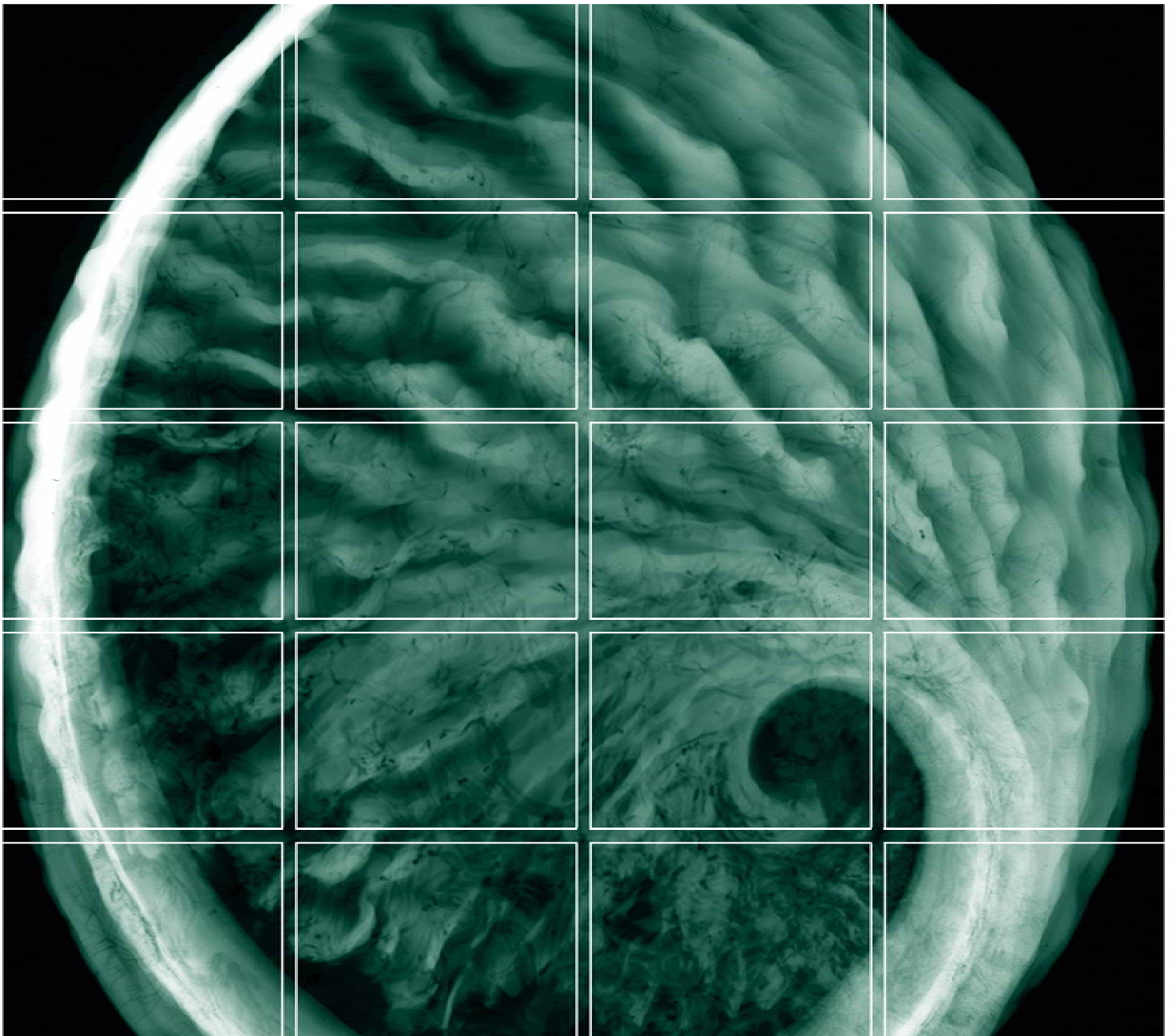


Annex N

NRE Wongawilli Colliery  
Aboriginal Heritage  
Assessment





# NRE Wongawilli Colliery

## Aboriginal Heritage Assessment—Nebo Area

Gujarat NRE FCGL Pty Ltd

21 June 2010

0097271 04 Nebo Aboriginal Heritage Final

[www.erm.com](http://www.erm.com)

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Gujarat NRE FCGL Pty Ltd

NRE Wongawilli Colliery  
*Aboriginal Heritage*  
*Assessment – Nebo Area*

June 2010

Reference: 0097271 04 Nebo Aboriginal  
Heritage Final

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## **EXECUTIVE SUMMARY**

*Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by Gujarat NRE FGCL Pty Ltd (NRE) to undertake an Aboriginal Heritage Assessment of the Nebo mining area within the NRE Wongawilli Colliery.*

*The surface geology is predominantly a Tertiary volcanic intrusion of the Cordeaux Crinanite. The presence of crinanite across the Nebo study area has implications for the type of Aboriginal sites which could be present, i.e. sandstone based sites less likely to be present. The study area contains a reasonable sized creek and has landforms that would have allowed the area to be easily traversed by Aboriginal people and therefore the study area is likely to contain evidence of Aboriginal occupation and activities, although this evidence is more likely to be in the form of scarred trees, stone artefact concentrations and isolated finds, rather than rock shelters and grinding grooves.*

*The study area was surveyed on foot by the study team and Aboriginal representatives. Owing to the difficult terrain and low ground surface visibility in much of the study area, the survey targeted the location of the previously recorded archaeological site and creek lines.*

*No new Aboriginal heritage sites were located. One previously identified Aboriginal heritage site in the study area (52-2-2247 Dendrobium 5) was able to be relocated.*

*Predictions made by MSEC (2010) indicate that 52-2-2247 Dendrobium 5 is located outside the area of predicted impact and that no subsidence, strain and tilt will occur. As there are no predicted impacts to the Aboriginal heritage site, management and monitoring are not required.*



## INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was commissioned to prepare an assessment of Aboriginal archaeological impact by Gujarat NRE FGCL Pty Ltd (NRE), who is seeking approval for the consolidation and continuation of mining at NRE Wongawilli Colliery in the Southern Coalfields (the 'Project').

The combined leases (Consolidated Coal Lease 766, Mining Lease 1565 and Mining Lease 1596) cover 14,767 hectares (ha) and represent the Project Application Area (PAA). A locality map showing the PAA and the extent of the relevant lease areas is presented as *Figure 1.1*.

Extensive underground mining has been undertaken within the PAA, dating from the early twentieth century, however a substantial volume of high quality coking coal remains along with some thermal coal. NRE is currently mining coal in the Wongawilli seam and a subsidence management plan (SMP) has been approved by Industry and Investment NSW (IIN) to mine Wongawilli seam longwalls 11, 12, 15, 16 and 19 and pillar extraction in area 1 (PE1).

The Project comprises a number of components, which are detailed in ERM 2010 *NRE Wongawilli Colliery Environmental Assessment*. However, this Aboriginal Heritage Assessment (AHA) only concerns possible impacts to Aboriginal heritage arising from underground mining in the Nebo area in the north east corner of the lease area (referred to as the Nebo area).

The Project was determined to be a major project under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Director General's Requirements (DGRs) were issued on 25 March 2010. The Department of Environment, Climate Change and Water (DECCW) has provided supplementary advice appended to the Environmental Assessment Requirements (1 September 2009) for the Project.

ERM's approach to the preparation of the detailed site assessment was based on the following requirements and current best practice guidelines:

- DECCW Environmental Assessment Requirements;
- NPWS Aboriginal Cultural Heritage. Standards and Guidelines Kit (draft 1997);
- Department of the Environment and Climate Change (DECC) *Interim Community Consultation Requirements for Applicants* (2005);
- DECC *Guide to Determining and Issuing Aboriginal Heritage Impact Permits* (2009);
- DECC *Operational Policy: Protecting Aboriginal Cultural Heritage* (2009);

- The *Australia ICOMOS Burra Charter 1999* (Burra Charter); and
- The Southern Coalfields Inquiry (SCI) Report (2008).

## 1.1

### *NEBO STUDY AREA*

The PAA is approximately 15 km south west of Wollongong and 80 km south west of Sydney, within the local government areas (LGAs) of Wollongong and Wingecarribee in the Illawarra region of NSW.

Part of the eastern portion of the lease sits on the Illawarra Escarpment. Within the PAA, the lip of the Escarpment reaches up to 500m Australian Height Datum (AHD) and slopes steeply down to the foothills at approximately 60m AHD. The steep slopes of the escarpment are heavily vegetated. Land directly west of the pit top makes up part of the Illawarra Escarpment State Conservation Area.

The Nebo study area includes the proposed longwalls and a 600 metre lateral buffer (as defined by the Southern Coalfields Inquiry (SCI) (2008)). The area is located 1.5 km south-west of the Upper Cordeaux No. 2 Dam and 1 km west of No. 1 Dam, within Wollongong LGA. The Nebo study area includes a one kilometre length of the west-east flowing Wattle Creek. The proposed Nebo longwalls are arranged in an 'n-pattern' as presented in *Figure 1.2*.

## 1.2

### *PROJECT TEAM*

This assessment was prepared by ERM cultural heritage advisors, Dr. Tim Owen, Dr. Diana Neuweger and Luke Kirkwood. Dr. Tim Owen and Dr. Diana Neuweger prepared the environmental and archaeological background reviews (Chapters 3 and 4). Luke Kirkwood prepared the results of the field survey and impact assessments (Chapters 5 to 8). Christine Allen (ERM Project Manager) and Mike Shelly (ERM Partner) reviewed the report.

Field work was undertaken by Luke Kirkwood and ERM Field Assistant Jakob Ruhl with Illawarra Local Aboriginal Land Council (ILALC) being represented by Richard Campbell and Jay Marsden and Cubbitch Barta representatives (CB) Glenda Chalker and Kristy-Lee Chalker.

### 1.3

#### *REPORT STRUCTURE*

This report is structured in the following way:

*Chapter 2* Aboriginal community consultation undertaken for the heritage assessment;

*Chapter 3* environmental background relating to the study area;

*Chapter 4* archaeological context of the study area, including known and potential heritage sites within and near the study area;

*Chapter 5* survey methodology, results of the field survey and significance assessment of heritage sites located within the study area;

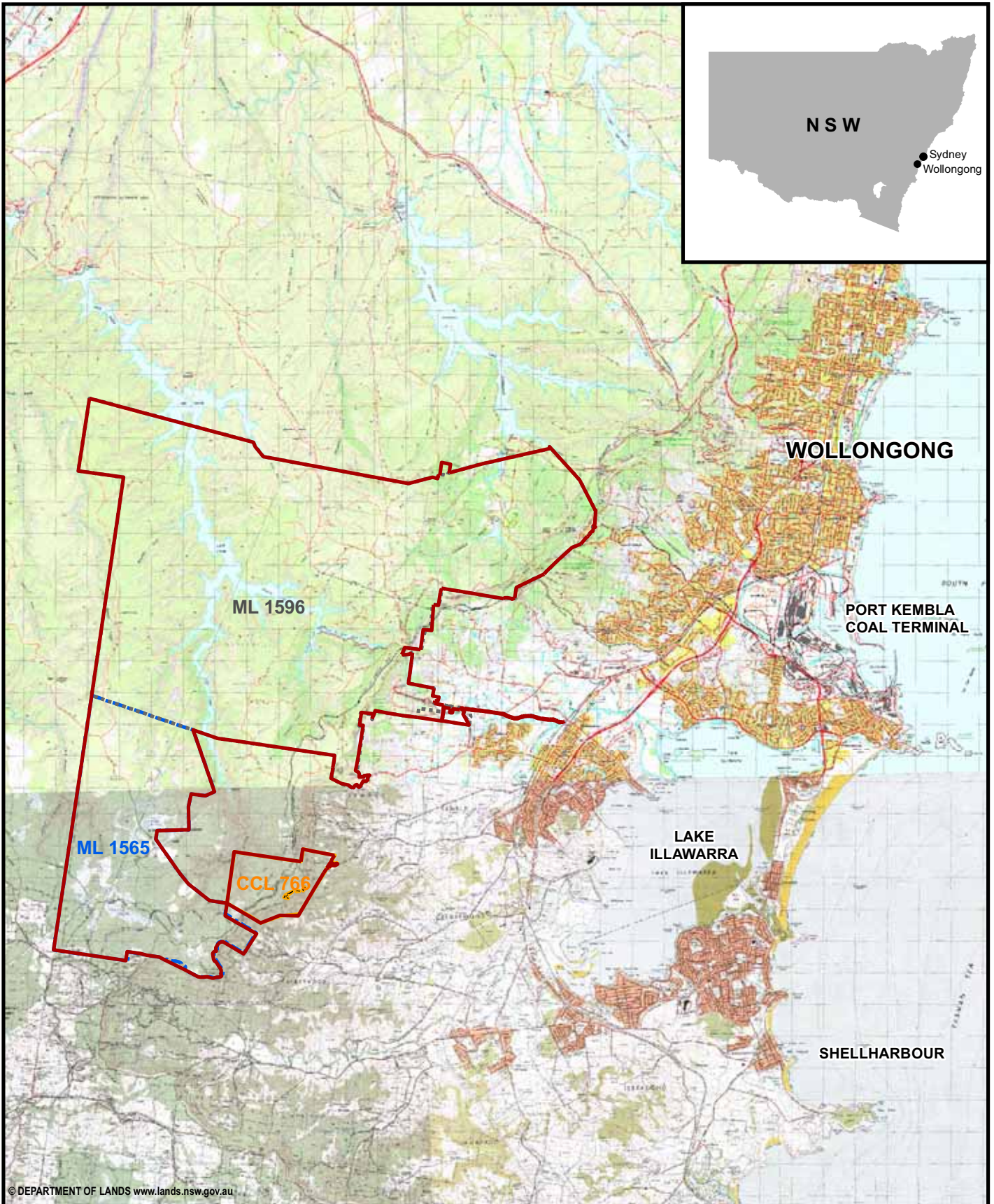
*Chapter 6* significance assessment;

*Chapter 7* impact assessment;

*Chapter 8* conclusion;

*Annex A* log of the stakeholder consultation undertaken for the Project;

*Annex B* detailed survey data recorded during the fieldwork;



**Legend**

 Project Application Area

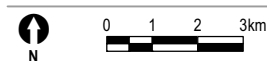
**Coal Titles**

 CCL 766

 ML 1565

 ML 1596

Client:	Gujarat NRE FCGL Pty Ltd	
Project:	NRE Wongawilli Colliery Aboriginal Heritage Assessment	
Drawing No:	0097271s_AHA_GIS001p_R0.mxd	
Date:	18/03/2010	Drawing size: A4
Drawn by:	JF	Reviewed by: MK
Scale:	Refer to Scale Bar	



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**Figure 1.1**  
**Locality Map**

Environmental Resources Management Australia Pty Ltd  
Brisbane, Canberra, Hunter Valley, Melbourne, Perth,  
Port Macquarie, Sydney



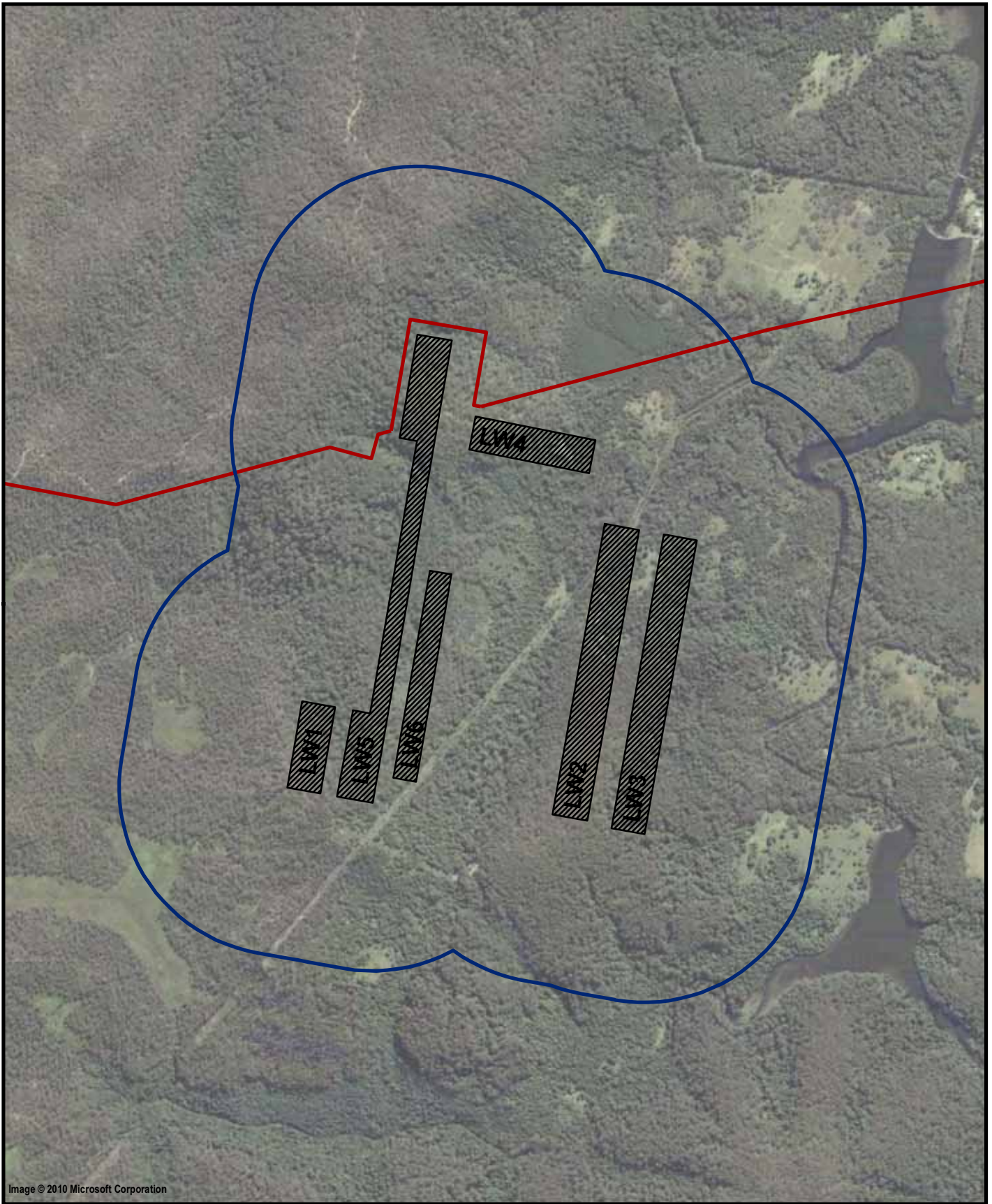





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**Legend**

-  Project Application Area
-  Study Area
-  Proposed Longwalls

**Figure 1.2**  
**Nebo Study Area**

Client:	Gujarat NRE FCGL Pty Ltd	
Project:	NRE Wongawilli Colliery Aboriginal Heritage Assessment	
Drawing No:	0097271s_AHA_GIS002_R0.mxd	
Date:	18/03/2010	Drawing size: A4
Drawn by:	JF	Reviewed by: MK
Scale:	Refer to Scale Bar	

Environmental Resources Management Australia Pty Ltd  
Brisbane, Canberra, Hunter Valley, Melbourne, Perth,  
Port Macquarie, Sydney



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**2.1 BACKGROUND**

This chapter contains specific details of Aboriginal community consultation with regard to ERM's heritage assessment of the Nebo study area.

Community consultation is required for any assessment of Aboriginal heritage. The DECCW adheres to the 'Interim Community Consultation Requirements Guideline' (2005) for Aboriginal consultation in relation to any study that might eventually be used to support an application under Part 3A of the *Environmental Planning and Assessment Act 1979*.

The interim guideline sets out a process for inviting Aboriginal groups to register interest as a party to consultation (including the placing of local press advertisement[s]), seeking responses on the proposed assessment methodology, and seeking comment on proposed assessments and recommendations. The interim guidelines require proponents to allow ten working days for Aboriginal groups to respond to invitations to register, and then 21 days for registered Aboriginal parties to respond to a proposed assessment methodology. Additional time should be allowed for groups to review a draft report and comment on the results and management recommendations.

The Aboriginal community consultation for this Project has been carried out in accordance with the DECCW guideline. The complete log of all communications between ERM and local Aboriginal stakeholders is presented in *Annex A*. This chapter provides a brief overview of the consultation process.

**2.2 ABORIGINAL GROUPS CONSULTED****2.2.1 Initial Consultation**

Letters requesting advice on Aboriginal organisations to be consulted, and any known heritage issues to be taken into consideration in the area, were emailed on 27 July 2009 to:

- the NSW DECCW (Laurel Alexander);
- Registrar, *Aboriginal Land Rights Act 1983* (NSW);
- Illawarra Local Area Land Council (ILALC) (Sharralyn Robinson);
- Native Title Service (Peter Schultz); and
- Wollongong City Council (Joel Thompson).

Phone calls were also placed to each group to discuss the Project. The outcome of this initial consultation was a list of stakeholder groups for the region.

A local press advertisement requesting response from local Aboriginal stakeholders interested in being consulted was placed in the *Illawarra Mercury* newspaper on 27 July 2009. No responses were received from this advertisement.

Eleven local Aboriginal groups were identified:

- Illawarra Local Aboriginal Land Council (ILAC);
- Korewal Elouera Jerrungurah Tribal Elders Council;
- Cubbitch Barta (CB);
- The Wadi Wadi Coomaditchie Aboriginal Corporation;
- Illawarra Aboriginal Corporation;
- The Wodi Wodi Elders Corporation;
- Woronora Plateau Gundungara;
- Wulungu Elders Council;
- Coomadichie United Aboriginal Corporation;
- D'harawal Knowledge Holders; and
- Gandangara Elders Group.

## 2.3

### *REGISTRATION AND CONSULTATION FOR FIELD SURVEY*

Each of the eleven groups were contacted through the instructions and addresses issued by the DECCW, requesting their registration for the Project. The letter (sent by express post) to each group contained details of the Project and the proposed survey methodology. Each group was asked to register in the Project and to provide feedback on the proposed survey methodology.

Registrations were received from the following groups:

- Illawarra Local Aboriginal Land Council; and
- Cubbitch Barta.

Further details of the Aboriginal consultation undertaken for the study area are provided in *Annex A*.

Fieldwork for the assessment was undertaken on 7-9 December 2009 with the following local Aboriginal community representatives in attendance:

- Richard Campbell (ILALC);
- Jay Marsden (ILALC);
- Glenda Chalker (CB); and
- Kristy-Lee Chalker (CB).

These representatives assisted in all aspects of the survey except the documentation. During the surveys, ERM archaeologists discussed the local Aboriginal heritage values and patterning with the community representatives. This provided an understanding of the local perspective for Aboriginal habitation and subsistence patterns; as well as understanding some local intangible values. The representatives' concerns, ideas and theories on the archaeological and cultural heritage values of the study area expressed during the fieldwork were noted. The outcomes of the discussions were agreed upon by all present. The outcomes of this consultation underwrite this heritage assessment.

## 2.4

### *REQUIREMENTS FOR FUTURE ABORIGINAL CONSULTATION*

Copies of the draft final report will be sent to all registered Aboriginal groups for comment and feedback on the content, assessment and recommendations. All comments received from these groups will be appended to this report when received. Any future work relating to the Aboriginal archaeological mitigation should include consultation with the relevant Aboriginal stakeholders.

The purpose of this section is to provide environmental contextual information for use in developing a predictive model of Aboriginal site locations. Interactions between people and their surroundings are of integral importance in both the initial formation and the subsequent preservation of the archaeological record. The nature and availability of resources including water, flora and fauna and suitable raw materials for the manufacture of stone tools and other items had (and continues to have) a significant influence over the way in which people utilise the landscape.

Alterations to the natural environment also impact upon the preservation and integrity of any cultural materials that may have been deposited whilst current vegetation and erosional regimes affect the visibility and detectability of Aboriginal sites and objects. For these reasons, it is essential to consider the environmental context as a component of any heritage assessment.

### 3.1 ENVIRONMENTAL CONTEXT

#### 3.1.1 *Physical Description and Geology*

The study area is located on the Illawarra plateau. The plateau is elevated 500 m above the coastal plain. The landscape of the plateau is incised with deep valleys and covered with dense vegetation. The plateau consists predominantly of Hawkesbury sandstone (with some areas eroded to reveal the underlying Narrabeen sandstone). However within the Nebo study area the surface geology is predominantly a volcanic intrusion of Tertiary formation of Cordeaux Crinanite (a coarse crinanite to fine grained analcite dolerite) (*Wollongong 1:250,000 Geological Sheet Series S1 56-9*).

The crinanite is a basalt like intrusion. The main surface outcrop of the crinanite covers a small area (2.5 km [E-W] by 3.5 km [N-S]) and represents a very different geology compared to the surrounding expanse of Hawkesbury Sandstone.

The presence of crinanite across the Nebo study area has implication for the type of Aboriginal sites which could be present, i.e. sandstone based sites will not be present. This geological unit may have been used and/or exploited by Aboriginal people in a different way to the surrounding areas.

### 3.1.2

#### *Landforms*

Landforms across the study area have high relief (the difference in height between the high and low points of the land surface: 567 m [on Wanyambilli Hill] to 370 m [in the eastern reaches of Wattle Creek]) and a modal terrain slope which is moderately inclined (10% to 32%). The result is an erosional landform pattern comprising predominantly of 'rolling hill' (after Speight 1990:36).

This landform pattern is particularly prevalent along the west and eastern boundaries of the study area, above the actual location of the longwalls. The landform between the longwalls can be described as 'undulating hills', given its gently inclined modal terrain slope.

The characteristics of this landform pattern are a series of steep valleys along the western and northern boundary of the study area. Two hills are present: Wanyambilli Hill, the highest local prominence, in the south-west of the study area; and Jacksons Hill (500 m) in the south-east of the study area. The central and eastern portions of the study area contain the undulating hills, which provide flat more easily traversable terrain.

### 3.1.3

#### *Soils*

According to the *Wollongong – Port Hacking 1:100 000 Soil Landscape Series Sheet 9029-9129*, a number of different soil landscape units are located across the PAA. The Warragamba, Bundeena, Hawkesbury and Lucas Heights soil landscapes all occur to the west of the escarpment.

The diversity of soil landscapes and landforms in the PAA means that the soil has variable properties. Soil types within the PAA include yellow and red podzolic soils, lithosols, yellow earths, brown earths, earthy sands, siliceous sands occurring on the escarpment and to the west of the escarpment with dark brown sands, siliceous sands, prairie soils, yellow podzolic soils and heavy clays on lower alluvial flats.

### 3.1.4

#### *Hydrology*

The availability of water has significant implications for the range of resources available and the suitability of an area for human occupation. The study area is located within the vicinity of a significant network of creeks and one river. The water sources that run through the study area are:

- Cordeaux River;
- Wattle Creek; and
- a tributary to Wattle Creek.

Wattle Creek flows directly into the Cordeaux River 500 m east of the study area.

The creeks within the study area are comparable in size and extent to those in the wider area (5km around the study area). The study area is therefore likely to have provided a source of water comparable to the adjoining areas.

### 3.1.5 *Flora and Fauna*

Fertile pockets of clay and shale have allowed rainforests to develop, other vegetation communities include dry and wet sclerophyll forest and hanging swamps. The hanging swamps are able to support moorland species such as sedges, melaleuca and banksia.

Some of the animal species present across the plateau include: large brown hawk, sugar gliders, quail, brown snake, red wallaby, echidna, brush bronzewing, pheasant coucal, platypus, currawong, red bellied black snake, dove, death adder, crow, magpie lark, white throated swift, heath monitor, white cockatoo and pied currawong.

DEC (Undated B: 80-104) state that plants and animals used by the Aboriginal peoples in the Illawarra may have included: maiden's blush, three-veined myrtle, dog wood, water gum, mopoke, silvertop ash, blackbutt, smooth-barked apple, Sydney golden wattle, blackwood, Port Jackson pine, white maple, prickly current bush, rough tree fern, soft tree-fern, prickly tree-fern, giant lily, gymea lily, blueberry ash, messmate, native cherry, native geranium, native mulberry, red devil, mountain devil, paper bark, bracelet honey-myrtle, broad leaved and narrow leaved geebung, five corners, waratah, grass tree. .

## 3.2 *SYNOPSIS OF ENVIRONMENTAL BACKGROUND*

With reference to Aboriginal heritage implications, the Nebo study area is unusual because of its surface geology – the Cordeaux Crinanite. This differs to surrounding areas which contain sandstone formations. The presence of crinanite means that it is unlikely for sandstone bearing sites to have been formed.

Two local high points (Wanyambilli Hill and Jacksons Hill) could have been a focus for Aboriginal activities.

The study area contains a reasonable one river, one creek and has landforms that would have allowed the area to be traversed by Aboriginal people. Therefore the study area is likely to contain evidence of Aboriginal occupation and activities, although this evidence is more likely to be in the form of scarred trees, stone artefact concentrations and isolated finds, rather than rock shelters and grinding grooves.

## 4.1

*REGIONAL ETHNO-HISTORY*

Archaeological studies have confirmed that Aboriginal people have occupied Australia for at least the past 40,000 years (c.f. Allen and O'Connell 2003). This date is frequently challenged with tentative indications that occupation may extend back into the early Pleistocene.

Such early dates for the Sydney basin, and surrounds, have not been established and the earliest occupation dates in the Illawarra area are around 20,000 BP. Scientifically verified dates have been obtained from rock shelters near the Nepean River (14,700 BP; cited in Attenbrow 2002 and Flood 1999); from sites along the current Shellharbour coast (17,000 BP; cited in Attenbrow 2002 and Flood 1999); a rock shelter on Burrill Lake (20,760 BP; Lampert 1971 cited in Flood 1999), and a date of 17,000 BP has been returned from a shell midden site at Bass Point (Steele 2006).

Late Pleistocene dates, obtained from Holocene 'coastal' locations, represent Aboriginal Pleistocene occupation of hinterland locations (sea levels during the Pleistocene were lower than today, with the sea positioned around 16 km further east).

These dates confirm a long history of Aboriginal occupation across the wider Illawarra region. Aboriginal occupation in the region has created an enduring and rich archaeological record. However, historical records relating to Aboriginal culture, at the time of European colonisation, are limited. Individuals, such as Tench (1793) and Matthews (1901) recorded facets of Aboriginal culture and language; albeit often as a secondary component to their primary research or objectives. Others, such as Tindale (1940; 1974), whilst aiming to record Aboriginal culture could, unfortunately, only record a social system which had been much altered during the preceding 150 years. Coupled with the inherent biases of western culture and society, the historical accounts are sometimes incorrect and/or lacking in detail.

However, coupling the available written documents with the archaeological record and oral histories (from descendents of the original inhabitants); allows a picture of Aboriginal society, demography and economy to be developed. The consequential account can be used to assist with interpreting and deciphering Aboriginal sites and their ancient landscape context.

The regional social organisation of the Illawarra Aboriginal groups has been understood from oral histories, early historical accounts and linguistic studies. The tribal group in the Illawarra area, prior to European occupation, was the Wodi Wodi (DEC Undated B; 2005 and Tindale 1974) who spoke a variant of the Dharawal language (Tharawal across the current study area [Mathews 1901:127]). The Dharawal name derives from traditional stories, which tell of arrival near the mouth of Lake Illawarra of people from the north bringing the Cabbage Tree Palm (Dharawal) with them (DEC Undated B: 5).

Groups of Dharawal inhabiting the Illawarra were probably composed of small units (also referred to in the literature as bands/tribes/clans or named groups), comprising individuals who spoke a similar language. A group may have been composed of one or two adult males and their 'wives' and dependants (McDonald 1992). The groups of people undertook localised social interaction between themselves (such as marriage); whilst numerous groups formed larger units (bands or clans) that gathered resources, traded and held regional gatherings (Attenbrow 2002).

Local Aboriginal population density prior to European settlement is not clearly understood (as for most of Australia) and it is believed that Illawarra local groups were decimated early in European history from introduced diseases (Organ 1997). Official European settlement in the Illawarra began in 1816 once a government land survey had been conducted (DEC 2005). DEC states that 'Dr. Charles Throsby moved cattle into the area in 1815 via the Bulli Pass with the assistance of stockman Joseph Wild and two Aboriginal guides (possibly Bundle and Broughton). The first five land grants for the Illawarra were issued in late December 1817' (2005:14).

Settlement in the Illawarra by Europeans had a profound effect on Aboriginal society and economy. Land grants adjacent to the larger fresh water resources, clearance of forests and the commencement of agriculture would have restricted Aboriginal access to food and land. The introduction of exotic plants and animals resulted in a significant alteration to (and prevention of) traditional land care practices (such as bush burning); which in turn impacted the balanced social, political and cultural balance which existed between the Aboriginal groups. The result was enmities between the Illawarra Dharawal speakers and the Bong Bong, Broughton Creek, Kiama and Shoalhaven Dharawal speakers (DEC 2005:16).

The pattern of pre-European Aboriginal society and economy across the Illawarra is far different from that recorded during the nineteenth century. Aboriginal economy across the Illawarra was split with people referring to themselves as 'fresh water' or 'salt water' people; depending on whether they occupied the coastal areas or plateaus and inland river valleys (DEC Undated B: 5). The current study area is on a plateau.

Water, stone, clay, plant and animal resources were the raw materials used by the Illawarra Dharawal people. These materials (such as ochre, silcrete and basalt) were traded with neighbouring groups. Water was a key resource, and whilst plentiful within the flatter landscape adjacent to the coast, could be scarce on the higher plateau. To allow habitation within the plateaux the Dharawal incised sandstone platforms with channels to drain water into carved wells (DEC Undated B: 11).

Resource gathering and patterns of habitation were influenced by the season. Knowledge of food resources influenced the timing for journeys, gatherings and festivals. An intricate knowledge of edible plants, their medicinal uses and practical applications was held by the Dharawal. Artefacts such as spears, shields and canoes were made from timbers, gums and resins. Nuts, feathers, teeth, ochres, animal skins and plant fibres were used to create decorative clothing, cloaks and ornamentation (DEC Undated B: 12).

Extensive use of resources created a visible symbology across a group's landscape (some of which may still remain today). For instance, the Dharawal identified distinct landforms from a distance by the colouring and form of trees (which were sometimes assigned uses by gender); ceremonial areas were defined spatially through carved trees; burials were also marked in such a way. During gatherings, trees were marked to designate camping areas for visiting groups (who may stay for weeks or months) (DEC Undated B: 13). Many uses of natural materials will not have resulted in an archaeological signature, i.e. smoke from leaves was used for communication over long distances or annual indicators observed in plants or animals that told people when they were in season or available. These cultural aspects would have resulted in use of resources, or actions of people, for which there may be a physical record (such as the resulting sites).

### 4.3

#### *LOCAL ARCHAEOLOGICAL CONTEXT*

A literature review of the DECCW library (and additional reports held by ERM) was undertaken to understand the broader region's archaeological patterning. This review was targeted to those reports relevant to the study area. Key word searches were used to find reports for the locality in Aboriginal Heritage Information Management System (AHIMS).

The majority of past Illawarra based heritage studies have concentrated on the coastal and estuarine zones (discussed in Navin Officer 2006). These studies have either been compiled as heritage or impact studies for the development sector or by interest groups.

Previous archaeological research in the Illawarra area suggests that Aboriginal sites are very common along the coastal plain. More recent research, triggered principally by mining related environmental assessment, has started to identify and record Aboriginal sites across the Illawarra's hinterland. Aboriginal sites in this landscape context have been associated with resources, such as food and fresh water.

Archaeological models for Aboriginal Holocene occupation in the Illawarra region have been developed by a number of researchers. Most models suggested ridgelines were used as they provide access routes through the difficult hinterland terrain. Flat areas and saddles were favoured for repeat visits and would have been a focus for occupation activities, possibly resulting in an archaeological signature in these areas.

A brief overview of Aboriginal site types (from the wider recorded pattern in the DECCW's AHIMS) suggests that most Aboriginal sites are lithic sites, rock shelters with art and deposits and grinding grooves. A general connection appears to exist between shallow shelves of sandstone located on the upper reaches of ridgelines, which create small overhangs that were attractive locations to Holocene Aboriginal people.

Of direct relevance to the current report (archaeological content and proximity) are two academic studies (Sefton 1998; McDonald 1994) and five consultants' studies (Saunders 1997, 1998; Biosis 2005, 2007a, 2008a). A further two studies define the observed impacts on Aboriginal heritage sites resulting from long-wall mining (Biosis 2007b, 2008b). A review of these reports is provided below.

Sefton (1988) focused on data collected by the Illawarra Prehistory group, who between 1970 and 1988 recorded hundreds of Aboriginal shelter sites. Sefton's study area comprised 351 km<sup>2</sup> from the Illawarra escarpment (east) to the Woronora River (north), Cataract Catchment (south) and Wallandoola River (west). The outcomes of the work were a higher incidence of recorded grinding grooves in the Georges River Basin than in the Cataract River Basin; suggesting a higher population density in the former. It was noted that rock engravings were found in the same locations as grinding grooves, although a higher incidence of engravings were noted in coastal locations (1988:69).

It was hypothesised that the different pattern of shelters, shelter attributes, shelter locations (inland/coastal) and drainage patterns suggested different settlement patterns and different uses of inland and coastal locations. This archaeological patterning corresponded with the ethnographic record and confirmed the coastal/inland territorial division of the *Tharawal* people.

McDonald (1994) undertook her PhD focusing on prehistoric rock art across the Sydney region. A number of correlations relevant to the current study area (south of the George's River) were drawn including: only 7% shelters with art contained deposits; 28% of shelter sites with deposits also contained grinding grooves; the majority of the art is depictive (66%), stencilled (33%) and only two of the sites (from 181) contained rock engravings; around half (41%) of motifs were unidentifiable (because of rock preservation); of the identifiable motifs, 49% were hand stencils or variants therein, 9% were macropods, 7% anthropomorphs, 6% other land animals. The majority of art was created by charcoal (or other dry pigment) stencilling, a few were painted; barely any used both techniques.

Archaeological excavation of a selection of the shelters (Attenbrow 1987) identified that 90% of the shelters with potential archaeological deposit (PAD) contained archaeological deposits.

The overall findings suggested that there was a major variation between the rock art techniques and motif types between the Woronora plateau and the central and northern areas of the Sydney basin.

Saunders (1997) surveyed four seismic lines in an area west of Lake Cordeaux (the nearest line was 2 km north of the Nebo study area). The surveys included the catchment of Sandy Creek and a major north-south ridgeline. Slopes across the survey were low to moderate. A low number of sandstone platforms, benches and boulders were recorded.

The survey identified one Potential Archeological Deposit (PAD) on a steep lower slope of a long broad spur crest, located within a sandstone shelter. Overall the survey was assessed to have a low archaeological potential because of a paucity of sandstone exposures.

Saunders (1998) surveyed ten kilometres of seismic lines associated with established fire trails (ending 1.5 km north of the Nebo study area). The background review determined that although the survey was associated with a watershed ridgeline the high degree of disturbance resulting from road construction, maintenance and vehicle use had greatly reduced the archaeological potential of the area. This supposition was confirmed through archaeological survey as no Aboriginal sites or PADs were identified.

Biosis (2005) surveyed fire trails from the Cordeaux Dam to Sandy Creek Road (crossing the northern limit of the Nebo study area). The survey identified one new site and one previously recorded Aboriginal site (both stone artefact scatters). The new site was assessed as having a low level of scientific value.

Biosis (2007a) involved survey and assessment of land 3 km to the north of the Nebo study area, between the Cordeaux and Avon Dam. The survey identified 65 Aboriginal sites (50 previously recorded, 40 of which could be re-identified in 2007).

Of the sites identified by this study, 65 were defined by site type comprising: shelters with art (n=35); shelters with deposit (n=13); shelters with art and deposit (n=7); stone artefact scatters (or isolated finds) (n=6); open sites with axe grinding grooves (n=3); and one suspected stone arrangement (2007a: Table 8).

An analysis of the archaeological landscape with reference to Aboriginal site locations was undertaken. It was noted that the rugged 'Hawkesbury sandstone landscape is where the majority of the archaeological sites (sandstone shelters with art/deposit) occur' (2007a: 68). The reason attributed to this patterning was that 'the rugged, broken landscape provides many sandstone features and overhangs that are suitable for Aboriginal use as shelters or places for artistic expression'.

An analysis of the relationship between recorded sites and slope (degrees) showed that the majority of Aboriginal sites (49%) are positioned on moderate to steep slopes (20-25 degrees), 20% are positioned on low slopes (5-15 degrees) and 31% are on steep slopes (30-40 degrees) (2007a: Chart 1). An analysis of art types revealed that the majority were indeterminate motifs (seconded by hand and human motifs) predominantly made from charcoal (2007a: 71).

An overview of the assessment determines that the recorded sites are typical of archaeological sites in the Woronora plateau; with a diversity of site types, motifs on art sites and art techniques. Art sites were in a variety of conditions, but generally charcoal art is poorly preserved. The significance assessment determined that all sites recorded were of high community or cultural significance to the local Aboriginal community. The archaeological significance (considering integrity, connectedness, chronological potential, representativeness, rarity and aesthetic values) defined that most sites were of low scientific significance (n=48) (moderate = 9; high = 7) (after 2007a: Table 9).

Biosis (2008a) undertook an extensive survey for longwall mining across a land area (approximately 3 km by 3 km) situated 1 km west of the Nebo study area. This report followed from prior research and resulted in the identification of 28 Aboriginal sites.

An assessment of likely impacts resulting from longwall mining was undertaken. It was found that the likelihood of significant impacts to *most* Aboriginal archaeological sites situated within the mining area was low, very low or negligible. Six Aboriginal shelter sites were positioned above or close to mining activities; and were under a greater threat of impact. It was summarised that 'larger shelters are more likely to be affected by subsidence movements, as these are naturally more unstable. Monitoring programs have shown that only shelters with internal volumes of greater than 50 m<sup>3</sup>, which are situated directly over a longwall, have suffered impacts from subsidence movements' (2008:1).

Biosis (2009) prepared a Cultural Heritage Management Plan (CHMP) for BHP Billiton Illawarra Coal to manage the cultural impacts of mining subsidence at the Dendrobium Area 3A Mine. A total of fourteen Aboriginal cultural heritage sites were identified within the proposed mining area. It was recommended that only the sandstone shelter sites should be monitored before, during and after longwall mining as these sites were most at risk from serious impact following subsidence events and outlined a monitoring program to accomplish this.

ERM (in production) surveyed the Wonga East and Wonga West mining areas for a proposed expansion of longwall mining operations at the NRE No.1 Colliery owned and operated by Gujarat NRE Minerals. Twenty AHIMS registered sites were identified in the desktop assessment as being potentially located within impact area. A total of 11 Aboriginal sites were identified during the survey. Ten of these sites were previously recorded AHIMS sites. These were comprised of eight rock shelters, one grinding groove site and one artefact scatter. A risk assessment of subsidence pressures on each archaeological site was presented as well as recommendations for monitoring to be conducted prior to, during and after longwall mining.

#### 4.4 *MINING SUBSIDENCE IMPACT ASSESSMENTS*

Of direct relevance to the current study are the impacts from longwall mining subsidence. A number of key reports, by consultants and NSW government, have recently been written on the subject. The following review provides a discussion of longwall mining subsidence. This review will be used to underpin the impact assessment portions of this Report.

Sefton (2000) reported on a ten year monitoring program assessing the impacts of longwall coal mining in the Southern Coalfields on sandstone overhang Aboriginal archaeological sites. Sefton's work inspected and monitored a total of 52 sites, prior to, during and after long wall mining (2000:15). The results of the assessment program (and a principle component analysis using 16 variables) were:

- five of the 52 sites had evidence of impacts resulting from mining (2000: 17-18);
- the impacts from long wall mining could be grouped into four categories: cracking, movement along existing joints/bedding planes, block falls and change to the pattern of water seepage through the rock;
- the components associated with most change were: overhang size (especially length); wetness of the overhang; location near the valley bottom; location above the goaf [that part of a mine from which the mineral has been partially or wholly removed]; and block-fall type shelters;
- no monitored overhang collapsed during the study;

- no monitored overhang less than 50 m<sup>3</sup> has suffered subsidence impacts (irrespective of other risks);
- not all sites larger than 50 m<sup>3</sup> suffer impacts (only five from 23 large overhangs [ $>50$  m<sup>3</sup>] suffered an impact);
- the 'over-riding factor which appears to be significant is overhang size where large overhangs are at greater risk' (2000:38); and
- the impacts caused by subsidence were not observed until at least three months post mining.

Biosis (2007b) undertook a review of the potential impacts to cultural heritage sites in the Dendrobium Area 2 Subsidence Management Plan (SMP) area. A single Aboriginal site (a sandstone shelter with art, AHIMS# 52-2-2252) was located within the project area. This site held moderate significance and was predicted to be subject to a number of subsidence related movement impacts. Site 2252 was located 2 km north of the Nebo study area.

The final aim of the study was to 'assess the impacts of predicted subsidence on identified heritage sites and recommend management and mitigation measures' (2007b:3).

An assessment of potential subsidence to Site 2252 was completed by Mine Subsidence Engineering Consultants (MSEC). The site was judged to be at some risk because of its large size ( $>50$  m<sup>3</sup>), the block fall shelter formation, bedding and jointing planes present, dampness and location directly over a longwall goaf. It was predicted that the site was at some risk from potential impact because of the compressive and tensile strains were enough to deform the rock and the cliff formation containing the site was in an advanced stage of natural erosion (2007b:32).

Biosis (2008b) provides the results from the assessment of post longwall mining subsidence on Aboriginal Site 2252 (see Biosis 2007b). The end of panel assessment for Longwall 3 was undertaken six months post-mining subsidence.

The results of the assessment showed that the site had suffered some damage attributable to subsidence movement. This damage included: the opening of a pre-existing crack at the base of the backwall and the down slope slumping of talus and boulders adjacent to the site. Twenty monitoring points were inspected only one of which had changed. The observed change was a minor additional opening of a pre-existing crack to a width of 10 mm. Soil cracking and displacement of boulders was observed in the front of the shelter (2008b:7).

Southern Coalfields Inquiry (SCI) Report (NSW 2008) is a report from an independent inquiry established because of concerns held by the Government over both past and potential future impacts of mine subsidence on significant natural features in the Southern Coalfield (NSW 2008). The objectives of the report were threefold:

1. to undertake a strategic review of the impacts of underground mining in the Southern Coalfield on significant natural features (i.e. rivers and significant streams, swamps and cliff lines), with particular emphasis on risks to water flows, water quality and aquatic ecosystems; and
2. to provide advice on best practice in regard to:
  - a) assessment of subsidence impacts;
  - b) avoiding and/or minimising adverse impacts on significant natural features; and
  - c) management, monitoring and remediation of subsidence and subsidence-related impacts; and
3. to report on the social and economic significance to the region and the State of the coal resources in the Southern Coalfield.

This report is of importance to Aboriginal heritage as it provides a basic assessment of potential environmental consequences resulting from subsidence impacts on Aboriginal heritage sites.

The summary of the report stated that:

*“Aboriginal heritage sites are most at risk of subsidence impacts where they are located in cliff lines and/or rock overhangs. The Panel was not made aware of any significant impacts having occurred on Aboriginal heritage features in the Southern Coalfield since the 1980s (2008: 2).”*

Chapter 4 of the report (*Subsidence impacts on natural features*) includes a review of the type of impacts that can be expected from mining related subsidence. Several types of subsidence impacts were judged to be relevant to archaeological sites:

- rock falls and cliff collapses;
- surface cracking and exfoliation; and
- water table and/or seepage changes (2008: 77).

It was reported that Aboriginal rock shelter and painted art sites located on valleys and cliff lines had the potential to be damaged by cliff falls or rock falls. Axe grinding grooves and engraved art sites were likely to be exposed to cracking of bedrock or creek side strata.

The conclusion of the panel (2008: 84) determined that the “prediction of the impacts on features of Aboriginal heritage significance is determined, first, by adequate surveys to determine the existence and significance of archaeological or cultural significance... the archaeological sites which are most susceptible to subsidence-induced damage are rock shelters in caves or overhangs, generally associated with cliff lines.”

The discussion relating to impacts on cliff lines (watercourses and valleys) was viewed primarily as ‘non-conventional’ (2008: 82). Therefore the measures of predicting valley closure and upsidence were judged to be the most valuable when determining impacts on these landforms.

Of the two the panel determined that predicted valley closure was the most useful subsidence parameter [2008: 83]. It should be noted that current scientific understanding of nonconventional surface subsidence effects (far-field horizontal movements, valley closure, upsidence and other topographical effects) are not as advanced as effects resulting from conventional subsidence [an opinion reflected in NSW 2009].

Management of impacts to Aboriginal sites arising from subsidence was discussed with the DECC (2008: 109). The outcomes of this discussion were a proposed risk based decision model that was ‘outcome-based and designed to avoid overly-prescriptive requirements’ (2008: 109):

*“DECC has instead proposed an ecological risk-based standard that addresses threatened species, Aboriginal heritage, upland swamps and other features, in addition to rivers and streams. This model is based on both risk management and risk avoidance. High risks are to be avoided; lesser risks are to be managed. DECC considers that clear and objective criteria with defined ‘acceptable limits of change’ are needed.*

*It proposes that this be made operational via a decision model that identifies limits of risk acceptability for identified ecological features and potential subsidence outcomes. The model is based on an ecological risk assessment approach that identifies risk values of ‘High’, ‘Medium’ and ‘Low’ and stipulates management measures of ‘Prevent’, ‘Minimise’ and ‘Proceed with Caution’. In essence, the model establishes qualitative risk standards by ensuring impacts do not exceed a qualitative impact rating. DECC argues that mining companies would then have the flexibility to determine solutions to comply with the required outcomes. DECC stresses that its model is still in its infancy and remains ‘conceptual’ until it can be trialled with mining companies and stakeholders.”*

Metropolitan Planning Assessment Commission (MPAC) report (NSW 2009) assessed the Metropolitan Coal Project, which was the first mining proposal in the Southern Coalfield to be assessed under Part 3A following the SCI report.

The Aboriginal Cultural Heritage Assessment (prepared for the Metropolitan Project Part 3A application) identified 188 Aboriginal heritage sites within the Project Area, of which 142 sites were sandstone overhangs; the remainder were open sites.

The summary presented in NSW 2009 noted that:

*“the subsidence assessments for the [Aboriginal] sites presented in the EA are based on conventional subsidence. There is no analysis of the non-conventional subsidence effects, albeit that some open sites are located in or close to drainage lines and a number of sites are associated with watercourses. The Panel considers that this does not constitute an adequate degree of assessment for an EA.*

*It appears likely that some sites of Aboriginal heritage and cultural significance will be impacted by the Project and approval conditions will therefore need to incorporate provisions for monitoring all highly significant sites for the purpose of comparing predictions of effects and impacts against measured effects and impacts and implementing mitigation and remediation measures where practical. (NSW 2009:v)*

*Monitoring of predicted versus measured effects, impacts and consequences of both conventional and non-conventional subsidence on a range of significant features including watercourses, groundwater, upland swamps, Aboriginal heritage sites and cliff lines (2009: vi).”*

A detailed review of the Aboriginal Cultural Heritage Assessment (ACHA) report is presented in NSW 2009: Chapter 11. The review included a discussion relating to scientific archaeological versus Aboriginal cultural significance assessment and conventional versus non-convention subsidence impacts on Aboriginal heritage sites.

The review found the impact assessment to be insufficient, and recommended the following be implemented for the future studies (after NSW 2009: 99-101):

- a high level of quantification of Aboriginal sites, with detailed descriptions of a site’s shape, dimensions, structure and composition, especially those of higher significance;
- a site specific assessment of high significance sites, having regard to assessment criteria recently adopted in another mining approval (Biosis 2007a, reviewed above);

- an analysis of conventional and non-conventional subsidence effects, impacts and consequences on Aboriginal sites (subsidence prediction should use the prediction of effects to then proceed to accurately predict what impact these effects will have on features of interest [NSW 2008: 78]), using terms that are quantified (not terms such as negligible, very low or low risk); and
- a quantitative link between subsidence impacts and consequences to Aboriginal sites and to the 'back analysis' of actual versus predicted effects and impacts on recorded Aboriginal sites (i.e. the possible inclusion of a monitoring program for all sites of high significance; for the purpose of comparing predictions of effects and impacts against measured effects and impacts and implementing mitigation and remediation measures where practical).

#### 4.5

##### *SUMMARY OF PRIOR ARCHAEOLOGICAL RESEARCH*

The past twenty years have seen a substantial number of archaeological surveys undertaken across the wider escarpment area. These surveys have been primarily undertaken to identify Aboriginal sites which could be affected by sub-surface mining activities.

The intensity of archaeological survey has resulted in the recording of hundreds of Aboriginal sites. In contrast to other areas of NSW, little archaeological excavation has occurred in this region. These approaches have seen the commencement of recording and monitoring programs, aimed at determining the effects of mining primarily on sandstone rock shelters.

Advancements in digital technology will allow these studies to become more refined, with greater precision in monitoring. However, based on the background review, the Nebo study area appears unlikely to contain Aboriginal sites which are suitable for such monitoring, i.e. due to the general absence of sandstone bedrock and absence of sandstone based Aboriginal sites.

#### 4.6

##### *STUDY AREA AHIMS DATA*

A search of the DECCW AHIMS database for an area 5 km by 5 km, with the proposed Nebo longwalls at the centre of the search, was undertaken in August 2009. The results of the search are shown in *Figure 4.1* and presented in *Table 4.1* and *4.2*. The search identified a total of 29 previously recorded Aboriginal sites.

**Table 4.1** *Frequency of Aboriginal sites*

Site Type	Number recorded	Proportion of total
Artefact Scatter	1	3%
Isolated Artefact	1	3%
Axe Grinding Groove	4	15%
Axe Grinding Groove, Shelter with Art	1	3%
Shelter with Art	14	48%
Shelter with Art; Shelter with Deposit	6	21%
Shelter with Deposit	2	7%
<b>Total</b>	<b>29</b>	<b>100%</b>

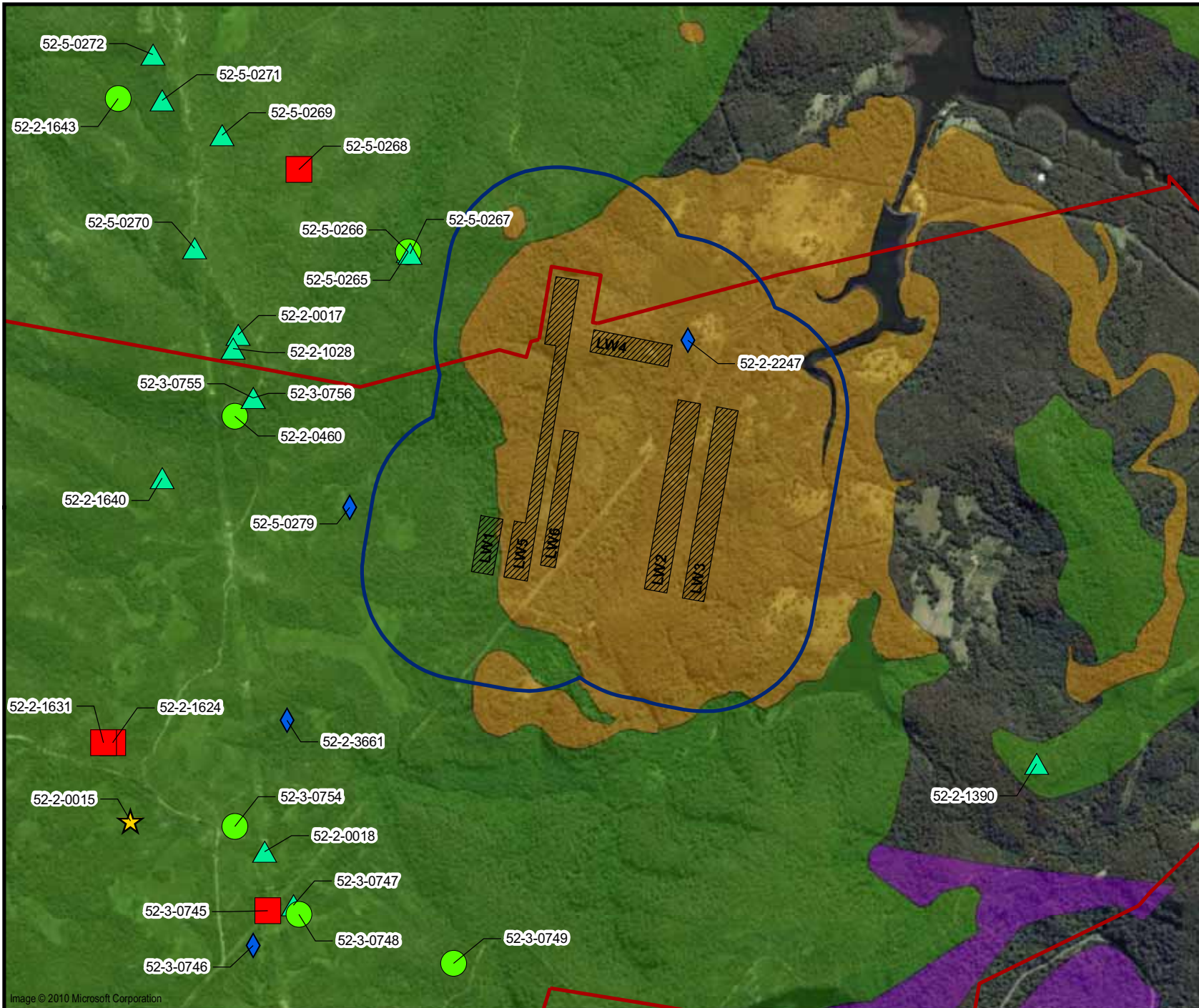
Only one Aboriginal site has been previously recorded on the Cordeaux Crinanite (Table 4.2). The majority of sites are located on Hawkesbury Sandstone on the western margin of the search area. This may be due to an absence of survey across the study area, although portions of it have been surveyed, resulting in one site being recorded in the study area (Dendrobium 5).

**Table 4.2** *AHIMS sites in the search area*

AHIMS Site Id <sup>1</sup>	AHIMS Site Name	AHIMS Site Type	Geology
52-2-0015	Upper Avon 1	Axe Grinding Groove, Shelter with Art	Sandstone
52-2-0017	Cordeaux Reservoir 2;	Shelter with Art	Sandstone
52-2-0018	Cordeaux Reservoir 2	Shelter with Art	Sandstone
52-2-0460	West Cordeaux	Shelter with Art; Shelter with Deposit	Sandstone
52-2-1028	No1 Reservoir	Shelter with Art	Sandstone
52-2-1390	Mount Burelli	Shelter with Art	Sandstone
52-2-1624	Browns Road Site 9	Axe Grinding Groove	Sandstone
52-2-1631	Browns Road Site 16	Axe Grinding Groove	Sandstone
52-2-1640	Browns Road Site 26	Shelter with Art	Sandstone
52-2-1643	Browns Road Site 29	Shelter with Art; Shelter with Deposit	Sandstone
<b>52-2-2247</b>	<b>Dendrobium 5</b>	<b>Artefact Scatter</b>	<b>Cordeaux Crinanite</b>
52-2-3661	SUDS 1 (Avon River)	Isolated Artefact	Sandstone
52-3-0745	Sandy Creek Road 8	Axe Grinding Groove	Sandstone
52-3-0746	Sandy Creek Road 9	Shelter with Deposit	Sandstone
52-3-0747	Sandy Creek Road 7	Shelter with Art	Sandstone
52-3-0748	Sandy Creek Road 6	Shelter with Art; Shelter with Deposit	Sandstone
52-3-0749	Sandy Creek Road 5	Shelter with Art; Shelter with Deposit	Sandstone
52-3-0754	Sandy Creek Road 10	Shelter with Art; Shelter with Deposit	Sandstone
52-3-0755	Sandy Creek Road 11	Shelter with Art	Sandstone
52-3-0756	Sandy Creek Road 12	Shelter with Art	Sandstone
52-5-0265	Sandy Creek Road 13	Shelter with Art	Sandstone
52-5-0266	Sandy Creek Road 14	Shelter with Art; Shelter with Deposit	Sandstone
52-5-0267	Sandy Creek Road 15	Shelter with Art	Sandstone
52-5-0268	Sandy Creek Road 16	Axe Grinding Groove	Sandstone
52-5-0269	Sandy Creek Road 17	Shelter with Art	Sandstone
52-5-0270	Sandy Creek Road 18	Shelter with Art	Sandstone
52-5-0271	Sandy Creek Road 19	Shelter with Art	Sandstone
52-5-0272	Sandy Creek Road 20	Shelter with Art	Sandstone
52-5-0279	Sandy Creek Road 27	Shelter with Deposit	Sandstone

1. **Bold** highlight indicates sites recorded in the study area
2. Co-ordinates for sites were estimated off topographical maps by the Illawarra Prehistory Group in the early 1980s. When sites are re-recorded with modern GPS equipment, errors in the original co-ordinates of up to 400 metres are not uncommon.

Overall general patterning of Aboriginal sites in the local area shows a strong association with shelter sites on steeper sandstone landforms. However, this pattern does not occur over most of the study area as sandstone is present in small areas and there are no steep sided gorges for shelter sites to occur.



**Legend**

- Project Application Area
- Study Area
- Proposed Longwalls

**AHIMS**

- ◆ Artefact
- ▲ Art
- Art & Artefact
- Grinding Groove
- ★ Art and Grinding Groove

**Geological Formation**

- Cordeaux Crinanite
- Hawkesbury Sandstone
- Colluvium 38491
- Not Specified

**Figure 4.1**  
**AHIMS Sites within the Locality of Nebo Study Area**

Client: Gujarat NRE FCGL Pty Ltd  
 Project: NRE Wongawilli Colliery Aboriginal Heritage Assessment  
 Drawing No: 0097271s\_AHA\_GIS003p\_R0.mxd  
 Date: 18/03/2010 Drawing size: A4  
 Drawn by: JF Reviewed by: MK  
 Scale: Refer to Scale Bar



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Given the background research presented in *Chapter 2* and *3* the most likely tangible Aboriginal site types to be located within the study area are stone artefact concentrations (and isolated finds) and scarred trees. The two high points, Wattle Creek and the central undulating hills are the most likely locations for Aboriginal sites.

Intangible sites, such as birthing places, ceremonial groups and resource gathering places have been recorded at the regional level by ERM at NRE No.1 Colliery (ERM in production). These could be associated with any location within the study area and would need to be identified by the Aboriginal community representatives.

*Table 4.3* provides an overview of the most likely tangible site types which could be found within the study area.

**Table 4.3** *Aboriginal sites commonly found in the local area*

Site types	Definitions
Stone artefact concentration	<p>Stone artefact concentrations are collections of stone, frequently brought from other areas, which demonstrate evidence for Aboriginal working, use and/or discard of the stone at a single location. Stone artefact concentrations may be associated with any of the below site types.</p> <p>Where such sites are buried by sediment they may not be noticeable unless exposed by erosion or disturbed by modern activities. These sites may be found in any landform across the study area, but are most likely to be associated with waterways, flat landforms and ridgeline.</p> <p>It is expected that some stone artefact concentrations will be present.</p>
Isolated finds	<p>Sites consisting of only one identified stone artefact, isolated from any other artefacts or archaeological evidence (and defined by an arbitrary separation distance of 50 m). They are generally indicative of sporadic past Aboriginal use of a location.</p> <p>A distinction should be drawn between isolated finds which are a component of the background distribution and objects such as axes, hammer stones, grinding dishes etc which would have been used repeatedly.</p> <p>These sites could be recorded anywhere within the study area.</p>

Site types	Definitions
Background distribution	<p>Represents the low density of Aboriginal objects that have been discarded but cannot be associated with concentrations of objects. The background distribution is a record of Aboriginal occupation of an area. The density that defines the background scatter needs to be defined through local comparisons.</p> <p>It is recognised that regionally there is a low density count of background objects recorded across the escarpment.</p>
Scarred trees	<p>Scarred trees bear the marks of bark and wood removal for utilisation as canoes, shields, boomerangs or containers. It is commonly very difficult to confidently distinguish between Aboriginal scars and natural scars or those made by Europeans. Scars may also originate as 'foot-marks', small pockets cut into the bark of a tree enabling the tree to be climbed.</p> <p>These sites have a moderate chance of being recorded within the study area, but only in areas with old growth trees.</p>
Stone arrangements, carved trees and ceremonial grounds	<p>These site types are often interrelated. Stone arrangements vary from simple cairns or piles of rocks to more elaborate arrangements; patterns of stone laid out to form circles and other designs, or standing slabs of rock held upright by stones around the base.</p> <p>Carved trees may have intricate geometric or linear patterns or representations of animals carved into their trunks. Ceremonial grounds and graves were often marked by such trees.</p> <p>Bora grounds are a common type of ceremonial site and they are generally associated with initiation ceremonies. They comprise two circles, generally edged with low banks of earth but sometimes of stone, a short distance apart and connected by a path.</p> <p>It cannot be predicted whether these sites will be located within the study area.</p>
Resource areas	<p>Resource gathering areas represent landforms that contain a high number of fauna and flora species, which were known Aboriginal resources. Resource areas are frequently associated with permanent water resources, often swamps or marshes, and frequently have recorded sites such as middens nearby. Landforms associated with these sites are often flats with a favourable outlook.</p> <p>These sites could be found on the lower lying landforms within the study area, possibly near Wattle Creek.</p>

**5.1 FIELD SURVEY METHODOLOGY**

The study area was surveyed by the study team and Aboriginal representatives (see *Chapter 2*) on 7-9 December 2009. The archaeological inspection took the form of a pedestrian survey. Owing to the difficult nature of the terrain and low ground surface visibility in much of the study area, the survey targeted the location of the previously recorded archaeological site and creek lines. Ground surface visibility was variable, however it was generally low, ranging between 0% and 10%. Survey transects are shown in *Annex B*.

**5.1.1 Fieldwork Constraints and Limitations**

The fieldwork was limited by three factors: restricted access to the survey area following wet weather, dense vegetation cover coupled with low ground surface visibility and extreme weather conditions.

The Nebo study area is part of metropolitan Sydney's water supply catchment. Consequently, a large part of the PAA is designated as a Schedule 1 Restricted Access Area (Metropolitan Special Area) under the *Sydney Water Catchment Management Act 1998*. It is managed by the SCA and access into and through the area is restricted following wet weather.

The study area contains few fire access trails and large areas of bushland over plateau terrain, much of which has not been burnt for some years. The density of vegetation restricts movement and poses a health and safety risk, especially in terms of concealing cliffs, drops and dangerous wildlife. Extreme weather conditions during the time of the field survey also presented additional risks to surveying in remote bushland. While all precautions were taken, excessive heat, bushfire risk and the potential for electrical storms during the field survey limited the distances that could be safely surveyed. The survey team therefore only accessed areas which did not pose a high level of risk to safety and could easily be evacuated in the event of an emergency.

**5.2 FIELDWORK RESULTS**

The location of Dendrobium 5 was surveyed but the site was unable to be relocated. Three historic archaeological sites were also identified during the survey (historic sites are discussed in the *NRE Wongawilli Nebo Area Environmental Assessment*). The location of the sites is shown in *Figure 5.1*.

### 5.2.1

#### *52-2-2247 Dendrobium 5*

Dendrobium 5 is an open artefact scatter measuring approximately 10 by 5m. Located on a fire trail on the southern banks of Little Wattle Creek, the site is recorded as being composed of five stone artefacts identified from the exposure created by the road surface. Originally recorded by the Illawarra Prehistory Group in 1984, the exposed areas today suffer from extensive erosion of the topsoil through water movement and fire trail upgrades. While the location of the site was able to be accurately relocated, no stone artefacts were observed.



**Plate 1** - *52-2-2247 Dendrobium 5* - Photo of recorded location of Dendrobium 5 looking north towards Little Wattle Creek.

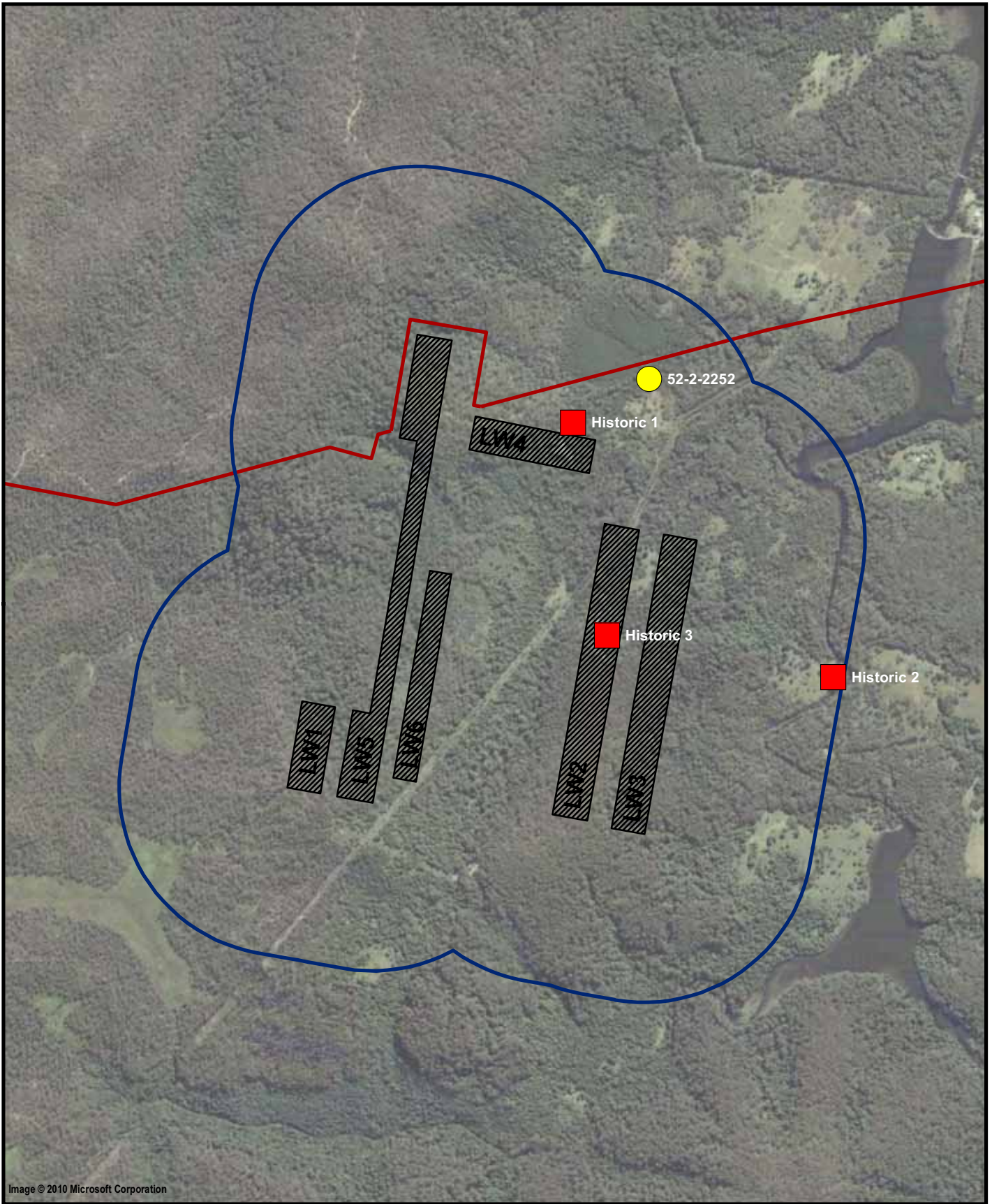


Image © 2010 Microsoft Corporation

**Legend**

- Project Application Area
- Proposed Longwalls
- Study Area
- Aboriginal Heritage Site
- Historic Heritage Site

Client:	Gujarat NRE FCGL Pty Ltd	
Project:	NRE Wongawilli Colliery Aboriginal Heritage Assessment	
Drawing No:	0097271s_AHA_GIS004p_R0.mxd	
Date:	18/03/2010	Drawing size: A4
Drawn by:	JF	Reviewed by: MK
Scale:	Refer to Scale Bar	



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**Figure 5.1**  
**Archaeological Sites**

Environmental Resources Management Australia Pty Ltd  
Brisbane, Canberra, Hunter Valley, Melbourne, Perth,  
Port Macquarie, Sydney

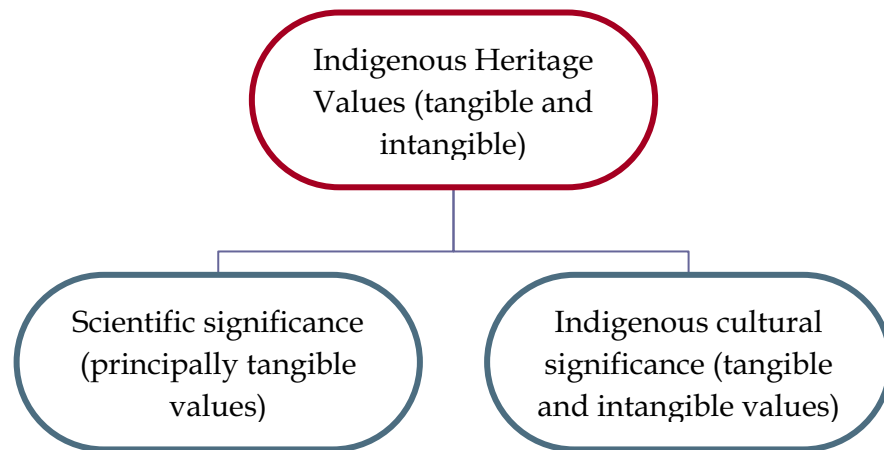


## 6.1

## PREAMBLE

Aboriginal heritage sites, objects and places hold value for communities in many different ways. The nature of those heritage values is an important consideration when deciding how to manage a heritage site, object or place and balance competing land-use options.

ERM's approach to Aboriginal heritage assessment is based upon identifying key Aboriginal heritage values; values that are likely to be both tangible and intangible. This approach needs to consider the values assessment from the scientific and Aboriginal community perspectives, in accordance with Australian best practice documents.



The NPWS Aboriginal Cultural Heritage Standards and Guidelines Kit (1997) states:

*While Aboriginal sites and places may have educational, tourism, and other values to groups in society their two principal values are likely to be in terms of their cultural/social significance to Aboriginal people and their scientific significance to archaeologists. It is thus possible to identify two main streams in the overall significance assessment process: the assessment of cultural/social significance to Aboriginal people and the assessment of scientific significance to archaeologists...* (1997: PDF page 92)

This assessment focuses upon the scientific significance assessment of the sites observed and recorded during the survey. The Aboriginal community has provided input into the survey and assessment and has been afforded the opportunity to comment on this report for a cultural and social significance assessment of the sites recorded.

## 6.2

### *ARCHAEOLOGICAL POTENTIAL*

Archaeological site formation is a combination of scientific factors, such as bioturbation, and environmental factors, such as erosion or burial through soil movement. Once discarded on the ground surface, artefacts are often readily incorporated into the topsoil horizons through the process of bioturbation. Most commonly, dense artefact deposits exist hidden beneath the upper surface (c.f. Wandsnider and Camilli 1992; Fanning and Holdaway 2001). Archaeological assessments that do not employ appropriate methods of sub-surface detection or prediction cannot reliably define an area's archaeological content. Most frequently, the eroded component of a larger subsurface deposit is detected and recorded as a site. Where soils are sandy, artefacts can occur at greater depths and erosion may frequently expose artefacts. An understanding of these factors, linked further to the notions of site integrity and condition, yield an understanding of an area or site's archaeological potential.

It is important to note that the level of archaeological potential relates to the likelihood of discovering an Aboriginal object or site, within a location. Further description should then be made as to the potential condition and integrity of the soil matrix and potential site itself. Only once all these factors have been considered, can scientific value start to be assessed for an area with potential. Therefore, whilst scientific value and potential are linked, it must be noted that these values and potentials are not the same and can differ substantially for any single site or area with potential.

## 6.3

### *SCIENTIFIC SIGNIFICANCE ASSESSMENT*

The primary guide to management of heritage places is the Australia ICOMOS Burra Charter 1999. The Burra Charter defines cultural significance as:

*Cultural significance* means aesthetic, historic, scientific, social or spiritual value for past, present or future generations.

Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects.

Places may have a range of values for different individuals or groups.

This assessment has sought to identify Aboriginal heritage objects and sites within the study area and obtain sufficient information to allow the values of those objects and sites to be determined. NPWS (1997:93) have stated that 'while various criteria for archaeological significance assessment have been advanced over the years, most of them fall under the heading of archaeological research potential'. As such, six key criteria may be used to examine the scientific value/significance of a site. These are:

**Rarity:** whether any or all aspects of a site (type, location, integrity, content and archaeological potential) can be considered common or rare within a local, regional or national context;

**Representativeness:** the comparative rarity of the site when considered and contrasted against other similar sites conserved at the local and/or regional level;

**Archaeological landscapes:** the study of the cultural sites relating to Aboriginal peoples within the context of their interactions in the wider social and natural environment they inhabited. Landscapes can be large or small depending upon specific contexts (i.e. local or regional conditions); they may also may be influenced by Aboriginal social and demographic factors (which may no longer be apparent);

**Connectedness:** whether the site can be connected to other sites at the local or regional level through aspects such as type, chronology, content (i.e. materials present, manufacturing processes), spatial patterning or ethno-historical information;

**Integrity and condition:** integrity refers to the level of modification a site has been subject to (the cultural and natural formation process) and whether the site could yield intact archaeological deposits, which could be spatially meaningful. Condition takes into account the state of the material, which is especially relevant for organic materials;

**Complexity:** the demonstrated or potential ability of a site to yield a complex assemblage (stone, bone and/or shell) and/or features (hearths, fire pits, activity areas);

**Archaeological potential:** the potential to yield information (from sub-surface materials which retain integrity, stratigraphical or not) that will contribute to an understanding of contemporary archaeological interest, or which could be saved for future research potential.

#### 6.4

#### *ABORIGINAL HERITAGE*

The survey was conducted according to the methodology discussed with all Aboriginal stakeholders and focused on the identification of Aboriginal heritage values relating to archaeological sites, although discussion also included intangible values and the importance of sites to the local community. Field survey methods were adopted to discover new archaeological sites, to ensure their accurate recording and to provide sufficient information to provide an assessment of cultural significance to the extent that surface survey allowed.

#### 6.5

#### *STATEMENT OF HERITAGE SIGNIFICANCE*

One Aboriginal cultural heritage site, Dendrobium 5, has been identified in the study area. Dendrobium 5 is an open Aboriginal artefact scatter and is recorded as being located on a heavily disturbed access track. There is the potential for this site to extend into undisturbed deposits. Although open stone artefact scatters are relatively uncommon on the Illawarra Escarpment, the number of artefacts identified coupled with the heavily disturbed nature of the site and lack of any visible cultural remains today means that this site only has low scientific value.

## 7.1 POTENTIAL IMPACTS

NRE Wongawilli Colliery intends to extract coal from the Nebo area using the longwall mining method, which leaves a void behind the miner into which the remaining strata collapses, forming what is called the goaf. This process has the potential to cause subsidence impacts on the surface. The potential impacts are described below.

### *Subsidence*

Subsidence is the vertical displacement occurring over the goaf. There is a horizontal component of this displacement both across the width of the panel and along the panel (NSW DoP 2008a). Subsidence is expressed in terms of millimetres of displacement.

### *Tilt*

Tilt is created when two adjacent points undergo differing amounts of vertical displacement. Tilt is expressed in terms of millimetres per metre, this is the change in vertical orientation per meter of height above ground (NSW DoP 2008a).

### *Strain*

Strain is the change of horizontal distance between two points. This occurs as extension or compression (NSW DoP 2008a). It is expressed in terms of millimetres per metre, where positive strain is tensile strain, and negative strain is compressive strain.

### *Valley Closure*

Valley closure is where two sides of a valley move horizontally toward the centre line of the valley (NSW DoP 2008a).

### *Upsidence*

Upsidence is the uplift of valley floor strata causing bulging, buckling and shearing of the near surface strata. This can cause the valley floor to 'rise' relative to its position prior to mining (NSW DoP 2008a).

### *Far Field Horizontal Movements*

Far-field horizontal movements involve the *en masse* horizontal displacement of the surface. This has been detected in the Southern Coalfield over the past 15 years up to several kilometres from the limits of mining. Far field horizontal movements are usually in the order of tens of millimetres. These movements give rise to induced tensile strains that are typically less than 0.01 mm/m. As such, they are immeasurable and their associated impacts are of little significance (DoP, 2008b).

### *Impact and Effects on Aboriginal Sites*

The following discussion provides an assessment of the potential impacts on Aboriginal heritage site types recorded within the study area. It should be noted that the different aspects of subsidence impact on heritage sites differently.

Rock shelters are adversely affected by cracking, movement along joints or bedding planes, by block fall and by water seepage. All these impacts may directly affect the stability of the shelter and consequentially any rock art within a shelter. Further impacts arising from valley closure can put additional strain on the cliff tops, which may cause consequential strain on any rock shelters present beneath the upper most landforms.

Grinding grooves can be affected by upsidence causing cracking as well as cracking from strain.

Artefact scatters can be indirectly impacted by tilt, causing rain water to run off in differing ways resulting in increased levels of erosion. Overall, artefact scatters are the least likely of Aboriginal site types to be impacted by mining subsidence.

## 7.2

### **PREDICTED IMPACTS**

Predictions made by MSEC (2010) indicate that 52-2-2247 Dendrobium 5 is located outside the area of predicted impact.

No Aboriginal sites are expected to be impacted by the Project. See *Annex C* for impacts to historical heritage sites.

## CONCLUSIONS

Desk top studies indicated that there has been one Aboriginal archaeological site found within the study area. This site is an artefact scatter referred to as Dendrobium 5. The potential to find additional sites within the study area is low due to the presence of crinanite geology rather than sandstone which is more commonly known to be used by Aboriginal people.

Overall, artefact scatters are the least likely of all Aboriginal site types to be impacted by mine subsidence. MSEC (2010) indicates that Dendrobium 5 is located outside the predicted area of impact.

As there are no impacts predicted at Dendrobium 5 management or monitoring of the site is not required.

Copies of this report have been provided to relevant members of the Aboriginal community for their comment and Aboriginal social assessment. Comments received from the community are provided in *Annex A*. Aboriginal stakeholders from the Cubbitch Barta suggested that Historic Site 2 might also have made a suitable camping site for Aboriginal people and requested that this could be an area of potential future investigation. However as this site was not within the potential subsidence footprint no further investigation was undertaken.

Three copies of the final report will be forwarded to the DECCW for their record.

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Annex A

## Stakeholder Consultation



**Table A.1 Stage 1 - Aboriginal Group Registration; Advisory Requests Sent**

Orgainsation	Contact	Date Sent	Comment	Reference
Illawarra Mercury Newspaper		27/07/09	Submitted ad via internet	0097271 Notice of Aboriginal Consultation Illawarra Mercury newspaper.doc
			No responses have been received in reply to this advert	
DECCW	Laurel Alexander <a href="mailto:laurel.alexander@environment.nsw.gov.au">laurel.alexander@environment.nsw.gov.au</a>	27/07/09	Rang but not in the office Sent email	0097271L02_MK to DECC.pdf
		05/08/09	Email sent with correct address for Tim Owen	
	Miranda Firman (9995 6836) <a href="mailto:Miranda.firman@environment.nsw.gov.au">Miranda.firman@environment.nsw.gov.au</a>	11/11/09	No reply had been received from DECCW, so letter re-sent to Miranda.	0097271L02_MK to DECC.pdf
Illawarra LALC	Sharralyn Robinson	27/07/09	Called office was asked to submit notification via email Email sent	0097271L01_MK to ILALC_v2.pdf
	02 4226 3338 <a href="mailto:srobinson@exemail.com.au">srobinson@exemail.com.au</a>			
		05/08/09	Email sent with correct address for Tim Owen	
Registrar Aboriginal Owners	Megan Mebberson	27/07/09	Spoke to Megan, she asked if we could fax notification and email map. Fax and email sent	0097271L04_MK to RAO.pdf
	02 9562 6333 <a href="mailto:megan.mebberson@oralra.nsw.gov.au">megan.mebberson@oralra.nsw.gov.au</a>			
		05/08/09	Email sent with correct address for Tim Owen	

Orgainsation	Contact	Date Sent	Comment	Reference
Native Title Services	Peter Schultz	27/07/09	Spoke to Peter he asked for a map to be sent with the notification Email sent	0097271L05_MK to NTS.pdf
	02 9310 3188			
	<a href="mailto:pschultz@ntscorp.com.au">pschultz@ntscorp.com.au</a>			
		05/08/09	Email sent with correct address for Tim Owen	
Local Council	Joel Thompson	27/07/09	Spoke to Joel happy to receive email notification Email sent	0097271L03_MK to WCC.pdf
	02 4227 7111			
	<a href="mailto:jthompson@wollongong.nsw.gov.au">jthompson@wollongong.nsw.gov.au</a>			
		05/08/09	Email sent with correct address for Tim Owen	

**Table A.2 Aboriginal Group Registrations**

<b>Organisation</b>	<b>Contact person</b>	<b>Date Registered</b>	<b>How the registration was received &amp; any comments</b>	<b>Reference</b>
Registrar Aboriginal Owners	Courtney Field	3 August 2009	No registered Aboriginal owners pursuant of the Aboriginal land Rights Act 1983. Stated that ERM should consult with the Illawarra Local Aboriginal Land Council.	0097272_L06_OTR to ERM.pdf
Wollongong City Council	Joel Thompson	27 July 2009	List of Aboriginal organisations who should be contacted.	0097272_L07_List of Illawarra Aboriginal Groups 2007.doc
DECCW	Miranda Firman	12 Nov. 09	List of Aboriginal stakeholders for the Illawarra area.	0097271_LIST OF ABORIGINAL STAKEHOLDERS FOR ILLAWARRA REGION_DECCW.doc
ILALC	Sharralyn Robinson	27 July 09	Call to register for the project	N/A
		16 Nov. 09	Phone call to discuss methodology and organise a representative to participate in the survey.	N/A
Cubbitch Barta	Glenda Chalker	1 December 09	Letter received stating that CB wish to be consulted during this project.	0097272_L08_CB to ERM.pdf

**Table A.3 Stage 2 - Briefing & Methodology Advice Sent**

<b>Organisation</b>	<b>Date Sent</b>	<b>Comment</b>	<b>Reference</b>
Illawarra Local Aboriginal Land Council	13 November 2009	Expressed posted and emailed	0097271_L08_Proposed survey methodology.doc
Korewal Elouera Jerrungurah Tribal Elders Council	13 November 2009	Expressed posted	0097271_L08_Proposed survey methodology.doc
Cubbitch Barta	13 November 2009	Expressed posted	0097271_L08_Proposed survey methodology.doc
Illawarra Aboriginal Corporation	13 November 2009	Expressed posted	0097271_L08_Proposed survey methodology.doc
The Wadi Wadi Coomaditchie Aboriginal Corporation (NIAC)	13 November 2009	Expressed posted	0097271_L08_Proposed survey methodology.doc
The Wodi Wodi Elders Corporation	13 November 2009	Expressed posted	0097271_L08_Proposed survey methodology.doc
Woronora Plateau Gundungara		Sent via NIAC, as instructions by the DECCW	
Wulungu Elders Council		Sent via NIAC, as instructions by the DECCW	
Coomadichie United Aboriginal Corporation	13 November 2009	Expressed posted	0097271_L08_Proposed survey methodology.doc
D'harawal Knowledge Holders	13 November 2009	Expressed posted	0097271_L08_Proposed survey methodology.doc
Gandangara Elders Group	13 November 2009	Expressed posted	0097271_L08_Proposed survey methodology.doc

**Table A.4 Stage 3 - Aboriginal Group Comments Received**

Organisation	Date Received	Comment	Reference
Cubbtich Barta Native Title Claimants	17 November 2009	No further comments on methodology. Wish to register for fieldwork. Provided Insurances.	0097272_L09_CB to ERM.pdf
Gandangara Elders Group	23 November 2009	Return to sender	
D'harawal Knowledge Holders	17 November 2009	Return to sender	
The Wodi Wodi Elders Corporation	20 November 2009	Return to sender	
Korewal Elouera Jerrungurah Tribal Elders Council	16 November 2009	Return to sender	

*Table A.5 Stage 4 - Field Survey*

<b>Organisation</b>	<b>Field Representative(s)</b>	<b>Date(s) of fieldwork</b>	<b>Comments</b>
Illawarra Local Aboriginal Land Council	Richard Campbell, Jay Marsden	7-9 Dec 2009	
Cubbitch Barta Native Title Claimants	Glenda Chalker, Kristy Chalker	7-9 Dec 2009	

**Table A.6 Stage 5 - Draft Report Sent**

Report reference: 00102828\_rp1\_v1

<b>Organisation</b>	<b>Contact person</b>	<b>Date Sent</b>	<b>Reference</b>
Illawarra Local Aboriginal Land Council	Sharralyn Robinson	12/04/10	0097271_L10_MK to ILALC.pdf
Cubbitch Barta Native Title Claimants	Glenda Chalker	12/04/10	0097271_L10_MK to CB.doc

*Table A.7 Stage 6 - Aboriginal Community Comments Received*

<b>Organisation</b>	<b>Contact person</b>	<b>Date Received</b>	<b>Comment</b>	<b>Reference</b>
Cubbitch Barta Native Title Claimants	Glenda Chalker	27/04/10	No constraints, or impacts preventing the project from proceeding. Some minor errors in the report.	0097271_L12_CBtoMK.pdf

Cubbitch Barta Native Title Claimants  
Aboriginal Corporation  
55 Nightingale Road,  
PHEASANTS NEST. N.S.W. 2574.  
22ND April, 2010

Ms Melissa Karam,  
ERM.  
Locked Bag 24,  
BROADWAY. N.S.W. 2007.

Dear Melissa,

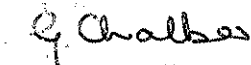
RE; NRE WONGAWILLI

Thank you for the opportunity of participating and for being able to comment on the Wongawilli Archaeological Assessment.

Firstly one of our representatives was Kirsty-Lee Chalker not Kristy Chalker

There are no constraints, or impacts from preventing this project from proceeding, I would however like to make a comment that the site Dendrobium Site 5, is referred to as site 52-2-2252 on page 38, and on Page 25 as site 52-2-2247, which is right. I would also like to make comment on the historical sites that were located during the survey, that have not been mentioned in this report. During the survey, at one of the historic sites, I was speaking to Luke, that I believed the area where we found historic items, should also be recorded as a PAD, it does not seem to have happened, nor has it been mentioned at all. Is the historic, in a separate report?

Yours faithfully,



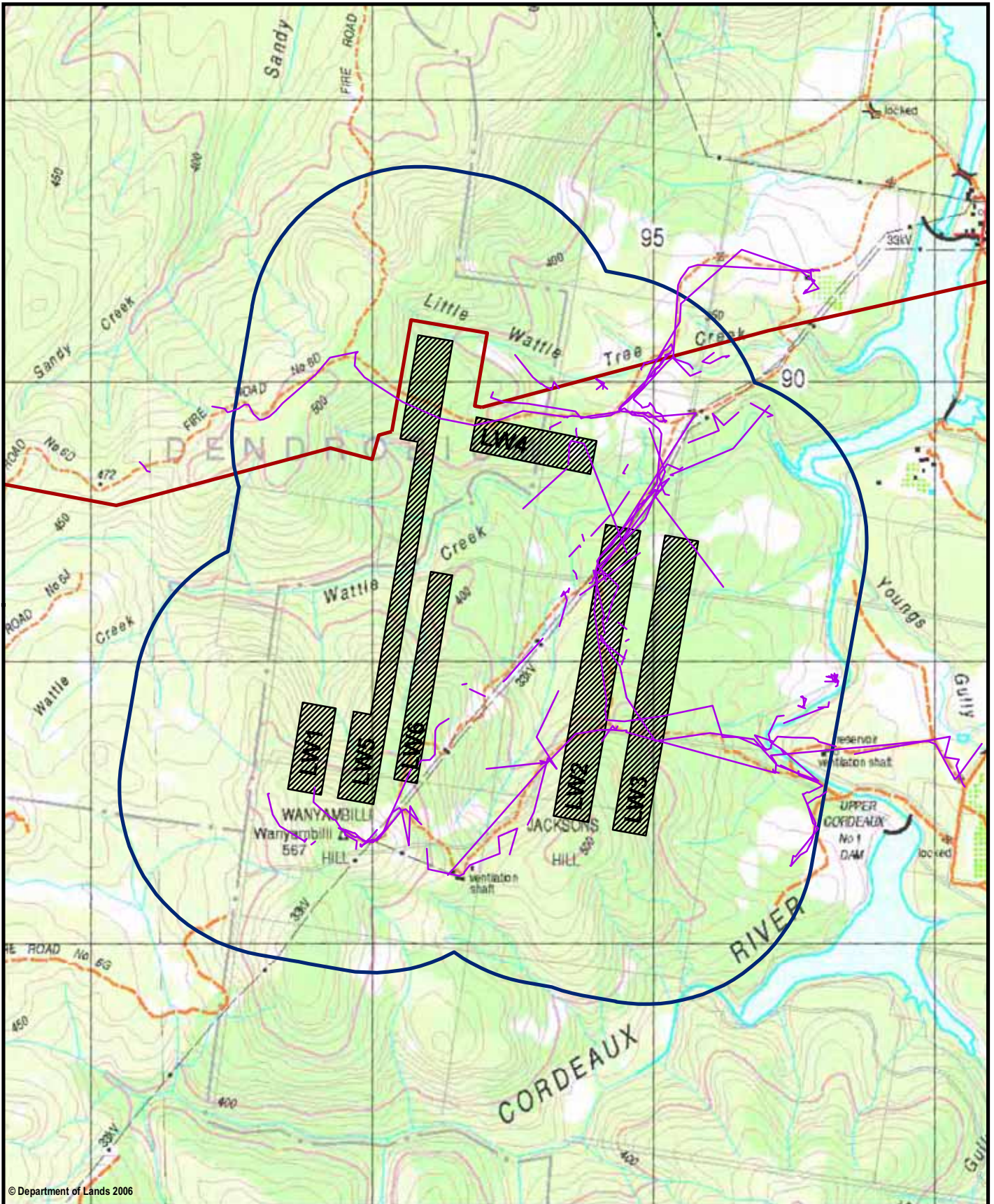
Glenda Chalker  
Hon. Chairperson  
Phone/Fax 02 46841129 0427218425



Annex B

## Survey Data





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**Legend**

- Project Application Area
- Study Area
- Proposed Longwalls
- Survey Tracks

Client:	Gujarat NRE FCGL Pty Ltd
Project:	NRE Wongawilli Colliery Aboriginal Heritage Assessment
Drawing No:	0097271s_AHA_GIS005_R0.mxd
Date:	29/03/2010
Drawing size:	A4
Drawn by:	JF
Reviewed by:	MK
Scale:	Refer to Scale Bar



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**Figure B.1**  
**Survey Data**

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Port Macquarie, Sydney







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Germany	Spain
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Hungary	Sweden
India	Taiwan
Indonesia	Thailand
Ireland	UK
Italy	USA
Japan	Venezuela
Korea	Vietnam
Malaysia	
Mexico	

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