McCardle Cultural Heritage Pty Ltd

Connell Wagner Pty Ltd

Proposed Wind Farm at Glen Innes

Indigenous Archaeological Assessment

September 2007

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Photograph on front cover: the study area

Report No: J07013

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1 INTRODUCTION

1.1 OVERVIEW

McCardle Cultural Heritage Pty Ltd (MCH) has been commissioned by Connell Wagner to prepare an indigenous archaeological assessment for a proposed Wind Farm at Glen Innes, NSW. The assessment employs a regional approach, taking into consideration both the landscape of the study area, (landforms, water resources, soils and geology), and the regional archaeological patterning identified by past studies.

The objective of the assessment is to identify areas of indigenous cultural heritage value and to develop management recommendations.

1.2 SCOPE OF WORKS

The following tasks were carried out:

- a review of relevant statutory registers and inventories for indigenous cultural heritage including the NSW NPWS Aboriginal Heritage Information Management System (AHIMS) for known archaeological sites, the State Heritage Register, the Register of the National Estate, the Glen Innes Severn Local Environmental Plan and the Register of the National Trust;
- a review of local environmental information (topographic, geological, soil, geomorphological and vegetation descriptions) to determine the likelihood of archaeological sites and specific site types, prior and existing land uses and site disturbance that may effect site integrity;
- a review of previous cultural heritage investigations to determine the extent of archaeological investigations in the area and any archaeological patterns;
- the development of a predictive archaeological statement based on the data searches and literature review;
- consultation with the Aboriginal community as per DECC Interim Community Consultation Requirements for Applicants (2005);
- identification of impacts in relation to known and recorded archaeological sites and predicted archaeological potential of the study area, and
- the development of mitigation and conservation measures.

1.3 STUDY AREA

The study area is situated within the New England Tableland with an area of 3,004,202 ha, of which 2,860,758 ha or 95.23% lies within NSW between the North Coast and Nandewar in northeast NSW, extending north just into Queensland. The wind farm site is located approximately 12 km west of Glen Innes and is located within mostly cleared grazing land within the Glen Innes Severn Local Government Area (Refer to *Figure 1.1*).

1.4 PROPOSED USE OF THE STUDY AREA

A description of the proposed wind farm and associated works are provided by Connell Wagner as follows:

The proposed Glen Innes Wind Farm project involves the construction and operation of a wind farm comprising up to 22 large wind turbines, a substation and associated access tracks and underground cables. The wind farm will be connected to an existing 66 kV transmission line (Refer to *Figure 1.1*)

The wind farm will be located on the Waterloo Range about 12 km to the west of Glen Innes. It will spread along about 8.5 km of the Waterloo Range south of the Gwydir Highway. The land on which the proposed wind farm will be located comprises privately owned properties, which are predominantly cleared pastoral land used for grazing. The sites selected for the turbine placement are the more elevated positions on the ridge lines and are generally cleared sites.

Each turbine will involve a footing, tower structure, nacelle and three turbine blades. The towers will be about 80 metres high and about 4 to 4.5 metres at the base. The towers will be constructed on a concrete footing that could have dimensions of up to 15 metre by 15 metres. The footing may be below the ground or at the surface and could require excavation to up to 3 metres depth. The hub height for the turbines will be about 80 metres with a turbine diameter of about 90 metres.

Construction of the turbines will also require clearing of an area adjacent to the base of the tower and the construction of a pad for the purposes of laying out the turbine equipment and situating a large crane that can lift the nacelle and blades into place. The pad can sometimes be formed by spreading and compacting excess topsoil that has been excavated from the footing location.

Currently, access to the northern part of the survey area can be gained via the existing Rose Hill Road and the old section of disused highway accessed through a gate on the Gwydir Highway some 10km west of Glen Innes. Access to the southern part of the survey area is currently via East Furracabad Road, Cherry Tree Road and Hillside Road which crosses Seven Mile Gully. Access roads will be constructed to each of the turbine sites and the substation. The roads may be up to 8 metres wide with greater width on bends to allow room

MCH: fig 1.1 CW Glen Innes Wind Farm

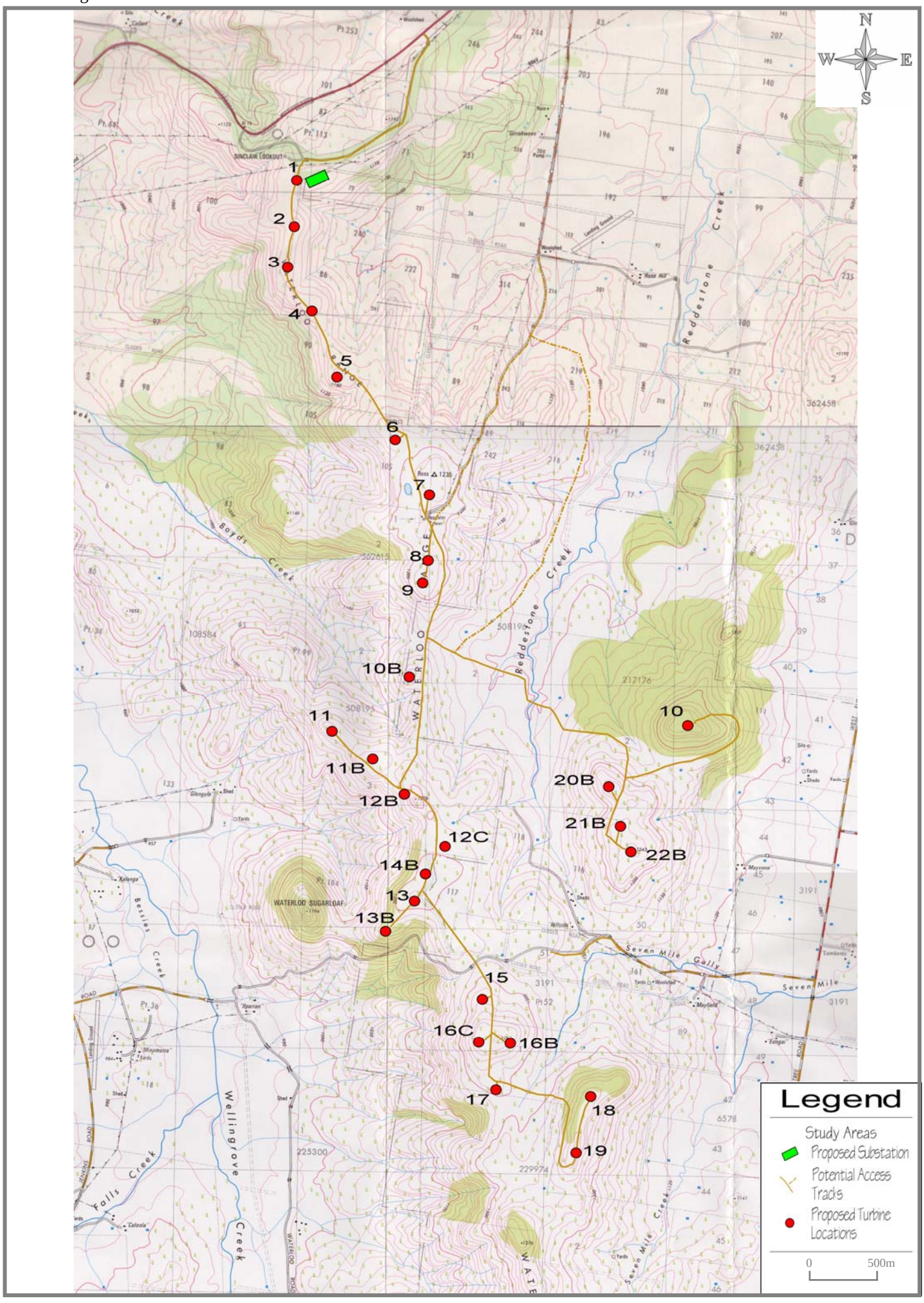


Figure 1.1 Location of the study area

Source: 1:25 000 Topo Series, Glen Innes & Stonehenge

for the long loads (up to 50 metres) associated with the delivery of the turbine blades. The turbines will be linked by underground cables which will also link to the substation. The substation will be located at the northern end of the wind farm close to the existing 66kV transmission line. Where possible the proposed access roads follow existing access tracks and farm roads through the site.

A temporary construction site office will be established close to the entrance to the site, (possibly at the entrance to the old section of the highway), and will comprise a small office and meal room, amenities and parking and storage area. A concrete batch plant may be located at the site office but the decision whether or not to set up a batch plant is often made by the contractor.

1.5 CONSULTATION

As per the new DEC Interim Guidelines for Consultation, MCH contacted the required organisations (Refer to *Table 1.1*) to identify who to contact and consult for this project.

Table 1.1 Initial consultation letters

Organisation contacted	Date	Response
Department of Environment and Conservation (DEC)	21st May 2007	No response
Glen Innes Local Aboriginal Land Council (GILALC)		GILALC
Glen Innes Severn Council		No response
Native Title Services		No response
Registrar of Aboriginal Owners		None registered

No additional groups were identified by those listed in *Table 1.1*.

An advertisement was placed in the local paper on 22nd May 2007 that outlined the project, its general location and called for interested parties to register their interest no later than 5th June 2007.

Following the above endeavours to identify who the interested groups were, MCH determined that Glen Innes Local Aboriginal Land Council (GILALC) were the only group to register an interest. GILALC was forwarded an information pack on 26th June 2007 that included an outline of the project with relevant location maps and a description of the methods. This pack also asked for comments on the methods and asked if people had any traditional knowledge they would feel comfortable in sharing with MCH for inclusion in the report. Finally, this pack also asked GILALC to provide a CV and insurance details for MCH to pass onto the client for selection in the participation of fieldwork.

MCH received a positive response from GILALC in relation to the project or methods proposed. GILALC were invited to participate in the survey with MCH Archaeologist Gillian Goode and Connell Wagner representative Jeff Bembrick from the 10th July to 12th July 2007. Field officers were Deborah Cutmore and Maxwell Kirk from GILALC.

MCH forwarded a draft copy of the report to all registered groups. MCH asked the community to provide a cultural significance assessment for its inclusion in the final report if they wished to do so (See *Annex A*).

MCH consulted with all groups identified who registered an interest in the project. All documentation regarding the consultation process can be forwarded to DEC upon request.

1.6 STATUTORY CONTROLS

Land managers are required to consider the affects of their activities or proposed development on the environment under several pieces of legislation. Indigenous cultural heritage in NSW is protected and managed under the following Commonwealth and State legislation:

- *New South Wales National Parks and Wildlife Act* 1974, Amendment 2001

All indigenous objects within the state of New South Wales are protected under Section 90 of the National Parks and Wildlife Act 1974 (NPW Act). Under s.5 of the Act, "object" means any deposit, object or material evidence (not being a handicraft made for sale) relating to indigenous habitation of the area that comprises New South Wales, being habitation both prior to and concurrent with the occupation of that area by persons of European extraction, and includes Aboriginal remains.

Sites of traditional significance that do not necessarily contain archaeological materials may be gazetted as "Aboriginal places" and are protected under Section 84 of the Act. This protection applies to all sites, regardless of their significance or land tenure. Under Section 90, it is an offence to knowingly disturb, damage or destroy objects or Aboriginal Places without the prior written consent of the Director-General of National Parks and Wildlife.

Amendments introduced by the National Parks & Wildlife Amendment Act 2001, include renaming Section 90 "consent" to "Heritage Impact Permit", removal of the term "knowingly" from Section 90, and adding reasonable precaution and due diligence as defences against prosecution under the amended Section 90. At the time of writing, these amendments have yet to commence.

- *Environmental Planning and Assessment Act* 1979, (EP&A Act)

The Minister for Planning has declared the Glen Innes Wind Farm as being subject to Part 3A of the EP&A Act. The EP&A Act requires that environmental impacts be considered in land-use planning, including impacts on indigenous and non-indigenous heritage. Local Environmental Plans prepared in accordance with the EP&A Act identify permissible land use and development constraints, and provide guidance on the level of environmental assessment required.

The NSW NPWS provides guidelines for Aboriginal heritage assessment, including those conducted under the EP&A Act 1979. Where indigenous heritage assessment is conducted under the Integrated Development Approval process, a more detailed set of NPWS guidelines applies.

- *The Heritage Act* 1977 (State)

The Heritage Act 1977 protects the natural and cultural history of NSW with emphasis on non-indigenous cultural heritage through protection provisions and the establishment of a Heritage Council. While Aboriginal heritage sites and objects are protected primarily by the NPW Act 1974, if an Aboriginal site, object or place is of great significance it can be protected by a heritage order issued by the Minister on the advice of the Heritage Council.

- *The Aboriginal and Torres Strait Islander Heritage Protection Act* 1984, Amendment 1987 (Commonwealth)

The Aboriginal and Torres Strait Islander Heritage Protection Act 1984 protects areas and/or objects which are of significance to Aboriginal people and which are under threat of destruction. A significant area or object is defined as one that is of particular importance to Aboriginal people according to Aboriginal tradition. The Act can, in certain circumstances override state and territory provisions, or it can be implemented in circumstances where state or territory provisions are lacking or are not enforced. The Act must be invoked by or on behalf of an Aboriginal or Torres Strait Islander or organisation.

- *The Australian Heritage Commission Act* 1975 (Commonwealth)

The Australian Heritage Commission Act 1975 established the Australian Heritage Commission, which assesses places to be included in the National Estate and maintains a register of these places, which are significant in terms of their association with particular community or social groups for social, cultural or spiritual reasons. The Act does not include specific protective clauses.

- The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

Development that may affect matters of National Environmental Significance (NES) requires review against the requirements of the EPBC Act.

This Act enhances the management and protection of Australia's heritage places. Any action that is likely to have a significant impact on the matters protected under the EPBC Act must be referred to the Commonwealth Environment Minister for further consideration.

Significant Australian Heritage items may be listed as an Australian property on the World Heritage List kept under the World Heritage Convention, or a property declared to be a World Heritage property by the Commonwealth Environment Minister. The National Heritage List includes natural, historic and Indigenous places that are of outstanding national heritage value to the Australian nation. The Commonwealth Heritage List comprises natural, Indigenous and historic heritage places on Commonwealth lands and waters or

under Australian Government control, and identified by the Minister for the Environment and Water Resources as having Commonwealth heritage values.

In January 2007, the Commonwealth and NSW governments signed a Bilateral Agreement which allows the assessment regimes under the Environmental Planning and Assessment Act 1979 (Parts 3A, 4 and 5 of the EP&A Act) to be automatically accredited under the EPBC Act. This means that separate assessment processes are not required. The Bilateral Agreement only covers matters that are determined to be 'controlled actions' by the Commonwealth Government. Guidelines have been prepared to assist councils, government agencies, proponents and the general public to understand the processes involved under the Bilateral Agreement.

There are no listed items of National Environmental Significance within the Project Area and therefore there are no referral requirements for the project under the EPBC Act.

1.7 REPORT STRUCTURE

This report has the following structure:

Chapter 2 outlines the environmental context;

Chapter 3 provides the archaeological context;

Chapter 4 provides the results of the archaeological fieldwork;

Chapter 5 provides the impact statement;

Chapter 6 provides the mitigation and management strategies, and

Chapter 7 provides the recommendations.

2 ENVIRONMENTAL CONTEXT

2.1 INTRODUCTION

The nature and distribution of Aboriginal cultural materials in a landscape are strongly influenced by environmental factors such as topography, geology, landforms, climate, geomorphology, hydrology and the associated soils and vegetation (Hughes and Sullivan 1985). These factors influence the availability of plants, animals, water, raw materials together with the location of suitable camping places, ceremonial grounds, burials and suitable surfaces for the application of rock art. As site locations may differ between landforms due to differing environmental constraints that result in the physical manifestation of different spatial distributions and forms of archaeological evidence, these environmental factors are used in constructing predictive models of Aboriginal site locations.

Environmental factors also affect the degree to which cultural materials have survived in the face of both natural and human influences and affect the likelihood of sites being detected during ground surface survey. Site detection is dependant on a number of environmental factors including surface visibility (which is determined by the nature and extent of ground cover including grass and leaf litter etc), the survival of the original land surface and associated cultural materials (by flood alluvium and slope wash materials), and the exposure of the original landscape and associated cultural materials (by water, sheet and gully erosion, ploughing, vehicle tracks etc), (Hughes and Sullivan 1984). Combined, these processes and activities are used in determining the likelihood of both surface and subsurface cultural materials surviving and being detected.

It is therefore necessary to have an understanding of the environmental factors, processes and activities, all of which affect site location, preservation, detection during surface survey and the likelihood of subsurface cultural materials being present. The environmental factors, processes and disturbances of the surrounding environment and specific study area are discussed below.

2.2 TOPOGRAPHY

The topographical context is important to identify potential factors relating to past Aboriginal land use patterns. The New England Tableland is a stepped plateau of hills and plains with elevations between 600 and 1500m on Permian sedimentary rocks, intrusive granites and extensive Tertiary basalts. Rainfall, temperature and soils change with topography and bedrock, and the vegetation is very diverse (NPWS: no date).

The Glen Innes area consists of steep plateau from 700-1500 metres. Undulating to low hills, swamps and lagoons with evidence of past higher water levels and lunettes are present with wide valleys in an evolving drainage system.

The specific study area consists of both undulating low hills with ridges, and steeper-sided ridges with flattened tops and several deeply incised valleys. There are a number of creek and drainage lines throughout the study area (with numerous dams).

2.3 GEOLOGY

Aboriginal land use is often related to the nature of the local geology, mainly relating to the procurement of stone resources or materials for manufacture and modification of stone tools.

The New England fold belt comprises sedimentary rocks of Carboniferous and Permian age that were extensively faulted during a period of rapid continental plate movement associated with granite intrusions in the late Carboniferous. Most of the bedrock is now overlain by Tertiary basalt flows that lie on river gravels and sands or on lake sediments. As the basalt erodes the sands are exposed and the surrounding area has been mined for sapphires, diamonds, gold, silver and tin ore.

Topography is a direct result of geology. The eastern area of the Tablelands is at the Great Escarpment where coastal streams have cut deep gorges below the plateau. The granite country is steep with boulder outcrops and rounded tors (exposed rock mass isolated in the landscape). The basalt country is more planar, except around former eruption centres that form high peaks and the individual basalt flows are seen as distinct levels across the plains. The basalts disrupted former drainage patterns and today the pre-basalt topography has been inverted with former valley floors, becoming ridge crests and hills. Large swamps and lagoons such as Llangothlin were partly created by these topographic changes. During the Quaternary, colder climates had a major impact on vegetation patterns and allowed the formation of wind-blown lunettes on the eastern margins of the lagoons (NPWS: no date).

Specifically, the Glen Innes area consists of extensive Tertiary basalt flows. Small enclosed areas of granite and fine grained Permian sedimentary rocks are present with Quaternary sediments in swamps and lagoons (Grafton Geological map).

The availability and distribution of stone materials has a number of archaeological implications. Evidence of stone extraction, and manufacture, can be predicted to be concentrated in the areas of stone availability. However, stone can be transported for manufacture and/or trading across the region. The nature of the surrounding and local geology has a number of implications for Aboriginal land use, mainly relating to the procurement of stone resources or materials for manufacturing and modification for stone tools.

2.4 *SOILS*

The nature of the surrounding soil landscapes has implications for Aboriginal land use and site preservation, particularly relating to supporting vegetation and preservation factors.

No specific Soil Landscape information has been published to date. However, a general description of the Tablelands and Glen Innes soils is provided by NPWS (no date).

The siliceous sands present were derived from granites that are found among rock outcrops. Red earths and mellow texture contrast soils are widespread across the region and are prone to erosion. Soils with increased organic matter occur in swampy sedge lands in valleys and these soils support a variety of open forests and woodlands.

In basalt areas, shallow stony loams are found on steep areas and deep, red brown and brown to black, fertile, well-structured loams are found on flatter slopes. Soils are sometimes waterlogged in valley floors. Siliceous sands and red earths occur on associated Tertiary sands and gravels. Harsh texture contrast soils derived from Permian sedimentary rocks are generally yellow, thinner and stonier on steep slopes.

The Glen Innes area typically has deep red brown and brown to black, fertile and well structured loams on basalt. These soils tend to be thinly layered and stony on steep slopes and waterlogged along the valley floors. Yellow texture contrast soils are found on granites and minor sedimentary rocks.

2.5 *CLIMATE*

Climatic conditions would also have played a part in occupation of an area and have impacted upon the soils and vegetation and associated cultural materials (Kovac and Lawrie 1991).

The area lies in the temperate to cool climate zone which is characterised by warm summers and uniform rainfall occurring in summer. The minimum average monthly temperature is -3.6 to 6^{o}C and maximum average monthly temperature of 20.8 to 31.6^{o}C. The mean annual rainfall for Glen Innes Post Office is 857 mm (Bureau of Meteorology).

Colder conditions, such as ice and frost, assist in cracking and weakening the basalt rocks. Rainfall is known to impact upon soils through runoff and rain splash, resulting in further aggravation of the landscape through erosion and the associated movement of cultural materials.

2.6 *WATERWAYS*

The availability of water (along with the fauna and flora resources utilising water) is one of the most important factors influencing patterns of past Aboriginal land use.

The order of streams was determined based on the Strahler method and using the Glen Innes and Stonehenge 1:25,000 topographic map. This method of stream ordering involves labelling all upper tributaries as first order streams. When two first order streams meet they form a second order stream. Where two second order streams converge they form a third order stream and so on. When a stream of lower order joins a stream of higher order the downstream section of the stream will retain the order of the higher order upstream section (Anon 2003; Wheeling Jesuit University 2002).

The study area is surrounded by 1st, 2nd and 3rd order streams. The Wellingrove Creek (3rd Order) ranges from two to three kilometres to the west of the study area and the Reddestone Creek (3rd Order) is situated roughly through the middle of the study area. A number of lower order streams are situated throughout the area including Boyds Creek, Seven Mile Creek and several un-named creeks. It is important to note however, that the location of the turbines are typically on elevated ground and some distance from reliable water sources although some of the proposed access roads cross some of the creek and drainage lines.

Although there was reliable water in the surrounding areas, it is likely that the majority of past occupation was closer to these major rivers rather than within the study area. However, occupation may occur within these areas to a lesser degree.

2.7 VEGETATION

The availability of flora and associated water sources affect fauna resources, all of which are primary factors influencing patterns of past Aboriginal land use and occupation. The preservation and detection of surface cultural materials of past Aboriginal land uses are also influenced by flora and fauna.

Flora investigations across the study area have been undertaken by Kevin Mills & Associates (2007) and the assessment has interpreted the remnant native vegetation on the Waterloo Range as indicating that large stands of Ribbon Gum Woodland/Forest once occurred on the basalt of the slopes and ridges and Yellow Box Woodland/Forest covered the alluvium on the broad valley floors. Mountain Gum and New England Peppermint were scattered throughout the area. Several Kurrajong trees were noted in the area.

The structure of the original vegetation would have ranged from open woodland to woodland with open forest, and with areas of savannah woodland in the valleys. The understorey would have been native grassland that included Red-leg Grass, Tussock Grass, Kangaroo Grass, Spear-grasses, Wallaby Grasses and Weeping Grass, with patches of shrubs on steep rocky sites.

Although most of the project area was cleared for agricultural purposes, the area is still well treed with stands of remnant Ribbon Gum Woodland/Forest.

Typically, due to vegetation cover, most artefacts identified through surface inspection are identified when they are visible on exposures created by erosion or ground surface disturbances (Dean-Jones and Mitchell 1993; Kuskie and Kamminga 2000). The grass ground cover throughout the study area is expected to result in limited visibility, hence reducing the detection of surface cultural materials.

2.8 LAND USES

Based upon archaeological evidence, the occupation of Australia extends back some 40,000 years (Mulvaney and Kamminga 1999) whilst Aboriginal people have been present within the Hunter Valley for at least 20,000 years (Koettig 1987). Although the impact of past Aboriginal occupation on the natural landscape is thought to have been relatively minimal, it cannot simply be assumed that 20,000 years of land use have passed without affecting various environmental variables.

The practice of 'firestick farming' whereby the judicious setting of fires served to drive game from cover, provide protection and alter vegetation communities significantly influenced seed germination, thus increasing diversity within the floral community.

Following European settlement of the Tablelands from the 1830's, the landscape has been modified by a range of different activities including extensive logging and clearing, agricultural cultivation (ploughing), pastoral grazing and residential developments (Glen Innes Information Centre). The associated landscape disturbance has resulted in the alteration of large tracts of land and the cultural materials contained within these areas.

Parts of the specific study area have been cleared and primarily used for pastoral purposes (grazing), involving the wholesale clearance of native vegetation, the introduction of pasture grass, the construction of fencing and dams, stock yards, farm buildings, power and telecom lines and dirt access tracks.

Although pastoralism is a comparatively low impact activity, it does result in disturbances due to vegetation clearance and the trampling and compaction of grazed areas. These factors accelerate the natural processes of sheet and gully erosion, which in turn can cause the horizontal and lateral displacement of artefacts. Furthermore, grazing by hoofed animals can affect the archaeological record due to the displacement and breakage of artefacts resulting from trampling (Yorston *et al* 1990). Pastoral land uses are also closely linked to alterations in the landscape due to the construction of dams, fence lines and associated structures.

Whilst the impacts of vehicular movements on sites have not been well documented, based on general observations it is expected that the creation of dirt tracks for vehicle access would result in the loss of vegetation and therefore will enhance erosion and the associated relocation of cultural materials.

The processes of bioturbation can also adversely affect the integrity of the soil profile. Due to the activities of plants and animals, soils may be artificially sorted and thus artefacts deposited within the soils will also be disturbed. Depending on the severity and nature of the bioturbation factors in operation, artefacts may be subject to significant lateral and/or vertical disturbance (Fowler *et al* 2004; Peacock and Fant 2002).

2.9 DISCUSSION

The regional and local environment provided a range of resources, including raw materials, fauna, flora and water, that would have allowed for use of the area.

However, natural agencies result in the movement of fine materials down slope, and sheet wash, alluvial flooding and deposition of sediments results in the movement of fine materials, including cultural materials. This affects archaeological sites by altering the horizontal and vertical relationship of artefacts, altering archaeological assemblages, changing artefact densities, and through the deposition of sediment, burying artefacts. These agencies appear to have been moderate within the study area and therefore significant impact upon the archaeological evidence is expected.

European land uses such as clearing and grazing would have also displaced any cultural materials that may have been present. Although this is expected to be minimal, such land uses would have accelerated erosion and displaced the associated cultural materials. The extensive vegetation covering the study area, (particularly the thick grass cover), reduces ground surface visibility and therefore reduces the potential to identify archaeological evidence by surface inspection.

Whilst site integrity cannot be assumed in light of these inter-relating activities and agencies, the existence of in situ cultural materials cannot be ruled out.

3 ARCHAEOLOGICAL CONTEXT

A review of the archaeological literature of the Glen Innes area, a NPWS AHIMS search and discussions with the appropriate Aboriginal groups will be discussed as they provide a broader picture of the wider cultural landscape highlighting the range of site types throughout the region, frequency and distribution patterns and identify site locations. Combined, this background understanding of the archaeological record assists with the construction of a predictive model of site location for the study area.

3.1 REGIONAL ARCHAEOLOGICAL CONTEXT

Following a DEC AHIMS search no sites or reports were listed within a 10km radius of the study area and as such no definitive archaeological context may be established. However, some generalisations may be made based on a general overview of archaeology in the region (Davidson 1982; NPWS: no date).

A strong oral history of the region indicates seasonal movement of past Aboriginal societies through the rugged gorge system, between the coastal plains and tablelands. It is stated that the tablelands were occupied during summer and autumn, with communities moving either to the coast or to the western river system for winter. It is argued that archaeological evidence in the wider region suggests that communities traded with groups on the western slopes. Trade items included spears, stone tools, boomerangs and waddies. Carved trees, ceremonial grounds and art sites are identified in the tablelands.

Based on the limited available information it is possible to identify a number of trends in site location and patterning within the Tablelands region. A variety of site types have been identified and the main sites types include open camps, isolated finds, grinding grooves, scarred and carved trees, rock shelters, art, ceremonial bora grounds, mythological and burials. The high representation of sites containing stone artefacts is to be expected due to the durability of stone in comparison to other raw materials.

In relation to stone artefact raw materials, it is important to note that there is a potential for discrepancies in the way in which archaeologists classify lithic materials. This will consequently affect the proportional representation of raw materials within the recorded assemblages.

Typically, a region focuses on one or two raw material types with lesser quantities of others. For example, in the Hunter Valley mudstone and silcrete are the most commonly used while the coastal area of the Hunter Valley Nobbys Tuff was predominantly utilised. Thus, when a specific material type is found in an area where it is not usually found (such as silcrete in coastal areas), it may be inferred that this may represent trade networks.

Variation in the usage of classification terms by archaeologists will again significantly influence the range of artefact types identified within a study area.

For example, the distinction between a waste flake, a debitage flake and a flaked piece may be heavily subject to the perspective of the recorder.

In general, the stone artefact assemblage in the region has been relatively dated to what was previously known as the Small Tool Tradition (10,000 years BP). On the basis of stone tool technology, the overwhelming majority of Aboriginal open sites within the region are attributed to the Holocene period. However, at Glennies Creek, north of Singleton, based on radiocarbon dated charcoal and geomorphological evidence it is suggested that artefacts found in the B-horizon may have been deposited between 10,000 and 13,000 BP (Koettig 1986a, 1986b).

An analysis of recorded sites including distance from water and the landform type of each site allows for the identification of a number of trends. While a number of trends have been analysed in great detail in parts of NSW (MCH 2003) this has not been the case in the Tablelands region and as such only general statements may be made.

Typically, as water and the associated flora and fauna resources are necessary for survival, the majority of sites are situated within 100 metres of water.

3.2 PREDICTIVE MODELLING

Although there is no specific information relating to the study area or surrounding areas, a very general predictive model may be developed.

3.2.1 Predictive Model for the Study Area

Occupation sites (open camps or artefact scatters) and isolated finds are expected to be the most predominant site types as they survive better than organic materials. The most common site locations are expected to be along watercourses.

As the study is situated between 400 metres and up to 3 kilometres from a reliable water source, there is a low potential for archaeological sites, in particular artefact scatters and isolated finds. Art sites and shelter sites may be present within caves and appropriate art application areas. No caves were evident within the project site.

It is anticipated that sites will contain assemblages dating from the mid to late Holocene, featuring a dominant raw material, with lesser quantities of other raw materials. Artefacts may consist predominantly of debitage from flaking, flakes, broken flakes and few cores. Small numbers of modified artefacts including retouched flakes, and asymmetrical and symmetrical backed artefacts may be expected.

Dependent on the level of exposure within the study area, artefacts are expected to be located within the disturbed context of erosion scars and within the remnant A soil horizon and on top of the B horizon. Whilst it is possible

that sub-surface deposits will be present within parts of the study area, this is entirely reliant on the level of disturbance across the site.

It must be emphasised that sites within the study area are expected to have been disturbed by both natural (erosion) and human disturbances (clearing, tracks etc) and thus, the accuracy of these predictions will be largely determined by the degree of such disturbances. The occurrence of disturbance dictates that the extent and spread of surface archaeological material may not reflect sub-surface deposits but rather may be a result of differential disturbance and exposure.

3.3 ARCHAEOLOGICAL POTENTIAL IN THE STUDY AREA

Despite the limited information available, two site types may occur throughout the site and include open artefacts scatters and isolated finds.

- Campsites

Also described as open campsites or open artefact scatters, these deposits include archaeological remains such as stone artefacts, shell, and sometimes hearths. These sites are usually identified as surface scatters of artefacts in areas where ground surface visibility is increased due to lack of vegetation. Erosion, agricultural activities (such as ploughing) and access ways can also expose surface campsites. Stone artefacts are the most common archaeological remains. They are the most numerous of all the relics produced by Aboriginal occupation, and the least susceptible to post-depositional destruction and decay.

- Isolated finds

Isolated finds are single artefacts that are usually identified in areas where ground surface visibility is increased due to lack of vegetation. Erosion, agricultural activities (such as ploughing) and access ways can also expose surface artefacts.

3.4 HERITAGE REGISTER LISTINGS

The Australian Heritage Commission Register of the National Estate Database and the NSW Heritage Office State Heritage Register were searched for Aboriginal contact places. No sites were listed near the study site. However, not all indigenous places are listed, and the Heritage Commission is consulting with Traditional Owners to gradually include indigenous information.

4 SURVEY RESULTS

4.1 METHODOLOGY

The study area was surveyed on foot by three people spaced approximately five to seven metres apart. The survey strategy was based on levels of vegetation cover and focused on areas of high ground, surface visibility, exposures and along creek lines. Flattened ridge tops were traversed in transects covering the entire crest of the hill thereby allowing for flexibility in the actual location and construction of each wind turbine. Proposed access routes were covered to a width between 10 to 15 metres and up to 50 metres wide on the bends.

Several alternative potential routes were surveyed. The feasibility of these routes is still under discussion by the Client. However in principal no particular constraints were identified on any of the various routes except for the area identified as GIWF 1. It was discussed that due to the uncertainties existing regarding specific routes, that once the final routes have been determined and marked out, if a route crosses an area not previously adequately surveyed, then those sections will undergo further survey.

4.2 LANDFORMS

McDonald *et al* (1998) describes the categories of landform divisions. This is a two layered division involving treating the landscape as a series of 'mosaics'. The mosaics are described as two distinct sizes: the larger categories are referred to as *landform patterns* and the smaller being *landform elements* within these patterns. Landform patterns are large-scale landscape units, and landform elements are the individual features contained within these broader landscape patterns. There are forty landform pattern units and over seventy landform elements. However, of all the landform element units, ten are morphological types. For archaeological investigations they divide the landscape into standardised elements that can be used for comparative purposes and predictive modelling.

Six broad landform elements are defined for the study area and include ridge tops, stepped ridges, slopes, flats, drainage lines and creeks (Refer to *Figure 4.1)*.

4.3 SURVEY UNITS

The area surveyed incorporated 27 wind turbines sites, 1 – 9, 10 & 10B, 11 & 11B, 12B & 12C, 13 & 13B, 14B, 15, 16, 16B & 16C, 17 -19, 20B, 21B and 22B, a substation located in the north of the site area, an existing 66 kV transmission line to the north of the site, and four existing monitoring tower sites M1 – M4. Where the turbine number has a suffix this represents that it has been moved from an original location or is an alternative or additional site. Associated

MCH: fig 4.1 CW Glen Innes Wind Farm

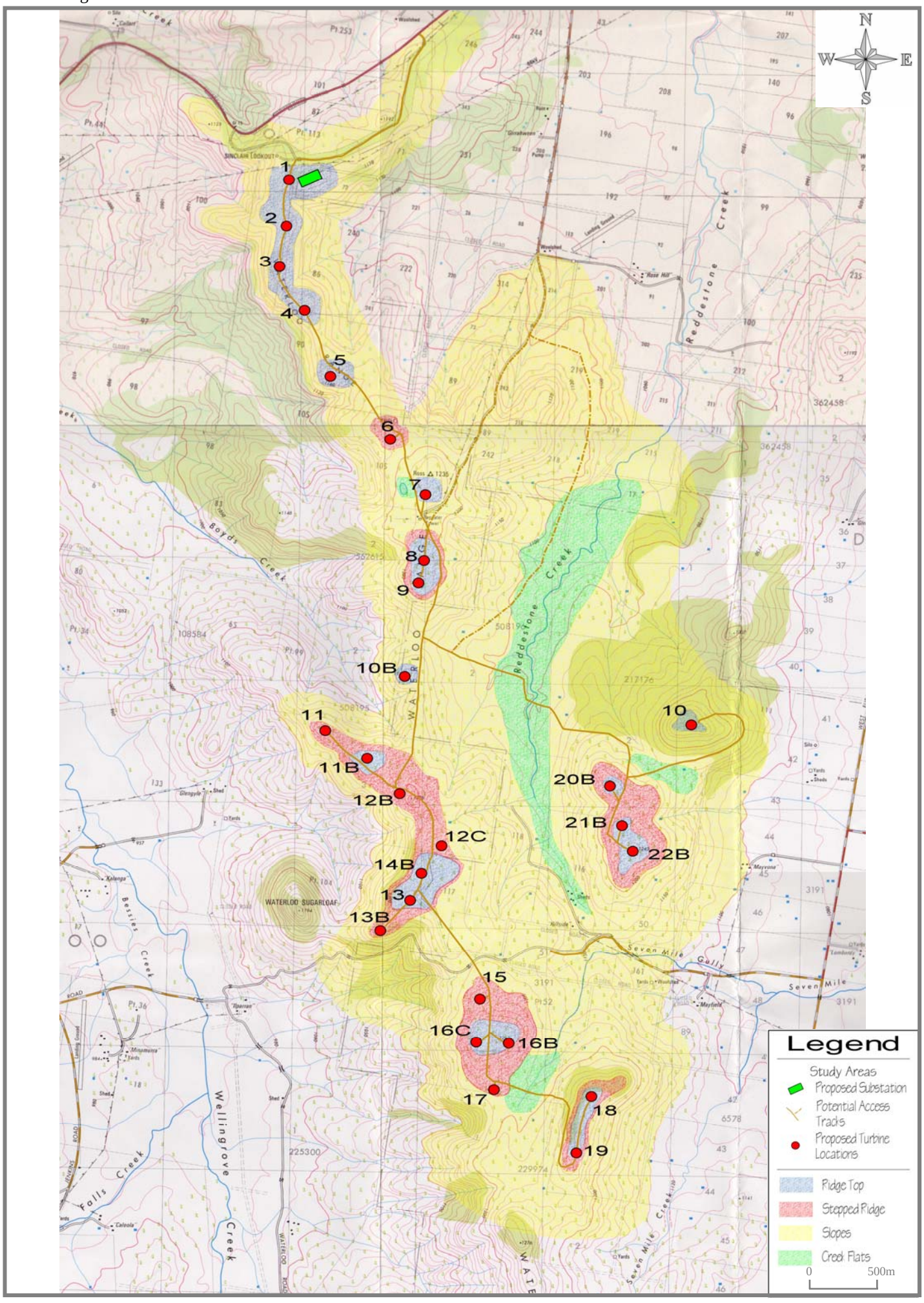


Figure 4.1 Landforms across the study area

Source: 1:25 000 Topo Series, Glen Innes & Stonehenge

access roads and routes for underground cables across the site were also surveyed.

Fourteen survey units (SU's) are described below and illustrated in *Figure 4.2.*

SU1

This survey unit in the southern part of the survey area consists of turbine sites 16, 16B and 16C. Turbine sites 16B and 16C were proposed as possible alternatives to site 16. The SU is located on a large, grass-covered, flattened ridge top with a small hillock on the south eastern side. Basalt boulders and rocks are exposed around the edge of hill. Beyond the ridge top, slopes are steeply inclined to the east and west but slope more gently to the north and south where the access tracks will be located.

A dirt track accesses the site from site 15 (SU 4) to the north, exiting to the south down the other side of the hill, providing access to sites 17 (SU2), 18 and 19 (SU3). A second disused, steep track runs down slope to the west. Disturbances included vehicle tracks, sheet wash and erosion, land clearing and cattle grazing.

Vegetation consists predominantly of grass covered slopes and crest, with some small shrubs and trees just below the hill top. Visibility was fair.

SU2

This survey unit consists of a small valley between the ridge on which turbine sites 16, 16B and 16C are located and the ridge where turbine sites 18 and 19 are located. It includes turbine site 17 and the access road to the southern turbines.

The access road across this valley follows an existing farm track that leads down the southern side of the hill where turbine sites 16, 16B and 16C (SU1) are located, past site 17, then across a creek to the east and along the western base of a ridge in a southerly direction to the base of the southern end of the ridge where sites M3, 18 and 19 (SU3) are located.

Turbine site 17 is located on a stepped ridge, and part of a broad flattened area above the creek line. This area is grass covered with some trees and shrubs with few basalt rocks and cobbles scattered amongst the grass.

The road way is easily accessible, passing by two dams to the north east of turbine site 17 and crossing an unreliable creek (1st order stream). Disturbances include fencing, dam works, cattle grazing, vehicle tracks and erosion on the lower slopes and in the creek bed. The track follows the base of a ridge which is grass covered and slopes gently uphill, before turning and climbing steeply up to M3, 18 and 19 located along the top of a ridge.

Vegetation on the lower slopes is predominantly short grass with some shrubs. The upper slopes are treed with some shrubs, and the ridge top has tussocky grass amongst the basalt rocks with wind resistant shrubs and some trees.

MCH: fig 4.2 CW Glen Innes Wind Farm

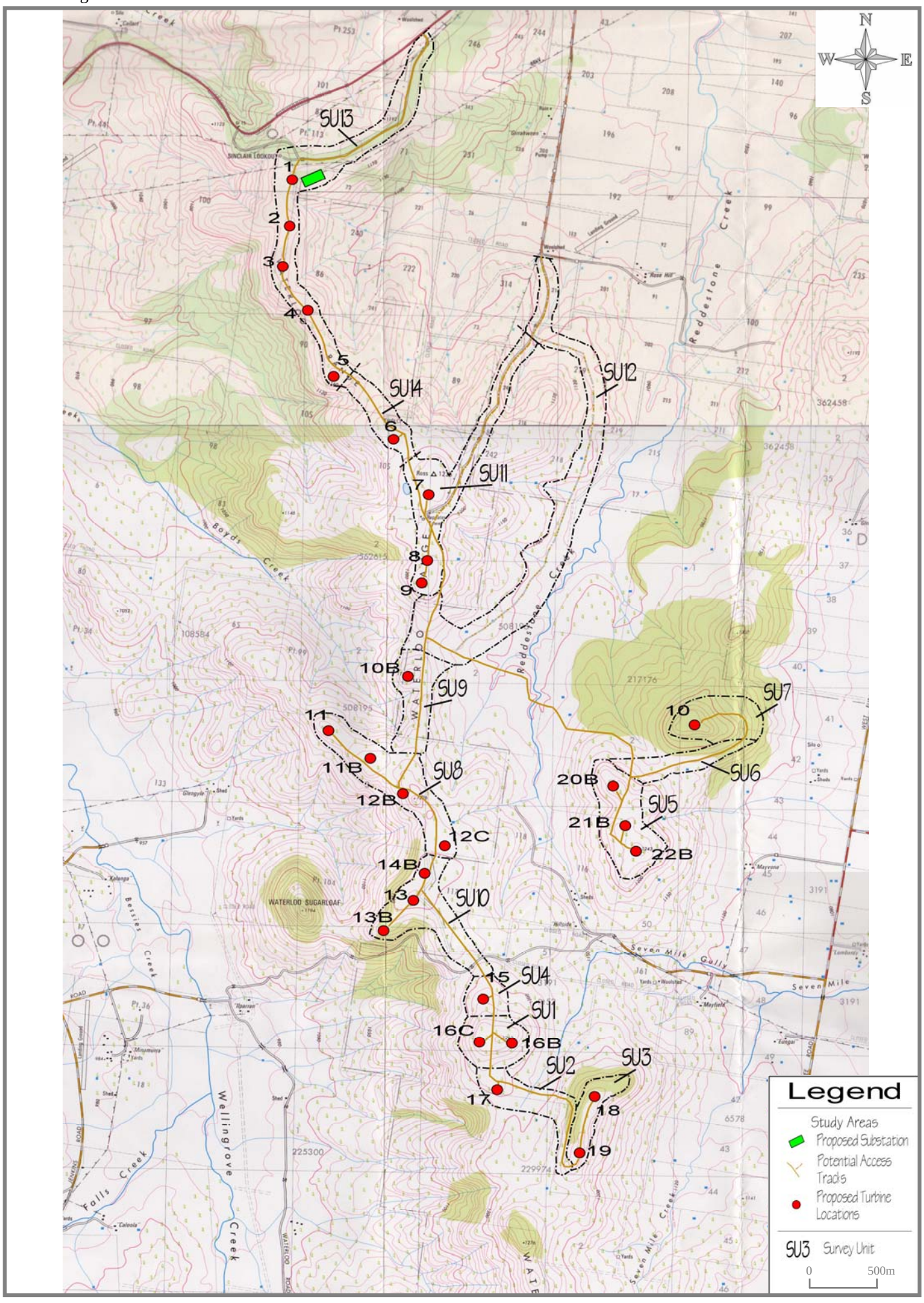


Figure 4.2 Survey Units across the study area

Source: 1:25 000 Topo Series, Glen Innes & Stonehenge

Visibility overall was good particularly along the length of the track and in the eroded creek bed.

SU3

This survey unit comprises a ridge top and stepped ridge incorporating monitoring mast M3 and turbine sites 19 and 18. M3 is located on a flattened grass covered stepped ridge to the south of the ridge top. Turbine site 19 is located on the top of the ridge to the north of M3. Turbine site 18 is located toward the northern end of the ridge top. The area extending to the grass-covered stepped ridge (bench) to the north east of turbine site 18 was also surveyed. The ridge is flat at the top with extensive areas of exposed basalt rock and the edges of the ridge are ringed by basalt boulders.

Disturbances include erosion, monitoring tower works (M3), land clearing and cattle grazing.

While the ridge top has been cleared, the flanks of the ridge line are treed with some wind resistant shrubs and tussock grass in the flat basalt rock exposures. The areas below the basalt rocks are grass covered. Visibility was good at the top of the ridge and fair in the flat grassy areas.

SU4

SU4 consists of the access road between turbine site 16 and site 15 down slope to the north, and the flat stepped ridge area comprising site 15. The road follows a grassy track gently down hill past cattle yards to the west, crosses a drainage line and meets both the Hillside Road from the east of the survey area (across Seven Mile Gully to Cherry Tree Road and East Furracabad Road and the proposed access road to turbine sites 13 and 14 (SU10).

Turbine site 15 is a flat, grass-covered area located directly to the south of some cattle yards. There are a few basalt cobbles lying on the surface, which have probably eroded down hill from turbine 16. There is a large stand of trees to the north of the site.

Disturbances include fencing and cattle yard works, land clearing, cattle grazing and vehicle tracks.

Vegetation consists predominantly of grasses and open woodland on the slopes. Visibility was good particularly along the length of the track and fair in the flat grassy areas.

SU5

SU5 is an extensive ridge line comprising turbine sites 20, 20B, 21, 21B, 22 and 22B and monitoring mast M2. Turbine sites 20B, 21B and 22B were proposed alternative locations to sites 20 to 22. The survey area was accessed by 4WD vehicle from Hillside Road along the upper part of Reddestone Creek. This

track went northward and to the west of the ridge along an existing farm track, past farm buildings and dams, before turning to the east at the northern end of the ridge up to a saddle. From the saddle, the approach continued up the steep northern slope of the ridge where turbine sites 20B to 22B are located.

The access road was traversed on foot from the northern end of the ridge along the top to turbine sites 21, 21B, 22 and 22B and monitoring mast site M2. Site 21 is located close to the ridge top on a stepped ridge above a gently sloping saddle. The other sites are located on a broad, flat, grass covered area along the crest of the ridge. Extensive areas of exposed flat-lying basalt rock occur on either side of the ridge. The southern edge of the ridge close to M2 and turbine 22 is ringed by basalt boulders.

Turbine sites 20 and 20B are located to the north west of turbine 21 across a small saddle. Turbine site 20B is located on the grass-covered, flat area at the top of the hill and there is a stepped ridge to the south west where site 20 is located. The site area is ringed by basalt boulders to the edge of the flat area with mature trees surrounding the ridge top area.

Access to turbines 21, 21B, 22, 22B and M2 is from a junction with the access road to turbine 10, up a relatively steep inclined slope. There is easy access between the sites along the broad gently sloping flank of the ridge as well as along the top of the ridge.

Disturbances include monitoring tower works (M2), land clearing, fencing, water pipes, cattle grazing and vehicle tracks.

The survey area consists predominantly of grasses and open woodland on the slopes. Visibility was fair.

SU6

SU6 commences at a saddle to the south of turbine site 10 and follows a grassy track across the upper end of a creek bed (1st order stream) which is a tributary of Reddestone Creek, through a locked gate and then north eastwards around the hill and up the steep slope to site toward site 10.

An isolated artefact (GIWF 1) was located on the surface close to the base of the saddle between the turbine group of 20 – 22 and the ridge where turbine 10 is located. The artefact appears to be an axe head and is manufactured from basalt rock which is local to the area. It was lying on the surface and does not appear to be in situ, and may have been washed downhill.

The track following the contour lines upslope to turbine 10 is extremely steep and slippery. Access commences on the southern slope and approaches the top of the hill from the north east.

Disturbances include vehicle tracks, erosion, fencing and dam works, land clearing, erosion control works and cattle grazing.

Vegetation consists predominantly of grass covered slopes and crest. There are some trees on the upper slopes and thick scrub below the hill top. Visibility was fair.

SU7

This survey unit includes turbine site 10 and the upper part of the existing farm track leading up to turbine site 10. The SU is located on a large, grass-covered, flattened ridge top. Basalt boulders and rocks are exposed around the edge of hill. The slopes from the hill are steeply inclined on all sides.

The access road climbs uphill bypassing a dam and forms an unstable muddy track accessing turbine site 10 on the north eastern flank. Disturbances include erosion control works, vehicle tracks, erosion, land clearing and cattle grazing.

Vegetation consists predominantly of grass covered slopes and crest, and the area is heavily treed on the upper slopes with some small shrubs and trees just below the hill top. Visibility was good particularly along the length of the track and fair in the flat grassy areas.

SU8

SU8 comprises turbine sites 11, 11B, 12, 12B, 12C, monitoring mast M4 and the access road to and between these turbine sites. SU8 lies in the western section of the survey area and is located along a stepped ridge line extending in a north westerly direction. The ridge line is typically flat with two prominent basalt-capped hillocks located between site 12B and 12C. The access to ridge traverses a grass covered slope from turbine sites 15 following a farm track (SU 10).

Turbine sites 12C and 12B were proposed as alternatives to turbine site 12 which was unsuitable as it coincided with a steep rocky hillock. Turbine site 12C is located in a paddock on flat, cleared ground directly to the south of the smaller of two rocky hillocks and also on a ridge between Wellingrove Creek Valley and Reddestone Creek Valley. The area is currently used for grazing cattle. Turbine site 12B is located to the north west and close to M4 and the original turbine site 12. The proposed access route between 12C and 12B follows the line of the ridge bypassing the small hillock on its eastern flank.

Turbine site 12B is on flat ground to the north of M4 and is located near the base of the larger of two basalt-capped hillocks. Basalt boulders and cobbles cover the slopes and have probably eroded down hill from the hillocks.

Turbine sites 11B an additional proposed turbine sites is on another flat area to the north west of 12B. Access to turbine sites 11 lies at the end of the ridge to the north west following an existing farm track.

Turbine site 11 is located on a small flat area at the north western end of the ridge. The area is strewn with basalt boulders, with a fallen tree at the north western tip and a heavily treed area including a Kurrajong Tree to the south east.

There is some erosion and disturbances include land clearing, monitoring tower works, fencing works, cattle grazing and vehicle tracks.

The survey area is grass covered with open woodland. Visibility was generally good to fair.

SU9

An additional turbine site 10B is visible to the north east of turbine site 11 and lies on the eastern side of Boyds Creek across a fairly steep sided valley. SU9 comprises the main access along the western ridge continuing from near turbine site 10B (on the western ridge) and heading south toward turbine sites 12B and 11B and sites further south. The proposed access to turbine sites 12B and 11B approaches from a small saddle between the ridges where the turbines are located. Access to turbine site 10B is by a short climb up a gentle slope on the western side of the main access route along the western ridge. Most of the proposed route follows open grassy areas along the western ridge.

The small hill top at turbine site 10B is relatively flat and has several outcrops of basalt near the top. Turbine sites 1 to 9 lie to the north of 10B and there are two proposed access routes to reach turbine site 10B and the more southerly turbines from the north. One proposed route lies directly north across the saddle between turbines sites 10B and 9. The descent from the ridge where turbine site 9 is located is fairly steep and would involve some extensive road building works on the eastern flank of the ridge below turbine sites 9 and 8 (SU11). The other route approaches from a north easterly direction, following the lower flank of the valley cut by Reddestone Creek (SU12). This access route would be reached from Rose Hill Road.

Disturbances include erosion, fencing works, vehicle tracks, cattle, deer and kangaroos. Visibility across this SU was fair.

SU10

Turbine sites 13B, 13 and 14B, the access road between these turbine sites and the access road from these turbine sites to 15 comprise SU10. Turbine site 14B is located in a large, flat, grass-covered, open woodland area to the south of turbine site 12C. The area is currently used for cattle grazing. The land rises gently from the south west from turbine sites 13B and 13 to 14B, and then levels out to turbine site 12C. The proposed access route between these turbine sites is across the grassy slope. There are some basalt rocks at the southern end of the ridge where turbine site 13B is located.

Turbine site 13B at the south western end of the ridge is reached by crossing a small saddle from turbine site 13. This hill top is covered with basalt boulders and some flat lying basalt and has some grass and scrub cover. Trees line the edge of the turbine sites. The proposed access route to turbine site 15 roughly follows an existing farm track from turbine site 13 across the paddock, down a

gentle slope, across a drainage line at the base of the slope and then upslope to turbine site 15 to the south west of the cattle yards.

The lower part of the route crosses marshy land which is waterlogged and extremely disturbed. In places, road base has been placed along the farm road to allow access. Other disturbances include land clearing, fencing works, vehicle tracks and cattle grazing.

Vegetation is predominantly native grasses over this extensive, flat grassed area with some small shrubs and trees generally to the west of the ridge. The slopes are open woodland and grass covered. Visibility is good to fair.

SU11

SU11 consists of turbine sites 7 to 9 and the access to and between these turbine sites. Rose Hill Road, an existing dirt and gravel farm road, provides an alternative access to these turbine sites. Turbine sites 8 and 9 are located along a ridge top directly to the south of turbine sites 7 which is on a hilltop close to the farm road. There are fractured, weathered basalt rocks at the northern end of the ridge and some basalt boulders and cobbles cover the slopes. Extensive drainage and erosion control works are evident on the southern and eastern flank of the ridge.

Turbine site 7 is located in a large flat grassed area at the top of a hill to the west of Rose Hill Road. At the base of the hill are extensive dam and water pipe works. On top of the hill, building works include a trig station and a small building and tower, and at the base of the hill is another building and repeater station.

Access between turbine sites 8 and 9 is along the top of the grass-covered flat ridge top and the access between these turbine sites and turbine sites 7 will probably be from the existing farm road or across the grassed saddle between the ridge top and the hill.

The most direct way to reach turbine site 10B and the southern turbines from the north was also surveyed. The route lies directly south across the valley from turbine sites 9 to 10B. The proposed access route from the north continues the access from turbines 1 to 6 and, follows the eastern flank of turbine sites 8 and 9 along existing erosion control lines and then descends on to a saddle on the western ridge line. This route is fairly steep and could involve some extensive road building works on the eastern flank of the ridge below turbine sites 9 and 8. The area is heavily disturbed by erosion, sheet wash and vehicle tracks.

Disturbances include deer farming, cattle, erosion control and drainage works, dams, fencing and building and road works.

Vegetation is thick grass with some shrubs and trees to the east and visibility was good.

SU12

An alternative route for access to the southern turbine sites from the north is from Rose Hill Road to the gate to the south of the woolsheds and then along the Ross Hill access track for a distance of about 500 metres. From this point, the potential route crosses an unnamed creek and a paddock to the east and then turns to the south. The route bypasses a gravel quarry and dam and then follows the line of the valley cut by Reddestone Creek above the creek flats. A number of unnamed creeks flow through this area and several alternative crossings were surveyed. It was determined that access was easiest lower down the slope following existing farm tracks. This proposed access route joins the preferred route in the saddle on the western ridge between turbine sites 9 and 10B.

There are scattered basalt boulders and cobbles eroded from the higher ground above. The area has been severely disturbed by farming practices, erosion and livestock. Cattle and sheep tracks cover the area. There are stands of trees along creek lines, and the slopes are grassed with extensive eroded areas. Creeks and creek banks are also severely disturbed and erosion control works follow the line of the valley.

SU13

SU13 comprises the proposed access along the old highway alignment to the northern part of the wind farm including turbine sites 1 to 5, monitoring mast M1and the proposed substation.

The former highway alignment is accessed by a gate adjacent the Gwydir Highway. The entry area is severely disturbed by road construction works, Council stockpiles and the transmission line. A temporary construction office and concrete batch plant may be established close to the entrance to the wind farm. This area would include a small office and meal room, amenities and parking and storage area.

The former highway alignment forms a corridor between trees alongside the road. Access from the former highway alignment to the proposed substation and turbine sites is through a locked gate.

The area comprising turbine sites 1, M1 and the proposed substation is heavily disturbed from transmission line and monitoring tower works. The proposed substation turbine sites, turbine sites 1 and M1 are in an extensive flat grassed area with few trees and no shrubs.

Turbine sites 1 to 5 extend in a south to south easterly direction along a long stepped ridge.

Turbine site 2 is to the south east of M1 and is also flat, grassed and treed on the eastern side.

Turbine site 3 is along the ridge to the south close to a fence line. Turbine site 4 is to the south east of turbine sites 3 and access is across a small saddle. The turbine site is at the top of a hill and is covered with some boulders and cobbles. The area is treed to the west.

Turbine site 5 is to the south east of turbine sites 4 across a small incised valley. The access follows a farm track down slope from 4, along the line of the valley and up the north facing slope to an extensive flat area at the top. This area is also covered by basalt boulders and cobbles.

The ridge and slopes have been cleared and disturbances include cattle, fencing works, vehicle and livestock tracks.

The land undulates gently with gently inclined slopes. The top of the ridge is generally flat and grassed with few trees and shrubs. Visibility is good.

SU14

SU14 consists of the access route between turbine site 5 and turbine site 6, the area comprising turbine site 6 and the access route to turbine sites 7. The access route from turbine site 5 to turbine site 6 follows a farm track, crossing through several paddocks and cattle yards. Turbine site 6 is on a gently sloping flat area to the north west of and at a lower level than turbine site 7. The area has undergone extensive land clearing. The main access route continues south to the west of turbine site 7 following an existing farm track which crosses a gently sloping paddock to the base of the hill close to a large dam.

Disturbances include vehicle tracks, dam works, cattle yard and fencing works. The road follows a gently sloping grassy track and crosses several fenced areas.

The land is gently sloping and is generally grassed with few trees and shrubs. Visibility is fair.

4.4 EFFECTIVE COVERAGE

Effective coverage is an estimate of the amount of ground observed taking into account local constraints on site discovery such as vegetation and soil cover. The effective coverage for the study area was determined and *Table 4.1* details the visibility rating system used.

Table 4.1 Ground surface visibility rating

Description	GSV Rating %
Very Poor – heavy vegetation, scrub foliage or debris cover, dense tree of scrub cover. Soil surface of the ground very difficult to see.	0-9%
Poor – moderate level of vegetation, scrub, and / or tree cover. Some small patches of soil surface visible in the form of animal tracks, erosion, scalds, blowouts etc, in isolated patches. Soil surface visible in random patches.	10-29%
Fair – moderate levels of vegetation, scrub and / or tree cover. Moderate sized patches of soil surface visible, possibly associated with animal, stock tracks, unsealed walking tracks, erosion, blow outs etc, soil surface visible as moderate to small patches, across a larger section of the study area.	30-49%
Good – moderate to low level of vegetation, tree or scrub cover. Greater amount of areas of soil surface visible in the form of erosion, scalds, blowouts, recent ploughing, grading or clearing.	50-59%
Very Good – low levels of vegetation / scrub cover. Higher incidence of soil surface visible due to recent or past land-use practices such as ploughing, grading, mining etc.	60-79%
Excellent - very low to non-existent levels of vegetation/scrub cover. High incidence of soil surface visible due to past or recent land use practices, such as ploughing, grading, mining etc.	80-100%
Note: this process is purely subjective and can vary between field specialists, however, consistency is achieved by the same field specialist providing the assessment for the one study area/subject site.	

As indicated in *Table 4.2*, the effective coverage for study area is moderate at24.92%. Dense grass cover and outcrops of basalt rocks hindered visibility and as indicated in *Figure 4.3,* disturbances are moderate and the vegetation was relatively consistent across the study area (Refer to *Figure 4.4*).

MCH: fig 4.3 CW Glen Innes Wind Farm

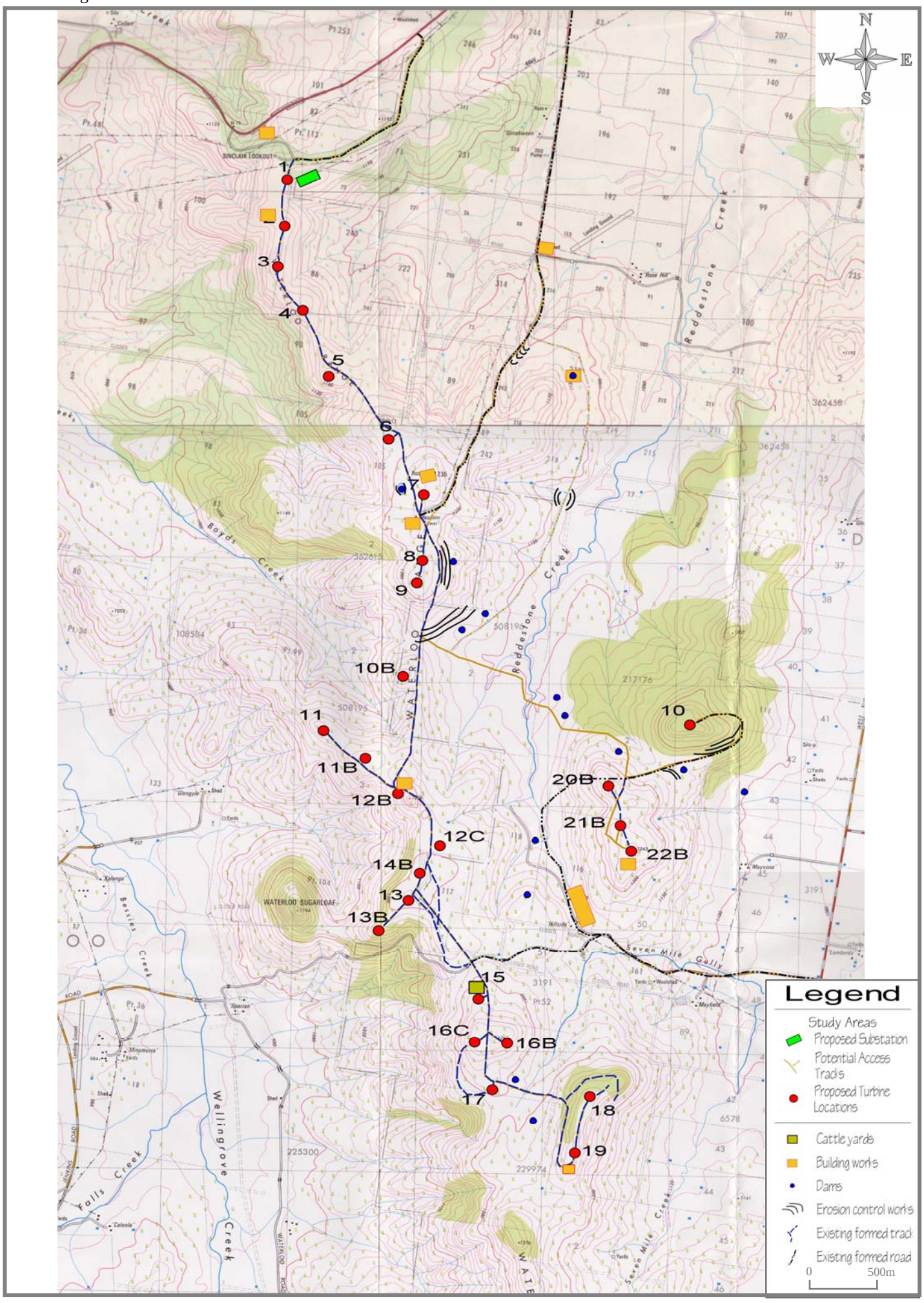
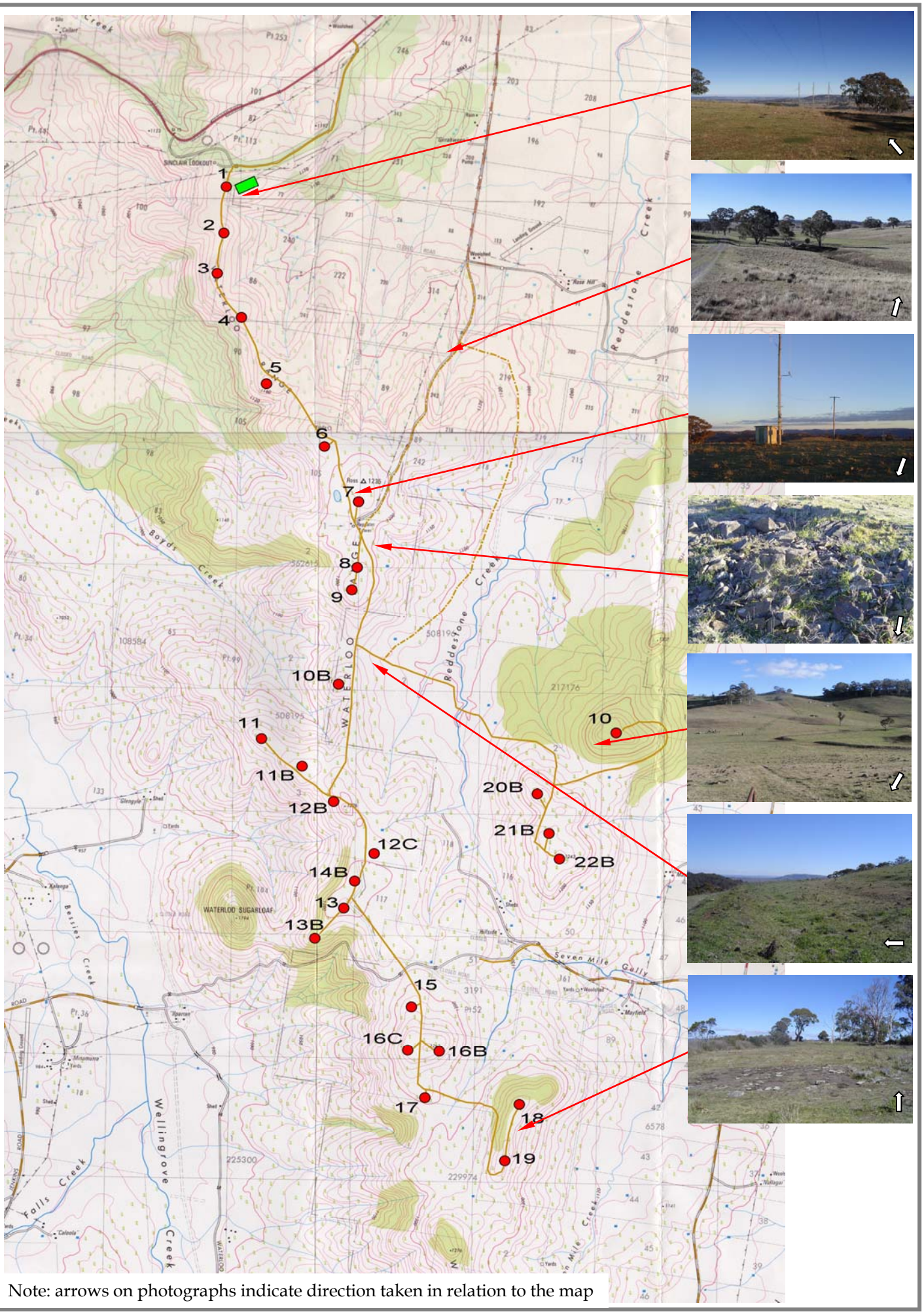


Figure 4.3 Disturbances across the study area

Source: 1:25 000 Topo Series, Glen Innes & Stonehenge

MCH: fig 4.4



Note: arrows on photographs indicate direction taken in relation to the map

Figure 4.4 Vegetation & disturbances across the study area

Source: 1:25 000 Topo Series, Glen Innes & Stonehenge

Table 4.2 Effective Coverage

Survey Unit	Landform	Length	Width	Area (m2)	Vis. %	Exp. %	Exposure type	Previous disturbances	Present disturbances	Limiting visibility factors	Potential Turbine Sites & access	Effective coverage (m2)
1	crest, slope	600	50	30,000	45%	40%	tracks, erosion, rock outcrops	clearing, pastoral	ploughing, livestock, vehicle tracks, erosion	rocks, grass, trees	16, 16B, 16C	5,400
2	slopes, creek	500	50	25,000	55%	55%	gullies, tracks, erosion, dam	clearing, pastoral, fences	dam works, ploughing, livestock, vehicle tracks, erosion, fencing	grass, trees	17; access from 16 to ridge	7,563
3	slopes, ridge, crest	500	50	25,000	50%	40%	tracks, erosion, rock outcrops	clearing, pastoral,, monitoring tower works	ploughing, livestock, vehicle tracks, erosion	rocks, grass, trees	18, 19, M3; access along ridge	5,000
4	slopes, creek	800	50	40,000	55%	35%	cattle yards, tracks, erosion	clearing, pastoral, fences	cattle yard works, ploughing, livestock, vehicle tracks, erosion, fencing	grass, trees	15; access from 16 to 15	7,700
5	slopes, ridge, crest	700	50	35,000	45%	40%	tracks, erosion, rock outcrops	clearing, pastoral,, tower works, fences	pipe lines, fencing works, ploughing, livestock, vehicle tracks, erosion	rocks, grass, trees	20, 20B, 21, 21B, 22, 22B, M2; access along ridge	6,300
6	slopes, creek, drainage line	800	50	40,000	45%	40%	tracks, erosion, sheet wash, dam	clearing, pastoral, fences	dam works, ploughing, livestock, vehicle tracks, erosion control	grass, trees	GIWF Site 1; access from eastern ridge to 10	7,200
7	crest, slopes, creek, drainage line	600	50	30,000	55%	55%	tracks, erosion, sheet wash, dam	clearing, pastoral, fences, dam works, bridge works	dam works, ploughing, livestock, vehicle tracks, erosion control	rocks, grass, trees	10; access from 10 to base of eastern ridge	9,075
8	slopes, ridge, crest	1400	50	70,000	55%	55%	tracks, erosion, rock outcrops	clearing, pastoral, fences	ploughing, livestock, vehicle tracks, erosion	rocks, grass, trees	11, 11B, 12, 12B, 12C, M4, access along ridge	21,175
9	crest, slopes, creek, drainage line	900	50	45,000	45%	40%	tracks, erosion, rock outcrops	clearing, pastoral, fences	ploughing, livestock, vehicle tracks, erosion, kangaroos	rocks, grass, trees	10B; access from western ridge	8,100
10	crest, slopes, drainage line	1800	50	90,000	55%	55%	tracks, erosion, rock outcrops	clearing, pastoral, fences, dam	dam works, ploughing, livestock, vehicle tracks, road works, erosion	rocks, grass, trees	13, 13B, 14, 14B, access to 15 from ridge	27,225
11	crest, slopes, drainage line	3000	50	150,000	55%	55%	tracks, roads, sheet wash, gully, dam	clearing, pastoral, fences, building	dam works, ploughing, livestock, vehicle tracks, road, erosion control, building	rocks, grass, trees	7, 8, 9; access from 9 to 10B	45,375
12	slopes & crest, creek	4000	50	200,000	55%	55%	tracks, dam, sheet wash, creek & drainage lines	clearing, pastoral, fences, dam, quarrying	dam works, ploughing, livestock, vehicle tracks, road, erosion control, quarrying	rocks, grass, trees	alternative access route to 10B from Rose Hll Road	60,500
13	slopes & crest, creek	700	50	35,000	45%	40%	tracks, erosion, rock outcrops	clearing, pastoral, fences, power lines	grazing, vehicle tracks, erosion control, power line	rocks, grass, trees	Highway alignment, substation, M1, 1 to 5 and access	6,300
14	slopes, creek & flats	4000	50	200,000	45%	40%	tracks, erosion, rock outcrops	clearing, pastoral, fences	cattle yard works, ploughing, livestock, vehicle tracks, erosion, fencing	rocks, grass, trees	6; access from 5 to 6, and 6 to 7	36,000
Totals				**1,015,000**								**252,913**
											Effective coverage %	**24.92%**

4.5 ARCHAEOLOGICAL SITES

An isolated artefact (GIWF Site 1) was located on the surface close to the base of the slope to the south of turbine site 10 and in a saddle to the north of the ridge

MCH: fig 4.5 CW Glen Innes Wind Farm

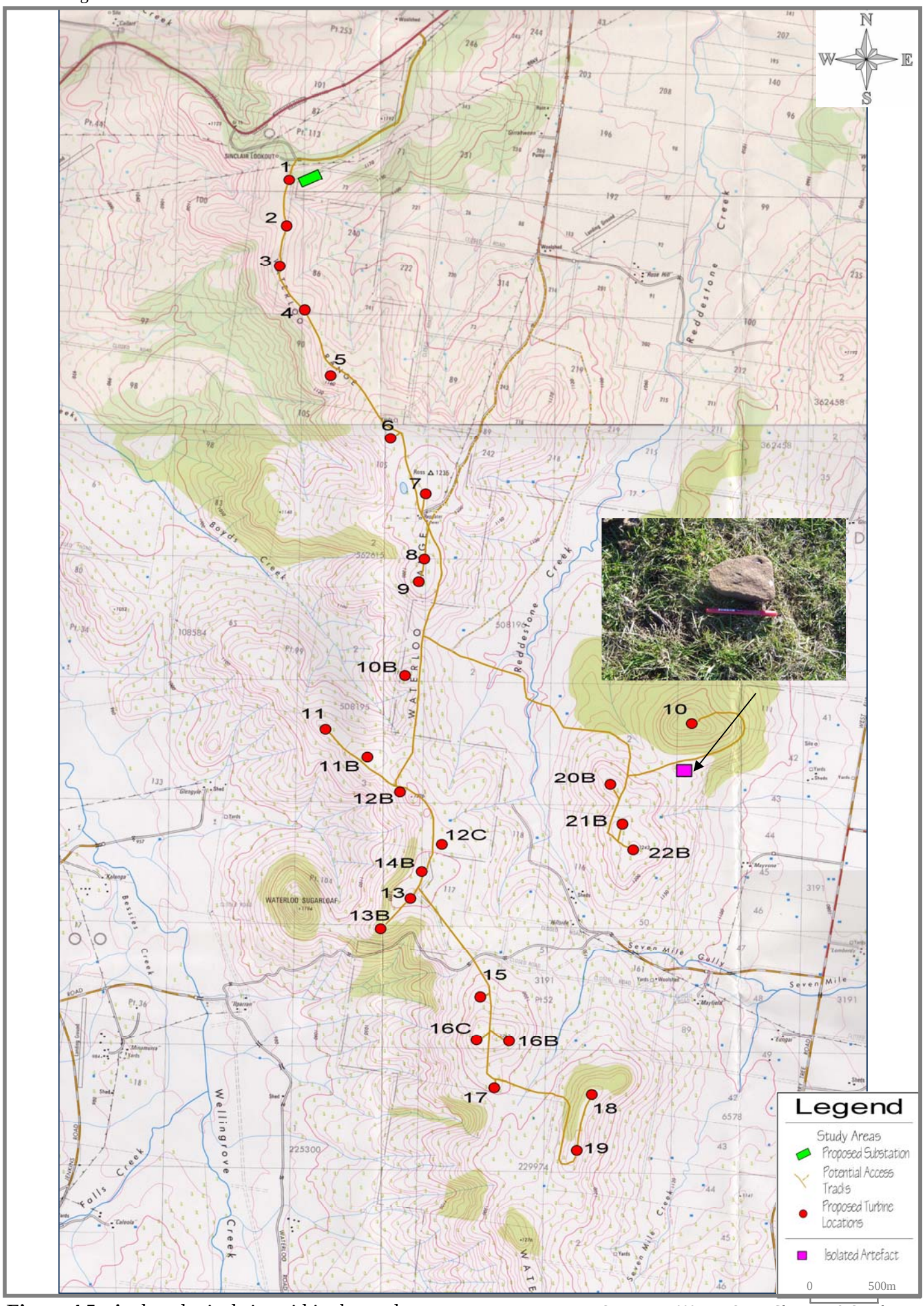


Figure 4.5 Archaeological site within the study area

Source: 1:25 000 Topo Series, Glen Innes & Stonehenge

where turbine sites 20B to 22B are located. The artefact appears to be an axe head and is manufactured from basalt which is local to the area. It was lying on the surface and does not appear to be in situ, and may have been washed downhill (refer *Fig 4.5*).

4.6 POTENTIAL ARCHAEOLOGICAL DEPOSIT (PAD)

The terms 'Potential Archaeological Deposit (PAD)' and 'area(s) of archaeological sensitivity' are used to describe areas that are likely to contain sub-surface cultural deposits. These sensitive landforms or areas are identified based upon the results of fieldwork, the knowledge gained from previous studies in or around the subject area and the resultant predictive models. Any or all of these attributes may be used in combination to define a PAD.

The likelihood of a landscape having been used by past Aboriginal societies and hence containing archaeologically sensitive areas is primarily based on the availability of local natural resources for subsistence, artefact manufacture and ceremonial purposes. The likelihood of surface and subsurface cultural materials surviving in the landscape is primarily based on past land uses and preservation factors.

Regardless of site disturbances, and given the extent and content of sites based on visible artefacts, it is unlikely that subsurface materials will exist in areas of least disturbance across the study area.

No potential archaeological deposit were identified

4.7 DISCUSSION

Sites provide valuable information about past occupation, use of the environment and its specific resources including diet, raw material transportation, stone tool manufacture, and movement of groups throughout the landscape.

Proximity to water appears to have been an important factor in past occupation of the area. The surrounding area contains raw materials that are typically used in the manufacture of stone tools, including basalt, metabasalt, quartz and granite as well as reliable water sources.

The specific study area has undergone both natural and human disturbances, all of which have had an impact on the landscape and associated cultural materials, resulting in a disturbed representation of the archaeological record of past occupation.

The majority of the study area is situated some distance from and above permanent water sources. There are numerous 1st and 2nd order streams throughout the study area and several 3rd order streams to both the east and

west of the survey area. However, due to the distances from water it is not surprising that only one site was identified.

In order to test the hypothesis that sites are expected to be in close proximity to reliable water sources, survey and test excavations would be required along water sources when and if developments occur in those areas in the future.

5 ASSESSMENT OF IMPACTS

The archaeological record is a non-renewable resource that is affected by many processes and activities. As outlined in *Chapter 2*, the various natural processes and human activities may impact on archaeological deposits. *Chapter 4* describes the impacts within the study area, showing how these processes and activities have disturbed the landscape and associated cultural materials in varying degrees.

The impacts of the proposed development, including excavation and construction works, must be considered in relation to the archaeological record in the landscape in order to determine the most appropriate management options.

5.1 IMPACTS

Works typically associated with development include excavation, clearing and construction and road works, landscaping, re-vegetation and associated infrastructure. The impacts of the proposed development must be considered in relation to the archaeological record in the landscape in order to determine the most appropriate management options.

Mitigation measures to minimise these impacts are outlined in the following chapter.

6 MANAGEMENT STRATEGIES

Specific strategies, as outlined in the Aboriginal Cultural Heritage Standards and Guidelines Kit (NPWS 1987), are considered below for the management of identified sites and potential archaeological deposits within the study areas. One of the most important considerations in selecting the most suitable and appropriate strategy is the recognition that Aboriginal cultural heritage is very important to the local Aboriginal community. Decisions about the management of sites and potential archaeological deposits should be made in consultation with the appropriate local Aboriginal community.

6.1 CONSERVATION/PROTECTION

The Department of Environment and Climate Change (DECC) is responsible for the conservation/protection of Indigenous sites and they therefore require good reason for any impact on an indigenous site.

Conservation is the first avenue and is suitable for all sites, especially those considered high archaeological significance and/or cultural significance.

Conservation includes the processes of looking after an indigenous site or place so as to retain its cultural significance and are managed in a way that is consistent with the nature of peoples' attachment to them.

No sites have been identified at this time that would warrant conservation.

6.2 FURTHER INVESTIGATION

When a site is identified but its extent, the nature of its contents, level of integrity and/or its significance cannot be adequately assessed through a surface survey, subsurface testing can be an appropriate strategy to further assess the site to determine its extent, nature, content, integrity and significance.

Subsurface testing is also appropriate where artefact deposits are predicted to occur in a Potential Archaeological Deposit (PAD) based on a predictive model. Subsurface testing can identify whether such deposits exist, their nature, extent, content, integrity and significance.

Test excavations can include either or a combination of auger holes, shovel test pits, mechanically excavated trenches or surface scrapes. The method of subsurface testing is determined by the terrain, vegetation cover, disturbances, available time, expected deposit and discussions/consultation with the local Aboriginal community.

A Section 87 Preliminary Research Permit is required from DECC to undertake the testing.

No PAD's or sites with subsurface potential were identified, and as such a s87 is not required.

6.3 MITIGATED DESTRUCTION

Mitigated destruction is considered when a site is of significance within a local context and the options for conservation are limited. Additionally, if the surface collection of artefacts or excavation of deposits could provide benefits and information for the Aboriginal community and/or archaeological study of past Aboriginal occupation, a salvage strategy may be considered.

Salvage may include the collection of surface artefacts or systematic excavation of known artefact deposits. Where the option of conservation is not possible, this strategy is the primary means of minimising impacts to Aboriginal heritage from development.

A Section 90 Consent to Destroy with Consent to Salvage from the DECC, is required to undertake such excavations.

A Section 90 Consent to Destroy with Permit to Collect will be required for GIWF 1 if it will be disturbed by the proposed development or construction works.

6.4 MONITORING

An alternative strategy for areas where archaeological deposits are predicted to occur is to monitor development works for cultural materials, predominantly during the initial earth moving and soil removal works. This is the main strategy for managing the possible occurrence of Aboriginal skeletal remains.

Monitoring is also used to identify the presence of artefacts and cultural materials that are important to the Aboriginal community, who may be looking to identify and salvage any materials that were not identified on the surface during the preliminary surface investigation. Monitoring may also include the sieving of a sample of graded/scraped soils.

Monitoring (in preference to sub-surface testing) is not a widely accepted method within the context of scientific investigation as it could result in costly delays to development and late/continued revisions to development plans. However, monitoring when Development Consent is granted can be of great scientific benefit and a benefit to the Aboriginal community. Monitoring undertaken in some circumstances (specifically where there is a possibility of skeletal remains) will enable the correct identification of such evidence (by qualified personnel) and thus ensure the appropriate methods of salvage or protection/conservation are undertaken.

Monitoring is not justified.

7 RECOMMENDATIONS

7.1 GENERAL

The persons responsible for the management of any works on site will ensure that all staff, contractors and others involved in construction and maintenance related activities are made aware of the statutory legislation protecting sites and places of significance. Section 90(1) of the National Parks and Wildlife Act, 1974 states that it is an offence to knowingly destroy, deface or damage, or cause or permit the destruction or defacement of or damage to, an object or Aboriginal place without first obtaining the consent of the DECC.

7.2 SITES

1) A Section 90 Consent to Destroy with Permit to Collect is required for GIWF 1 prior to works being undertaken in those areas; and

2) If any cultural materials are uncovered during works, work in that area are to stop and the DECC and qualified archaeologist notified.

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Annex A

Aboriginal group's Reports / Letters

No report or letter provided by Glen Innes Local Aboriginal Land Council