grooves occur.

Transmission Line Landform 2a (TL L2a) *not surveyed*
TL L2a traverses the proposed *Alternate* transmission line route and is comprised of a series of gently to very gently undulating simple slopes and crests of low local relief. The bedrock geology is sandstone. The landform is comparable to the TL LU2 (*Preferred* route) which has been surveyed and assessed to be of very potentially high cultural and archaeological potential. A large number of previously recorded AHIMS sites are present

in the immediate vicinity of this landform. The southern end of the landform would follow an existing cleared existing easement.

Table 2 Overview of proposed impacts and Landform Units.

Landform Unit	Proposed impacts	Survey mode	Landform	Predicted landuse	Material manifestation of landuse
LU1	turbines, tracks and underground electrical	pedestrian	Generally gently undulating ridge crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences of knapping events or random artefact discard associated with hunting and gathering.
LU2	turbines, tracks and underground electrical	pedestrian	Generally very gently undulating ridge crest	Hunting and gathering; day forays away from river. Travel between Coolaburragundy River and Coolah Tops area. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed in a patchy manner across the landform associated with hunting and gathering.
LU3	turbines, tracks and underground electrical	not surveyed	Generally gently undulating spur crest	Hunting and gathering. Travel from Turee Creek valley to the elevated ridges. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences of knapping events or random artefact discard, associated with hunting and gathering.
LU4	turbines, tracks and underground electrical	not surveyed	Generally gently undulating crest descending to valley of Turee Ck	Hunting and gathering. Travel from Turee Creek valley to the elevated ridges. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences of knapping events or random artefact discard, associated with hunting and gathering.
LU5	turbines, tracks and underground electrical	pedestrian	Gently undulating narrow crest descending to valley of Turee Ck	Hunting and gathering. Travel from Turee Creek valley to the elevated ridges. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences of knapping events or random artefact discard, associated with hunting and gathering.
LU6	turbines, tracks and underground electrical	pedestrian	Generally very gently undulating crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences of knapping events or random artefact discard, associated with hunting and gathering.
LU6a	access track	not surveyed	Gentle to moderate gradient simple slope	Hunting and gathering.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU7	since modification to design, nil	pedestrian	Gently undulating ridge crest/major watershed	Hunting and gathering; day forays away from Coolah Tops area. Unlikely to have been used for camping due to lack of water.	Very low/low density of stone artefacts distributed in a patchy manner across the landform associated with hunting and gathering.
LU7a	access track	not surveyed	Gently undulating upper slope/crest	Hunting and gathering; day forays away from Coolah Tops area.	Low density of stone artefacts distributed in a patchy manner across the landform associated with hunting and gathering.

Landform Unit	Proposed impacts	Survey mode	Landform	Predicted landuse	Material manifestation of landuse
			/major watershed landform		
LU8	turbines, tracks and underground electrical	pedestrian	Gentle gradient upper slopes	Hunting and gathering.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU9	turbines, tracks and underground electrical	pedestrian	Moderately undulating ridge crest/major watershed	Hunting and gathering.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU10	access track, substation	pedestrian	Gentle gradient upper slopes	Hunting and gathering.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU11	turbines, tracks and underground electrical	pedestrian	Generally very gently undulating crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences of knapping events or random artefact discard, associated with hunting and gathering.
LU12	turbines, tracks and underground electrical	pedestrian	Gentle/ moderate gradient, undulating crest descending to Coolaburragundy River valley	Hunting and gathering. Travel from Coolaburragundy River valley to the higher ridges. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences of knapping events or random artefact discard, associated with hunting and gathering.
LU13	turbines, tracks and underground electrical	Not surveyed	Gentle/moderate gradient, undulating crest descending to Coolaburragundy River valley	Hunting and gathering. Travel from Coolaburragundy River valley to the higher ridges. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences of knapping events or random artefact discard, associated with hunting and gathering.
LU14	turbines, tracks and underground electrical	Not surveyed	Gently undulating spur crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences of knapping events or random artefact discard, associated with hunting and gathering.
LU15	turbines, tracks and underground electrical	pedestrian	Very gently undulating broad (>200m wide) crest	Travel between Turee Creek and Coolah Tops area. Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences of knapping events or random artefact discard associated with travel and hunting and gathering.

Landform Unit	Proposed impacts	Survey mode	Landform	Predicted landuse	Material manifestation of landuse
LU15a	turbines, tracks and underground electrical	not surveyed	Gently undulating spur crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences of knapping events or random artefact discard associated with hunting and gathering.
LU16	access track	pedestrian	Generally gently undulating crest descending to valley of Turee Ck	Hunting and gathering. Travel from Turee Creek valley to the higher ridges. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with travel and hunting and gathering.
LU17	turbines, tracks and underground electrical	pedestrian	Very gently undulating broad plateau like ridge crest	Hunting and gathering. Unlikely to have been used for camping, other than overnight, due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with minor levels of camping and hunting and gathering.
LU17a	turbines, tracks and underground electrical	not surveyed	Very gently undulating spur crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences of knapping events or random artefact discard associated with hunting and gathering.
LU18	turbines, tracks and underground electrical	pedestrian	Gently (sometimes moderate gradient) undulating narrow ridge crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU19	turbines, tracks and underground electrical	pedestrian	Gently undulating crest descending to minor valley	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU20	turbines, tracks and underground electrical	not surveyed	Gently undulating crest descending to Gundare Ck	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU21	access road	not surveyed	Gentle to moderate gradient simple slope	Hunting and gathering. Unlikely to have been used for camping due moderate gradient.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU22	tracks and underground electrical	pedestrian	Gently (sometimes moderate gradient) undulating narrow ridge crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.

Landform Unit	Proposed impacts	Survey mode	Landform	Predicted landuse	Material manifestation of landuse
LU22a	access road	not surveyed	Moderate gradient simple slope	Hunting and gathering. Unlikely to have been used for camping due moderate gradient.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU22b	access road	not surveyed	Very gentle gradient simple slope/flat	Hunting and gathering. Occasional camping.	Low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering and occasional camping.
LU23	since modification to design, nil	pedestrian	Gentle gradient simple slope	Hunting and gathering.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU24	since modification to design, nil	pedestrian	Very gentle gradient simple slope/flat adjacent to Gundare Ck	Hunting and gathering. Occasional camping.	Low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering and occasional camping.
LU25	access road	not surveyed	Moderate gradient simple slope	Hunting and gathering. Unlikely to have been used for camping due to gradient.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU26	turbines, tracks and underground electrical	pedestrian	Gently (sometimes moderate gradient) undulating narrow ridge crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU26a	access road	not surveyed	Gentle to moderate gradient simple slope	Hunting and gathering. Unlikely to have been used for camping due to gradient.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU26b	access road	not surveyed	Steep gradient simple slope	Hunting and gathering.	Negligible density of stone artefacts.
LU26c	access road, batching plant	not surveyed	Very gentle gradient simple slope/flat	Hunting and gathering. Possible occasional camping.	Low density of stone artefacts associated with hunting and gathering and occasional camping.
LU27	turbines, tracks and underground electrical	pedestrian	Gentle gradient broad ridge crest	Hunting and gathering. Possible occasional camping, but no obvious water source.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering and occasional camping.
LU27a	access road	not surveyed	Moderate/steep gradient simple slope	Hunting and gathering.	Negligible density of stone artefacts.

Landform Unit	Proposed impacts	Survey mode	Landform	Predicted landuse	Material manifestation of landuse
LU28	turbines, tracks and underground electrical	pedestrian	Gently undulating ridge crest	Travel between Turee Creek and Coolah Tops area. Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences of knapping events or random artefact discard associated with travel and hunting and gathering.
LU28a	access road	not surveyed	Moderate gradient, spur crest/simple slope	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU28b	access road	not surveyed	Lower slope/flat landform	Hunting and gathering. Possible occasional camping.	Low density of stone artefacts associated with hunting and gathering and occasional camping.
LU28c	access road	not surveyed	Moderate gradient, spur crest/simple slope	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU29d	access road	not surveyed	Lower slope/flat landform	Hunting and gathering. Possible occasional camping.	Low density of stone artefacts associated with hunting and gathering and occasional camping.
LU29	overhead electrical	pedestrian	Gentle gradient simple slope	Hunting and gathering.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU30	turbines, tracks and underground electrical	pedestrian	Gently undulating ridge crest descending to south	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU30a	access road	not surveyed	Moderate gradient, spur crest/simple slope	Hunting and gathering.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU31	access road	pedestrian	Very gentle gradient simple slope	Hunting and gathering.	Very low/negligible density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU32	turbines, tracks and underground electrical	pedestrian	Very gently undulating spur crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU33	turbines, tracks and	not surveyed	Undulating ridge crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting

Landform Unit	Proposed impacts	Survey mode	Landform	Predicted landuse	Material manifestation of landuse
	underground electrical				and gathering.
LU34	turbines, tracks and underground electrical	not surveyed	Undulating ridge crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU34a	access road	not surveyed	Moderate/steep gradient simple slope	Hunting and gathering.	Negligible density of stone artefacts
LU35	turbines, tracks and underground electrical	not surveyed	Undulating ridge crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU35a	access road	not surveyed	Lower slope landform	Hunting and gathering. Possible occasional camping.	Low density of stone artefacts associated with hunting and gathering and occasional camping.
LU36	turbines, tracks and underground electrical	not surveyed	Undulating ridge crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU37	turbines, tracks and underground electrical	not surveyed	Undulating ridge crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU37a	access road	not surveyed	Moderate gradient simple slopes	Hunting and gathering.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU37b	access road	not surveyed	Lower slope/flat landform	Hunting and gathering. Possible occasional camping.	Low density of stone artefacts associated with hunting and gathering and occasional camping.
LU37c	access road	not surveyed	Lower slope/flat landform	Hunting and gathering. Possible occasional camping.	Low density of stone artefacts associated with hunting and gathering and occasional camping.
LU38	turbines, tracks and underground electrical	not surveyed	Undulating ridge crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.

Landform Unit	Proposed impacts	Survey mode	Landform	Predicted landuse	Material manifestation of landuse
LU39	turbines, tracks and underground electrical	not surveyed	Undulating ridge crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU39a	access road	not surveyed	Moderate/steep gradient simple slope	Hunting and gathering.	Negligible density of stone artefacts.
LU39b	access road	not surveyed	Lower slope/flat landform	Hunting and gathering. Possible occasional camping.	Low density of stone artefacts associated with hunting and gathering and occasional camping.
LU40	turbines, tracks and underground electrical	not surveyed	Undulating spur crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU41	turbines, tracks and underground electrical	not surveyed	Undulating ridge crest/major watershed	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed in a patchy manner across the landform associated with hunting and gathering.
LU41a	turbines, tracks and underground electrical	not surveyed	Undulating ridge crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU42	turbines, tracks and underground electrical	not surveyed	Undulating ridge crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU42a	turbines, tracks and underground electrical	not surveyed	Undulating spur crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU42b	access road	not surveyed	Steep gradient spur crest	Hunting and gathering.	Negligible density of stone artefacts.
LU42c	access road	not surveyed	Lower slope/flat landform	Hunting and gathering. Possible occasional camping.	Low density of stone artefacts associated with hunting and gathering and occasional camping.
LU42d	access road	not	Moderate/steep	Hunting and gathering.	Negligible density of stone artefacts.

Landform Unit	Proposed impacts	Survey mode	Landform	Predicted landuse	Material manifestation of landuse
		surveyed	gradient spur crest		
LU42e	access road	not surveyed	Lower slope/flat landform	Hunting and gathering. Possible occasional camping.	Low density of stone artefacts associated with hunting and gathering and occasional camping.
LU43	turbines, tracks and underground electrical	not surveyed	Undulating spur crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU43a	turbines, tracks and underground electrical	not surveyed	Undulating spur crest	Hunting and gathering. Unlikely to have been used for camping due to lack of water.	Very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering.
LU43b	access road	not surveyed	Steep simple slopes	Hunting and gathering.	Negligible density of stone artefacts.
TL LU 1	Transmission line: Preferred route	pedestrian	Gently undulating amorphous crests and simple slopes of low local relief: basalt	Hunting and gathering. Occasional camping.	Generally low to very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering. The exception would be landform elements located close to higher order streams which may have been used for periodic camping; artefact density would be higher and in some instances could be present in moderate density.
TL L 1a	Transmission line: Alternative route	not surveyed	Gently undulating amorphous crests and simple slopes of low local relief: basalt	Hunting and gathering. Occasional camping.	Generally low to very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering. The exception would be landform elements located close to higher order streams which may have been used for periodic camping; artefact density would be higher and in some instances could be present in moderate density.
TL LU 2	Transmission line: Preferred route	pedestrian	Gently undulating amorphous crests and simple slopes of low local relief: sandstone which	Hunting and gathering. Occasional camping.	Generally low to very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering. The exception would be landform elements located close to higher order streams which may have

Landform Unit	Proposed impacts	Survey mode	Landform	Predicted landuse	Material manifestation of landuse
			occurs as low outcrops, cliffs and in creekbeds		been used for periodic camping; artefact density would be higher and in some instances could be present in moderate density. Rock shelters likely to have been used for camping and suitable sandstone exposures for grinding hatchets heads and other tools, and perhaps for food processing.
TL L 2a	Transmission line: Alternative route	not surveyed	Gently undulating amorphous crests and simple slopes of low local relief: sandstone which occurs as low outcrops, cliffs and in creekbeds	Hunting and gathering. Occasional camping.	Generally low to very low density of stone artefacts distributed as isolated occurrences associated with hunting and gathering. The exception would be landform elements located close to higher order streams which may have been used for periodic camping; artefact density would be higher and in some instances could be present in moderate density. Rock shelters likely to have been used for camping and suitable sandstone exposures for grinding hatchets heads and other tools, and perhaps for food processing.

Aboriginal Object Recordings

The Aboriginal object locales recorded during the survey are summarised in Table 3 and described in further detail below. Artefacts are listed in Table 4.

Table 3 Summary of Aboriginal object locales recorded during the field survey.

Name	Comments	Easting	Northing
LU6/L1	1 artefact on a large area of exposed bedrock pavement	766467	6476439
LU10/L1	2 artefacts in a patch of bare earth exposure in LU10	778664	6487168
TL LU2/L1	10 artefacts in an area of exposure on a vehicle track in TL LU1/L1	761702	6430532
TL LU2/L2	Small rock shelter with potential archaeological deposit	768682	6440662
TL LU2/L3	3 artefacts in an area of exposure adjacent to a creek	767918	6440024
36-3-0105	Grinding grooves adjacent to a rock pool in a creek	767857	6439959
TL LU1/L1	3 artefacts in an area of exposure on vehicle track	776895	6446565
LU30/L1	1 artefact on a section of graded track in LU30	776965	6459411

Two previously recorded sites occur adjacent to the Ulan Road and the southern end of the proposed *Preferred* transmission line route option, AHIMS # 36-3-1138 and #36-3-1139, both of which have been subject to impacts during pipeline construction (in accordance with an OEH Permit). Another is located at the site of the Transgrid 330kV transmission line (36-3-709). These were not inspected during the current survey.

AHIMS # 36-3-203 is located near to, but outside the route. Further to the north along the *Preferred* route, another tree with a scar, 36-3-0107 is near, but outside the alignment.

Landform Unit 6/Locale 1 (LU6/L1) 766467e 6476439n (GDA)

One stone artefact was recorded in a large area of exposed bedrock in Landform Unit 6 (Plate 42). The landform is a long ridge crest of very gentle/flat gradient and open aspect. The area in which the artefact was found measuring c. 20 x 20 metres has ground exposure of 50%, of which 90% was assessed to be archaeological visibility. The effective survey coverage at this locale is high, and given that one artefact only was recorded, artefact density is assessed to be very low. Because this is an extensive area (>1 ha) of exposed bedrock pavement, the site has no subsurface potential. A vehicle track crosses the site.

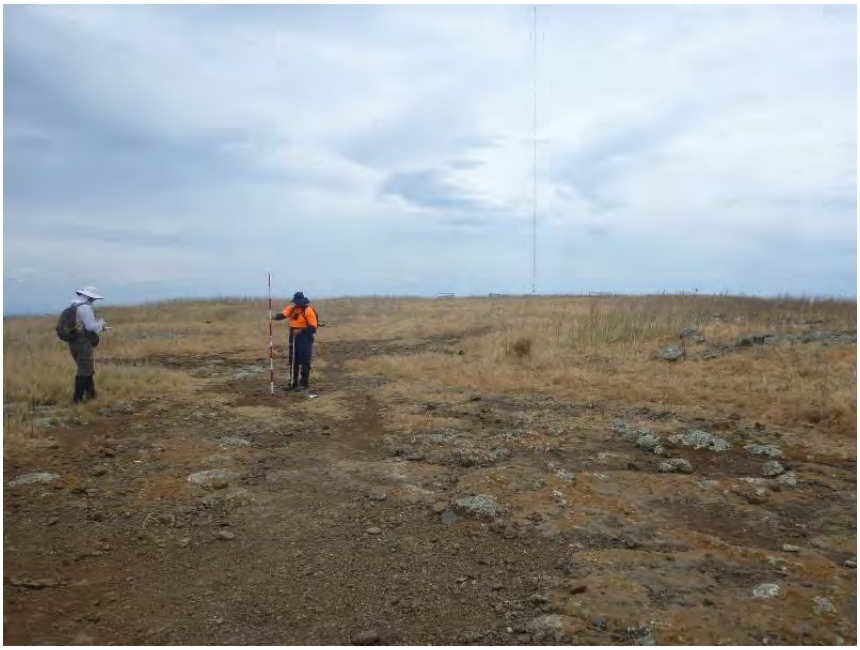

Plate 42 LU6/L1 looking 190°; note extensive exposure.

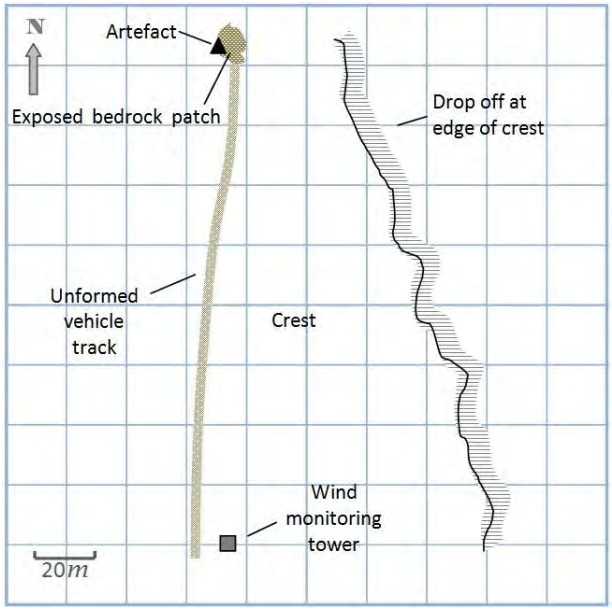

Figure 3 Sketch map showing location of LU6/L1.

Landform Unit 10/Locale 1 (LU10/L1) 778664e 6487168n (GDA)

Two stone artefacts were recorded in an area of exposure adjacent to three gates at this locale within Landform Unit 10 (Plate 43). The landform is a simple slope, with gentle gradient and an aspect to the south-east. The area measures 20m x 10m of which 90% was ground exposure, possessing 80% archaeological visibility. The effective survey coverage at this point is relatively high, and given that two artefacts only were recorded, artefact density is assessed to be low. The site has some subsurface potential given some depth to the soils, but it is disturbed and rocky with surface cobbles. Any undetected artefacts are predicted to be present in low density.

Plate 43 LU10/L1 looking 220˚.

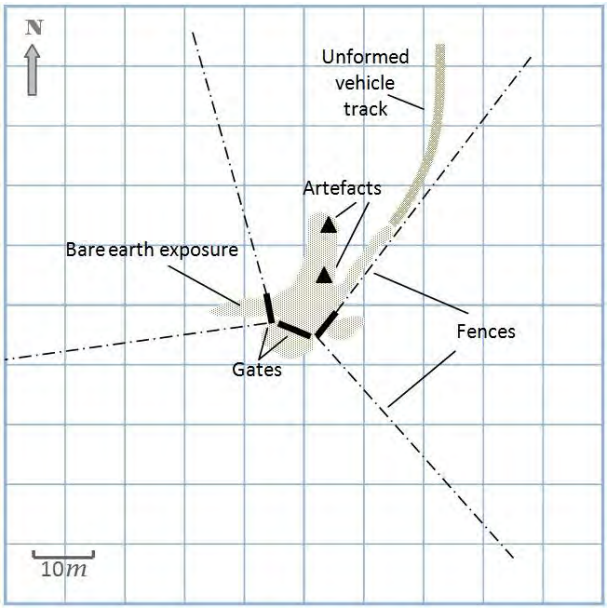

Figure 4 Sketch map showing location of LU10/L1.

Landform Unit 30 /Locale 1 (LU30/L1) *776965*e *6459411*n (GDA)

One stone artefact was recorded in an area of exposure on a recently graded crest (Plate 44). The landform is a flat area on a crest, with open aspect. In an area measuring 10m x 30m, 80% was ground exposure, possessing 80% archaeological visibility. The effective survey coverage at this point is relatively high, and given that one artefact only was recorded, the artefact density assessed to be very low.

The site, although very rocky, has subsurface potential, but artefact density is predicted to be very low.

Plate 44 LU30/L1 looking 180˚.

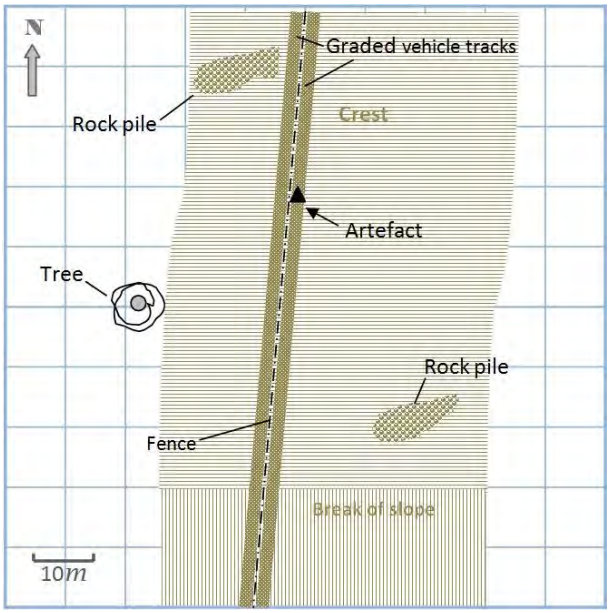

Figure 5 Sketch map showing location of LU30/L1.

Transmission Line Landform Unit 2/Locale 1 (TL LU2/L1) 761702e 6430532n (GDA)

Ten stone artefacts were recorded at this locale within Transmission Line Landform Unit 1 (Plate 45). They are situated in an area of exposure associated with a vehicle track incised to a depth of c. 20 cm. The artefacts are located on the northern side of a crest, which has a very gentle gradient and northerly aspect. The locale measures 10m x 5m in area, of which 80% was ground exposure, possessing 60% archaeological visibility. The effective survey coverage is relatively high and artefact density is assessed to be low. The site has little subsurface potential on the track, but the potential to be considerably larger off the track. Artefact density is predicted to be low to moderate.

Plate 45 TL LU2/L1 looking 160°

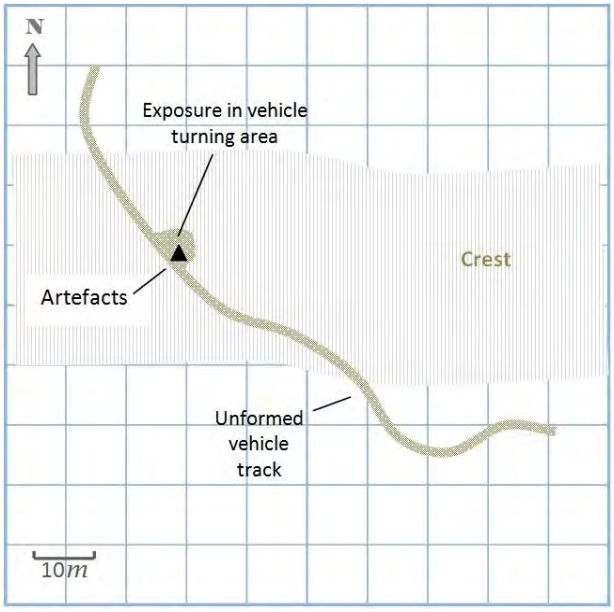

Figure 6 Sketch map showing location of TL LU2/L1.

Transmission Line Landform Unit 2/Locale 2 (TL LU2/L2) 768682e 6440662n (GDA)

This recording is a small sandstone rock shelter which is assessed to have the potential to contain archaeological deposit (Plate 46). The shelter has an easterly aspect. It is 5 metres wide, 3 metres deep and 1.4 metres high at its drip line. The shelter has a very gently sloping floor with sandy deposit. The shelter does not contain any rock art. The shelter is small, and accordingly, artefact density in the shelter is predicted to be relatively low.

Plate 46 TL LU2/L2 looking west.