



**WERRIS CREEK COAL
ENVIRONMENTAL
MANAGEMENT SYSTEM**

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WHC_PLN_WC_HERITAGE MANAGEMENT PLAN

APPENDIX B – Archaeological Surveys & Reports Pty Ltd, Aboriginal Heritage Assessment
Proposed Werris Creek Mine, 2004

99464

Werris Creek Coal Pty Limited

ABN: 69 107 169 103

Proposed Werris Creek Coal Mine

ABORIGINAL HERITAGE ASSESSMENT

Prepared by
Archaeological Surveys & Reports Pty Ltd

August 2004

**Specialist Consultant Studies Compendium
Part 6**



99464

ABORIGINAL HERITAGE ASSESSMENT

Proposed Werris Creek Coal Mine

Prepared for: R.W. Corkery and Co. Pty. Limited
PO Box 80
ORANGE NSW 2800

On behalf of: Werris Creek Coal Pty Limited
37 Mayfield Street
ASCOT QLD 4007

Prepared by: Archaeological Surveys & Reports Pty Ltd
16 Curtis Avenue
ARMIDALE NSW 2350

Telephone: 02 6772 6512
Fax: 02 6772 4567
Email: japples@northnet.com.au

Copies to: The Archaeologist
NPWS Northern Zone
PO Box 914
COFFS HARBOUR NSW 2450

The Chairperson
Nungaroo Aboriginal Land Council
PO Box 28
QUIRINDI NSW 2343

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Enquiries should be addressed to Archaeological Surveys & Reports Pty Ltd.

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EXECUTIVE SUMMARY

This investigation was performed for R.W. Corkery & Co. Pty. Limited (RWC) on Werris Creek Coal Pty Limited (Werris Creek Coal). Werris Creek Coal is proposing to develop an open cut coal mine 4km south of Werris Creek and 11km north-northwest of Quirindi (RWC brief 28 January 2004).

The scope of works was for Archaeological Surveys & Reports Pty Ltd (ASR) to conduct an archaeological investigation of the Project Site with the assistance of a representative of the Nungaroo Local Aboriginal Land Council (LALC), and to identify any Aboriginal sites and relics that might be present. The results of the investigation were to be presented in a report, which was to include an assessment of the significance of any cultural relics or places identified, an appraisal of the options and opportunities arising from the discoveries, and clear recommendations for the management of those cultural resources.

An axe-grinding groove site had previously been recorded in the area, and was relocated. The site comprises 25 or more axe-grinding grooves on exposed sandstone bedrock surfaces, distributed over an area approximately 90m long by 35m wide.

The axe-grinding grooves occur within the footprint of impacts from the proposed coal mine, and it was therefore necessary for the Nungaroo LALC to assess the cultural significance of the site in order that an appropriate management strategy could be proposed for the further development or conservation of the site.

After a lengthy and comprehensive consultation process involving representatives of Nungaroo LALC, Werris Creek Coal, RWC and ASR it was agreed:

That no mining should occur within 100m of the axe-grinding groove site until the results of mining and blasting in the section beyond the buffer zone are known. Werris Creek Coal is to monitor the effects and impacts from mining and blasting in the eastern section to determine the effects on the sandstone substrate on which the axe-grinding grooves occur. When the results of monitoring are known Werris Creek Coal should consult further with Nungaroo LALC to determine the appropriate management strategy for the continued operation of the mine, and the appropriate conservation or preservation strategies for the care and management of the axe-grinding groove site.

In addition, the proponents are advised of the following provisions: All developers, contractors and their employees are bound by the provisions of the *National Parks and Wildlife Act 1974* as amended, which was in part designed to mitigate impact to the Indigenous archaeological record.

Under the provisions of the *National Parks and Wildlife Act 1974*, all earthmoving contractors and operators should be instructed that in the event of any bone or stone artefacts, or discrete distributions of shell, being unearthed during earthmoving, work should cease immediately in the area of the find, and the Nungaroo Local Aboriginal Land Council, and officers of the National Parks and Wildlife Service, informed of the discovery. Work should not recommence in the area of the find, until those officials have inspected the material and permission has been given to proceed. Those failing to report a discovery and those responsible for the damage or destruction occasioned by unauthorised removal or alteration to a site or to archaeological material may be prosecuted under the *National Parks and Wildlife Act 1974*, as amended.

In the event that a relic or item is discovered during earthworks details of the discovery should be communicated to: The Archaeologist, NPWS Metropolitan Zone, and to The Chairperson, Nungaroo Local Aboriginal Land Council (addresses at the front of this report).

1 INTRODUCTION

This investigation was performed for R.W. Corkery & Co. Pty. Limited (RWC) on behalf of Werris Creek Coal Pty Limited (Werris Creek Coal). Werris Creek Coal is proposing to develop an Open Cut Coal Mine within an area defined by the Mining Lease Application 249 incorporating the “Narrawolga” property in its entirety and incorporating parts of the “Eurunderee” and “Cintra” properties.

1.1 SCOPE

The scope of works was to conduct an archaeological investigation of the Project Site with the assistance of a representative of the Nungaroo Local Aboriginal Land Council (LALC), and to identify any Aboriginal sites and relics that might be present. The results of the investigation were to be presented in a report, which was to include an assessment of the significance of any cultural relics or places identified, an appraisal of the options and opportunities arising from the discoveries, and clear recommendations for the management of those cultural resources.

1.1.1 Report Objectives

The objectives of this report are to describe the archaeological investigation of the Project Site and to record the archaeological relics and sites that were identified. Further, the report documents the participation of the Nungaroo LALC in the field survey, and the recommendations of the land council as to the future management of the site identified during the investigation. In addition, the report includes a discussion of the results of the investigation in the context of other known sites in the area. Finally, the report includes a statement as to the recommendations for the future development of the Project Site.

1.1.2 Report Format

The report is presented in the following format:

i	Executive summary
1	Introduction
2	Aboriginal consultation
3	The environmental context
4	The archaeological record
5	Models for site location
6	The survey
7	The results
8	Discussion
9	Significance assessment
10	Recommendations.

1.2 THE SURVEY AREA

The Project Site is located approximately 4km south of Werris Creek and 11km north-northwest of Quirindi, Northern New South Wales.

The proposed mine and associated activities will occur on Lots 73, 74, 75, 83, 109, 110, 112, 120, 130, 131, 132, 133, 135, 217 and 225 DP 751017, and Lots 1, 2 and 3 DP 1022826; Parish of Grenfell, County of Buckland, Shire of Quirindi. The Rail load-out facility will occur on Lot 271 DP 257307, Parish of Grenfell, County of Buckland, Shire of Parry. The rail load-out road will occur on Lots 121, 123 and 129 DP 751017, and Lot 271 DP 257307, Parish of Grenfell, County of Buckland, Shire of Quirindi. All but Lot 271 DP 257307 and Lots 83, 131, 132, 217 and 225 DP 751017 lie within the "Narrawolga" property owned by Werris Creek Coal. Lot 271 DP 257307 lies within the "Cintra" property and the remaining lots within the "Eurunderee" property.

The Project Site covers an area of 679ha, which includes the Limit of Mining of 80.0ha, the Overburden Emplacement of 152.8ha, the Coal Processing Area of 2.5ha, the rail load-out road of 2.9km length, the Rail Load-out Facility of 6.0ha, and Administration and Facilities Area of 1.7ha, as well as Water Management Structures and Soil Stockpiles.

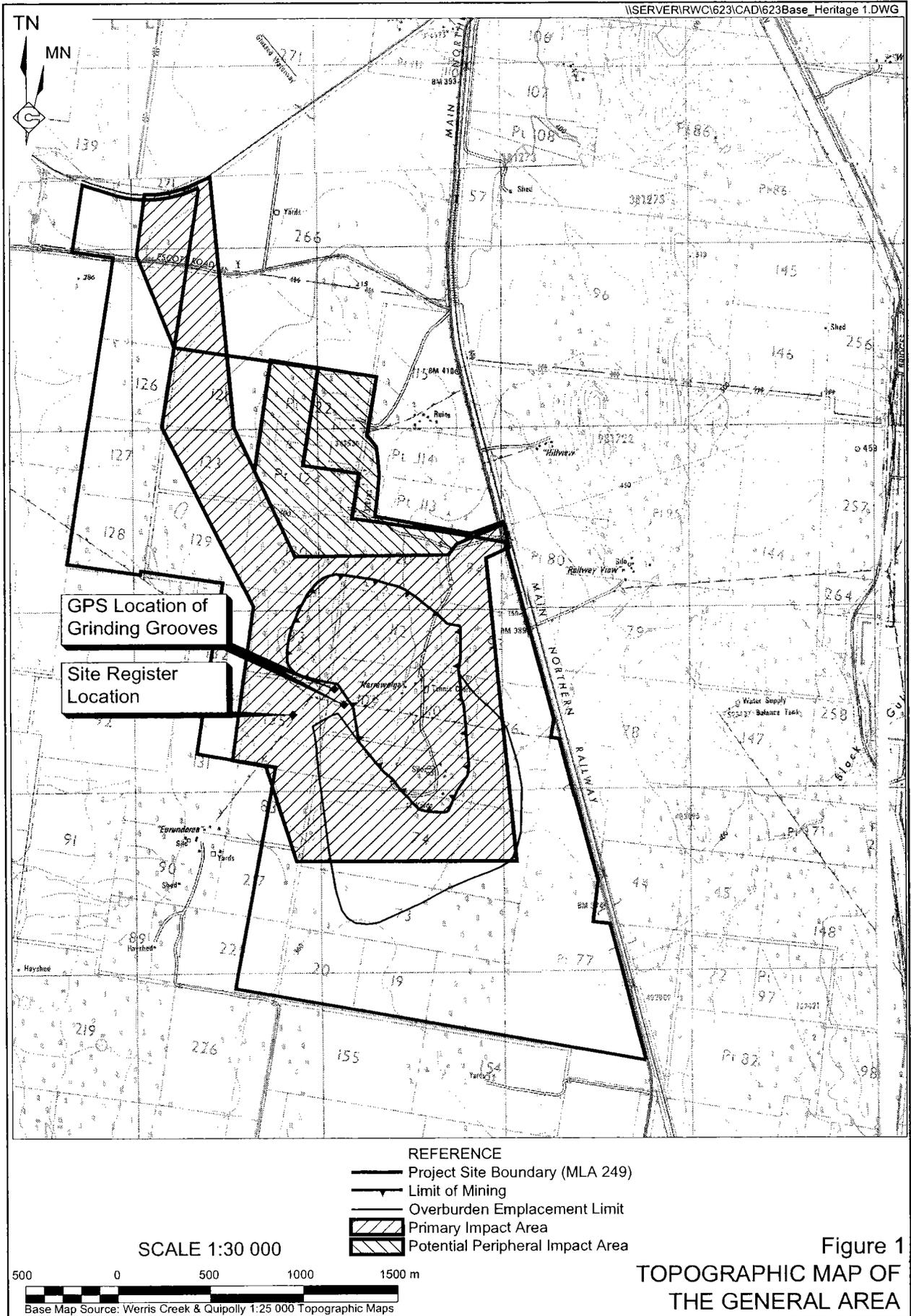
Figures on the following pages include detail from a Topographic map of the area (**Figure 1**), showing the survey areas as defined at the time of the investigations (the area outlined in red was surveyed in October 2003, and the area outlined in blue was surveyed in March 2004) and the location of the site recorded in the October 2003 survey; the Project Site Layout (**Figure 2**); detail of the original concept plan of the proposal (**Figure 3**); and detail from an aerial photograph of the area superimposed with the primary features of the proposed open cut mine (**Figure 4**).

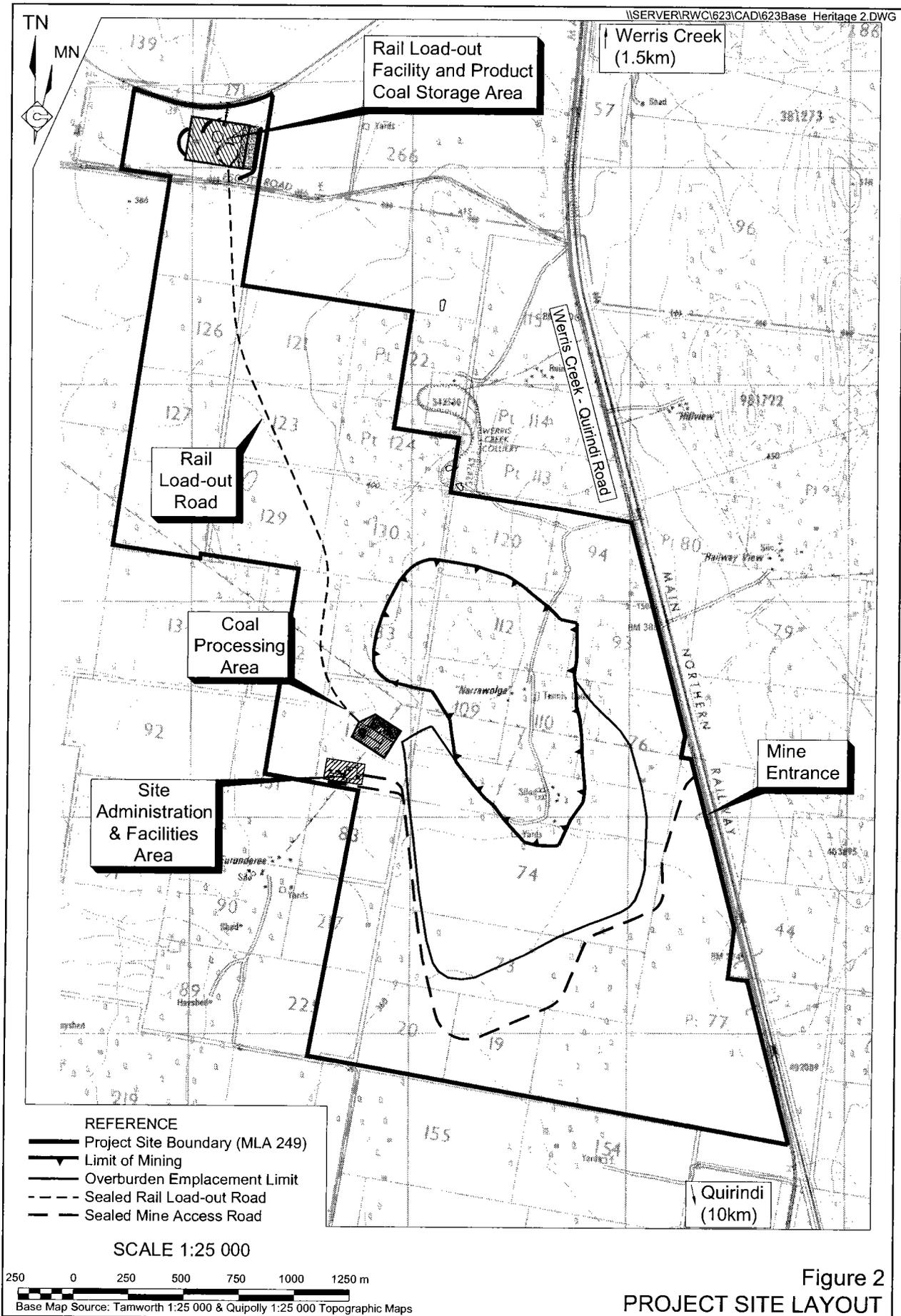
The archaeological investigation was undertaken in the area shown in **Figure 1**, but following the discovery of the axe-grinding groove site, RWC revised the dimensions of the Project Area and redesigned the concept plan in order to mitigate the impacts to the site from access to and placement of the overburden stockpiles. The results of the archaeological investigation in-so-far-as they representative of the revised Project Area are considered in the Discussion in Section 8.

1.3 POTENTIAL IMPACT OF THE PROPOSED COAL MINE.

As **Figures 2 - 4** show the potential impacts to the Project Site will be extensive, and have the potential to destroy any archaeological contexts that might be present within the footprint of proposed direct and peripheral impacts.

As a consequence of this survey it is extremely unlikely that the same area will ever be surveyed again, thus from an archaeological perspective, this was the only opportunity to observe and record any sites that might be present, and to propose a strategy for the management of any known or potential archaeological and/or cultural material in the future development of the area.





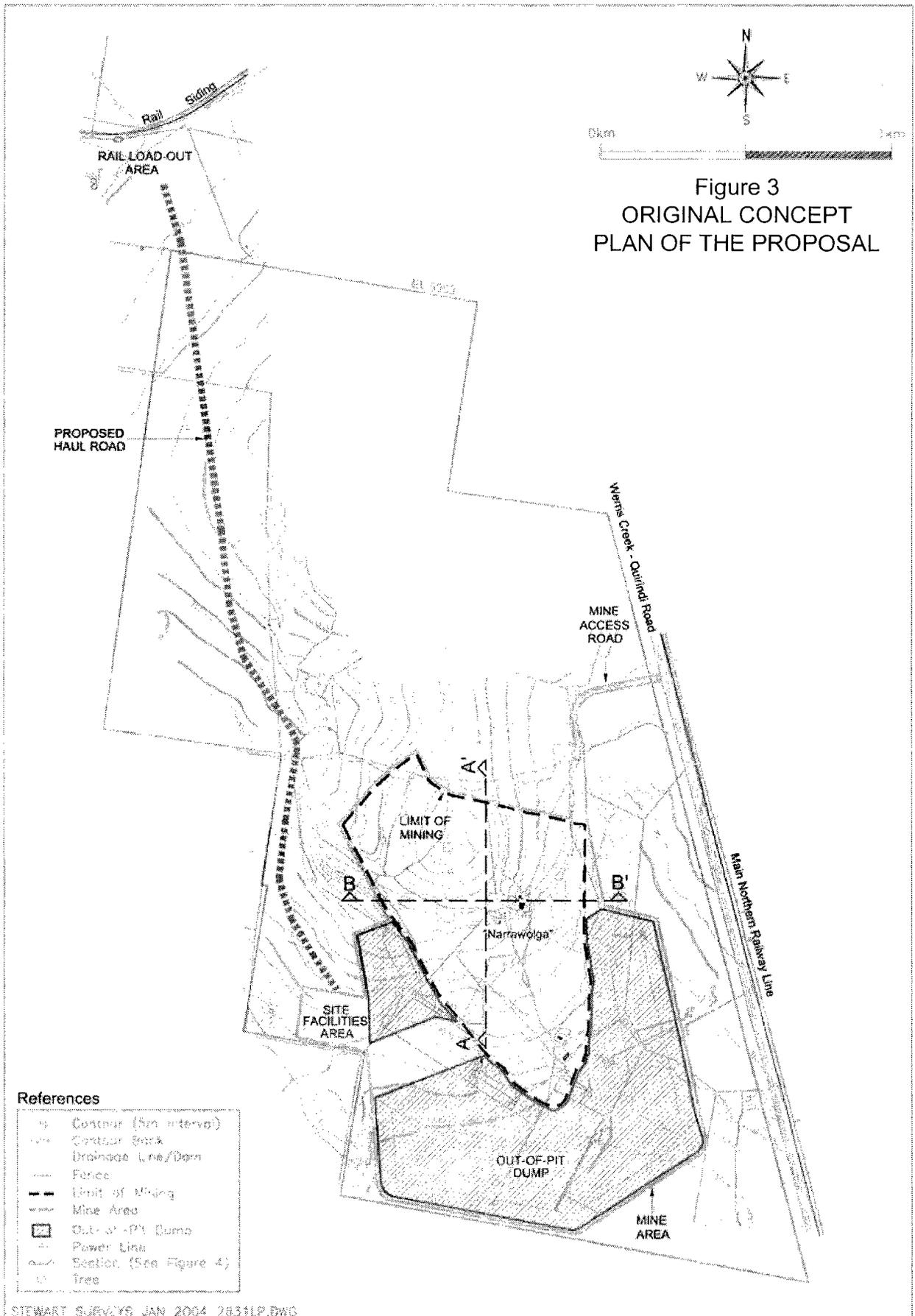




Figure 4
DETAIL OF AN AERIAL
PHOTOGRAPH SHOWING
THE FOOTPRINT OF THE
PROPOSED IMPACTS

2 ABORIGINAL CONSULTATION

Prior to the investigation Archaeological Surveys & Reports Pty Ltd (ASR) contacted the Nungaroo Local Aboriginal Land Council (LALC), to arrange for a Sites Officer to assist in the fieldwork. As a consequence Peter Allan and Shane Allan assisted in the survey, which was undertaken on 28 October 2003.

Neither Peter nor Shane were aware of any specific Aboriginal associations with the survey area, prior to being informed that a site had previously been recorded on the Project Site.

Both prior to and during the survey Peter, Shane and Appleton (ASR) discussed the potential for particular site types to be present, and the particular environments in which they might occur. The survey strategy and results were considered and discussed throughout the survey and at the completion of each survey transect or survey unit. At the conclusion of the survey the results in general were discussed, and it was agreed that Appleton would approach NPWS for a second opinion as to the nature of a number of surface marks on exposed rock surfaces, provisionally identified as being possible axe-grinding grooves.

A site of axe-grinding grooves had previously been recorded in the area but the listed map references did not correspond with the GPS (Global Positioning System) reading for the marks.

Subsequently, Mr Ron Naden from the Aboriginal Cultural Heritage Unit, Coffs Harbour, visited the site with Peter Knight and Appleton. The features were much clearer than when first observed and were positively identified as axe-grinding grooves. Because the grooves occurred over such a relatively large area both Ron Naden and Appleton agreed that the Nungaroo LALC should determine their preferred option for the future management of the site. Mr Naden then undertook to arrange a meeting of the Nungaroo Community to discuss the issue and formalise their recommendations for the management of the site.

Unfortunately Mr Naden's contract with NPWS came to an end before the issues were resolved, and so Appleton asked Mr Claude McDermot, standing in for Mr Naden as Manager of the Aboriginal Cultural Heritage Unit, to complete the consultation process with the Nungaroo Community. Mr McDermot's advice was for Appleton to consult directly with Mrs Rhonda Hilt, Coordinator, Nungaroo LALC.

Appleton contacted Mrs Hilt, who apologised for having not sent him a copy of a letter that Nungaroo had sent to Mr McDermot, advising him that the Nungaroo LALC required a meeting with NPWS, Liverpool Shire Council and Werris Creek Coal – **Appendix 1**.

Following receipt of a copy of the letter and as a consequence of several telephone conversations with Mrs Hilt, Appleton attended a meeting at the Nungaroo LALC office on 30th June, attended by Rhonda Hilt, Peter Allen, and Karen Glover, Aboriginal Sites Officer, NPWS Glen Innes (representing the Aboriginal Cultural Heritage Unit) - (at this stage Appleton thought it appropriate that the Land Council should be fully informed of its options before it attended a meeting with the Company).

At the meeting of 30 June Appleton presented Werris Creek Coal's schematic section drawings showing the relationship of the axe-grinding groove site to the coal seams and proposed open-cut pit – **Appendix 2**. Various management options were discussed including the Company's preferred option of removing the grooves to allow the coal mine to proceed and re-instating them at the completion of mining operations.

It was generally agreed that the proposal to remove the grooves was not an acceptable option, and that it would be preferable to retain the grooves *in situ*, while still allowing Werris Creek Coal to proceed with the mine. The meeting concluded with a preliminary recommendation that mining should be allowed to proceed from the east to within 100m of the grinding groove site, during which the impacts to the underlying sandstone strata (on which the grinding grooves occur where it surfaces to the west) from shock and vibration from blasting should be monitored by the company, and that no work could take place within the 100m 'zone' until Werris Creek Coal had discussed the results of monitoring with Nungaroo LALC. Mrs Hilt concluded the meeting with the request that Appleton should advise the Company that Nungaroo LALC wished to discuss the issues further with the mine management and a representative of R.W. Corkery & Co. Pty. Limited.

Subsequently, on 8 July 2004, Mr Keith Ross, Managing Director, Werris Creek Coal Pty Limited, Director, Graham Holley, and Mr Alex Irwin representing R.W. Corkery, attended a meeting with Mrs Rhonda Hilt at Nungaroo LALC. As a result of the meeting the Nungaroo LALC accepted a proposal made by Mr Irwin that the mine was '...to place a buffer zone along the sandstone passage and to monitor all blasting within 100m radius of the site', and that both Messrs Ross and Holley '... attend regular meetings with the Aboriginal Community' to discuss the possibility of employing members of the Local Aboriginal Community in mine operations – see **Appendix 3**.

Following the meeting Mr Irwin drafted an 'Aboriginal Heritage Site Management and Agreement'. A copy of the agreement is included as **Appendix 4**.

3 THE ENVIRONMENTAL CONTEXT

Any discussion of the likely presence of Aboriginal cultural remains or of the basis why such remains might be discovered must be within the context of the environment and the resources that would have been available to any Aboriginal occupants of the area.

3.1 THE GENERAL GEOLOGY AND TOPOGRAPHY

The Project Site occurs within the Sydney-Bowen Basin, a major structural basin, which extends from Batemans Bay in the south, to Collinsville, Queensland in the north. The New South Wales portion of the basin is divided into northern and southern sections by a transverse structural high to the north of Narrabri. The southern section of the Sydney-Bowen Basin has been divided into two lower category structural basins, the Sydney Basin and the Gunnedah Basin (Menzies 1974). The study area occurs in the Gunnedah Basin.

The Project Site occurs on the Werris Creek Coal Measures in the Werrie Basin. The structure occurs at the southern end of the Gunnedah coal deposits, which occur in the eastern half of the Gunnedah Basin, and extend from just north of Narrabri south-eastwards to Murrurundi. The Gunnedah Basin is in the initial stages of development as a source of export coal, and in terms of resources, is second only to the Hunter Region, but current production is quite small by comparison (Department of Mineral Resources 1985).

The Project Site generally straddles the southern half of a north-west south-east trending ridgeline, and the rail load-out road route runs from the foot of the western slopes of the ridge, via a low saddle, to the Werris Creek rail siding north of Escott Road.

Elevations in the area of the proposed pit descend from over 420m AHD on the summit of the southern rise down to just over 400m AHD in the south-eastern corner of the pit area, and in the overburden emplacement area from 400m AHD down to approximately 365m AHD adjacent to the southern boundary of EL 5993; and the rail load-out road descends from approximately 385m AHD where it leaves the mine down to approximately 380m AHD at the proposed rail load-out facility – see **Figure 2**.

The soils in the study area generally comprise of fine to medium grained weathered sandstone, some of which was covered with a very shallow layer of humic soils, derived from woodland detritus and past agricultural activities. The western rim of the ridge is starkly defined by a linear exposure of tilted sandstone beds, which form a low cliff-line along the central western slopes.

No stone suitable for knapping into stone tools was observed anywhere in the study area, however from the presence of metasedimentary pebbles in a recently ploughed paddock in the south-western corner of the survey area it is likely there are other conglomerate lag deposits in the paddocks to the west of the ridge, which unfortunately were concealed by grasses and crops at the time of the survey.

3.2 VEGETATION

As can be observed from the aerial photograph in **Figure 4** at least 90% of the Project Site has been cleared or been severely impacted upon by pasture improvement and grazing. However, there are several remnants of woodland that suggest that prior to clearing the area supported a robust and mature dry sclerophyll woodland, probably with areas of open grassland where the soils were too shallow to support shrubs or trees.

White box (*Eucalyptus albens*) is and probably was the predominant species, with Blakely's Red Gum (*E. blakelyi*) on open slopes, and Rough-barked apple (*Angophora floribunda*) on the western scarp and rim.

In terms of potential resources to Aboriginal people the box woodland would have been the habitat of possums, koalas, snakes, bats, goannas, birds (and eggs), and native bees (and 'sugarbag' or honeycomb), insects and grubs; and the grasslands the habitat of kangaroos, wallabies, echidnas, snakes, birds, and insects – as well as being a source for seeds, nectar and bark.

3.3 WATER RESOURCES

The Project Site straddles a low sandstone ridge on which there are only minor drainage depressions, and the nearest perennial watercourses are Werris Creek, 3.4km north of the limit of open cut mining, and Quipolly Creek which flows 2.9km to the south.

There was no evidence of any surface water on the Project Site at the time of the survey, although a narrow gully descended the western slopes in the south-western corner. While it is unlikely that the gully was ever a reliable source of water, the presence of the grinding grooves raises an interesting point. While it is possible to grind an edge onto stone without water it is very difficult and a not very efficient method and one not likely to have been common practice. Water must therefore either have been available nearby or brought to the site. Either way, the fact that water was used to grind axes and that there are so many axe-grinding grooves shows that the apparent absence of onsite water was not a constraint to Aboriginal use of the area.

3.3 STONE RESOURCES

As referred to previously there was very little stone in the study area that would have been suitable for knapping into tools or implements, although there appeared to be some lag conglomerates on the middle and lower slopes to the south and south-west of the ridge, but not all conglomerates include material suitable for knapping. In the apparent absence of a suitable knapping material occurring naturally in the study area any artefacts that might be present might have been sourced from elsewhere.

3.4 PREVIOUS IMPACTS

As the photographic record shows the Project Site has been subject to a number of impacts. The primary impact has been from tree clearing and pasture improvement, but there is also a residence with lawns, and a number of barns and yards, and several well-worn tracks.

4 THE ARCHAEOLOGICAL RECORD

A search was made on the Aboriginal Sites Register (Aboriginal Heritage Information Management System – AHIMS) for all sites within a 10km by 10km square centred on the Project Site, defined by Eastings: 270000-280000, Northings 6519000-6529000. The result of the search showed that three sites had been recorded within the area, of which only one occurred within the map coverage of **Figure 1**. Details of the search are included as **Appendix 5**.

Two of the sites comprised open artefact scatters, and the third of axe-grinding grooves. The only record of the original recording for the grooves is included as **Appendix 6**.

As can be seen from **Appendix 6** the map references for the axe-grinding grooves are to the nearest 100m, and the reference was taken from a 1: 250,000 scale map, which was the largest scale available in 1964. Unfortunately, at that scale one millimetre on the map equates to 250m on the ground, and when an attempt was made to relocate the grooves using the map reference there were no exposed rock surfaces in the paddock in which the map reference occurred. It was therefore concluded that the Site Register listing was for the same set of axe-grinding grooves recorded during this investigation. See the disparity in the two locations shown in **Figure 1**.

It should be noted that the recording was based on information received at the time, and as there is no reference to a field description of the site, or to a consulting qualified archaeologist, or a sketch showing the location of the site, or to any artefacts that might have been present, the recording is far from conclusive. The reference to other sites “associated with” the grooves is also misleading, as the scale of 1: 250,000 would have made any site within 1cm on the map look like it was in the locality – but 1cm on the map would equate to 2 500m on the ground.

The low density of sites in the general area, however, should not be seen to represent the typical density or distribution of sites generally in the area. Most sites are recorded during investigations required to support development applications etc, or because they are well known or are readily visible, but in areas where there has been little development, or in which there are few distinctive geological features, and particularly in areas where there has been clearing, ploughing, grazing or cropping, there are few occasions when sites will firstly be observable, and secondly recorded. The low density of sites therefore reflects in part the fact

that in the absence of development, there have been no structured surveys, and secondly, that crops and pasture grasses are a constraint to archaeological visibility, and sites such as artefact scatters and isolated artefacts will not be observable. However, having recognised that based on the availability of resources, history of land use, and likely archaeological visibility, there is a potential for other sites to exist, it is reasonable to suppose that an investigation of the total 10km by 10km search area might not yield any additional sites – see the Predictive Model, Section 5.2.

5 MODELS FOR SITE LOCATION

5.1 SITE TYPES AND THEIR LOCATION

In order to design an investigative strategy it is firstly necessary to develop a predictive model for site location. This is not to determine where the investigation should be conducted, but to establish a theoretical model for the distribution of archaeological material against which the effectiveness and subsequent analysis of the survey results can be tested, compared and reasoned. The basis upon which the predictive model is derived must, however, be one of consideration of which archaeological material might realistically be expected to not only be present, but also detectable.

The first objective of any archaeological investigation must be to observe and record sufficient of the archaeological record that is present to be able to propose that it is representative of the record as a whole. The investigative strategy is therefore directed and designed to detect that which is representative of the record in the particular study area, and naturally, as different study areas will comprise variations in environment, vegetation, topography, etc., so the investigative strategy must be designed to best suit the circumstances. The objective must be to detect material evidence, and so it is necessary to consider the extent to which artefactual material may be present, and the degree to which it is visible or might be discovered.

There are several factors, which are likely to affect, firstly, where Aboriginal people are most likely to have been, secondly, where they have left evidence of their activities, and thirdly, the degree to which that evidence is observable in the present record.

People visited places mainly to obtain resources, and in general places that were richest in resources were more likely to have been visited by people than those places with fewer resources. Important resources were permanent water, ephemeral water, food resources, stone raw material sources, shelter (from sun, wind, and rain), and perhaps suitable surfaces for rock art, and proximity to mythological natural features. Those resources may have been a factor in the suitability of a location for particular ceremonial activities but cultural boundaries also influenced the choice of ceremonial grounds. Alternatively, sites frequently occurred along preferred access routes and particularly where that route coincided with a watercourse.

However, the attractions of such an environment frequently resulted in the archaeological record becoming discontinuous or significantly disturbed, as stock and vehicles impacted upon it in the post-European contact phase.

Frequency of visits and use of particular locations was also determined by the 'accessibility' or freedom from environmental constraints in the area. For example, whether there were alternative, preferred or easier ways to travel around or over natural barriers, be they

geological, geographical, cultural, or imposed by fauna or flora, or whether they were only seasonally accessible, such as mounds on flood terraces, or the availability of water during periods of drought, or whether or not floods, fire or snow hindered access.

Few past Aboriginal activities are represented by surviving material evidence. This in part is because many activities did not leave material evidence (eg. tools were reused), but it is also because very little cultural material survived. An exception to this was shellfish, which was very durable.

The survival of material that is durable was also affected by recent European land use. Cultivation has destroyed many archaeological sites. However, cultivation can also help expose sites that might otherwise be covered. This brings us to the other important point about site distribution, which is that to a great extent site distribution recorded by archaeologists reflects the distribution of places where the ground surface is sufficiently eroded to expose artefactual material.

By far the majority of recorded sites have been stone artefact scatters or isolated stone artefacts, and in the vast majority of sites they were found in one or more of the following contexts:

- i) On or adjacent to deposits containing quartz, quartzite, jasper, silcrete, chert, chalcedony, metamorphosed greywacke, and other indurated or siliceous sedimentary rocks, or redeposited fine-grained volcanics, or
- ii) On river banks or adjacent to river banks where the watercourse contains river pebbles of quartz, quartzite, jasper, silcrete, chert, fine-grained volcanics, basalts, etc., and particularly at the junctions of watercourses, or
- iii) On ridges and spurs overlooking watercourses or on high vantage points affording uninterrupted views of swamps, water holes, saddles, passes, and any other likely access path into the observer's area, or
- iv) In the vicinity of outcrops of suitable raw material such as basalt, silcrete, chert, or other highly silicified sedimentary rock.

Other site types do occur and perhaps because of their lower and less predictable profile, are present in far greater numbers than we are aware of. People die but there are few recorded burials. One reason may be that in many instances the soils are too acid for the preservation of bone, but a far more likely reason is simply that burial frequently entailed subsurface internment, and a surface survey will only discover a burial where there has been erosion of significant disturbance to the surface deposits. As a consequence many burials have only been discovered when exposed by erosion of a sand body or river terrace.

Other site types such as carved trees, scarred trees, stone arrangements, Bora rings, etc., may once have been present, but are unlikely to have survived in easily accessible country from the attention of non-indigenous people. Thus, much of what might have existed is now lost or destroyed, and the archaeological record has become biased by the post-contact utilisation of resources, and by the selective exploitation and preservation of particular environments.

Other factors which affect the degree to which sites are recorded during an investigation include the time of year at which the fieldwork is performed (the seasonality of some vegetation growth) and the conditions under which the survey is performed – (wet, dry, cold, windy, poor light, etc.).

A brief description of site types such as isolated artefacts, open scatters, camp sites, knapping floors, quarries, middens, mounds, hearths, carved trees, scarred trees, stone arrangements, Bora rings, burials, engravings, paintings, grinding grooves, occupation deposits (and PADs), and ceremonial and mythological sites is included as **Appendix 7**.

5.2 A PREDICTIVE MODEL FOR THE STUDY AREA

Based on all of the above the following model for site distribution was proposed for the study area, in which there was likely to be shelving sandstone outcrops on the slopes, particularly towards the edge of the ridge, but in which there was very little water and no apparent source of useful knapping material.

- Isolated artefacts may be present and visible in erosion features
- Low-density artefact scatters may be present and visible in erosion features, but it is unlikely that any debitage will be visible
- There is a potential for trees more than 150 years old to exhibit scarred surfaces
- There is a potential for any trees more than 150 years old to exhibit carved surfaces
- There may be engravings, and/or grinding grooves wherever there is outcropping sandstone
- There will be no shelters and therefore no art sites
- There will be no shelters and therefore no intact occupation deposits
- There will be no stone quarries
- There will be no shell middens
- There will be no visible evidence of burials
- There will be no surviving Bora rings
- There will be no surviving stone arrangements
- There are no known cultural associations with the area

6 THE SURVEY

6.1 THE SURVEY STRATEGY

Prior to the investigation it was decided that as the survey area was not large it would be possible to undertake a comprehensive survey of the entire survey area. In effect, the grass ground cover was so dense in most of the cleared areas that it was only possible to perform a sample survey. As a consequence the survey strategy entailed walking tracks, and targeting rock and soil exposures, erosion features, drainage lines, and any tree that appeared to be old growth.

Following the survey RWC requested ASR revisit the site to survey the area to the north of the proposed open cut area for sites of heritage significance. As can be seen in Figure 2 the area contained the former Werris Creek Colliery Workings. RWC were concerned that there might

be items or features of heritage significance that could be damaged by fly-rock, and as their representative had observed a stack or chimney in the area of the workings they were keen that it should be assessed for its significance. However, when Appleton arrived on site he was advised by the Project Manager of the proposed coal mine that the owner of the property had denied access. Long-distance photographs of the stack, and overburden or bund were taken as a record of the site.

6.2 DETAILS OF THE SURVEY

The survey was undertaken by ASR, assisted by Peter Allan and Shane Allan representing the Nungaroo LALC. The survey was made on foot, in dry conditions under a partly cloudy sky, but in light ideal for observing any artefactual material present and observable.

The area outlined in red in **Figure 1** was surveyed on 28th October 2003, and the area outlined in blue on 4th March 2004.

All of the areas shown shaded in red in **Figure 5** were surveyed on foot.

6.3 SITE RECORDING

All relevant observations as to the topography, vegetation cover, and conditions, were recorded in a field-log, and photographs taken with an Olympus Camedia C-3030 Zoom Digital Camera, to record the character of the survey area, the art site, and to witness survey conditions. The site reference was recorded using a hand-held GPS (Global Positioning System).

6.4 EFFECTIVENESS OF THE SURVEY TECHNIQUE

There was a dense grass cover in most cleared areas but there was sufficient ground surface exposure, and in the tracks, and in erosion features, and in environments in which artefactual material was most likely to be present if at all, for an effective sampling of the survey area. In addition to the more obvious ground surface exposures some areas contained minor erosion features, which provided samples of those environments least likely to contain artefactual material. Also, there was direct access to the few extant old growth trees and so the survey in respect of identifying scarred or carved trees was highly effective.

The survey technique was the most appropriate one to use in the circumstances, and the results are believed to be generally representative of the archaeological record in the survey area, in which it was predicted there would be very little artefactual material, primarily because of the absence of a suitable knapping material. Although the entire sample area was surveyed, the groundcover was a constraint to the effectiveness of the survey.

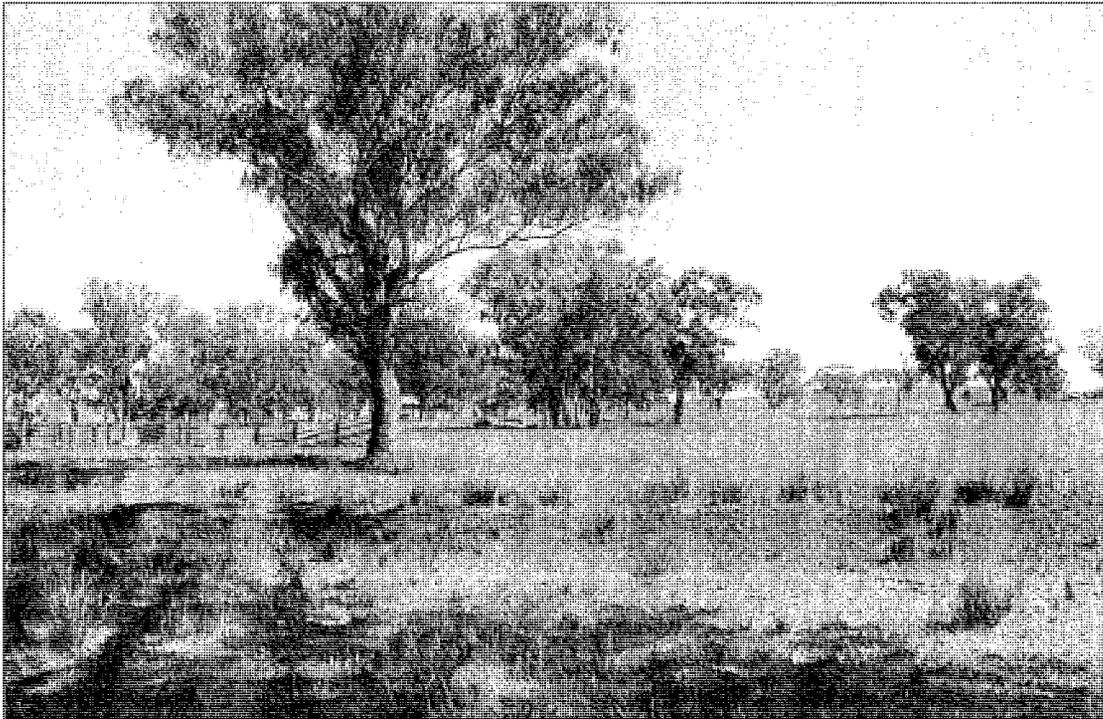


Figure 6 – Looking northwards from the south-western corner of the study area



Figure 7 – Looking south-westwards towards the south-western corner from the foot of the ridge. Reverse aspect to Figure 6.



Figure 8 – Looking westwards from the footslopes midway along the ridge

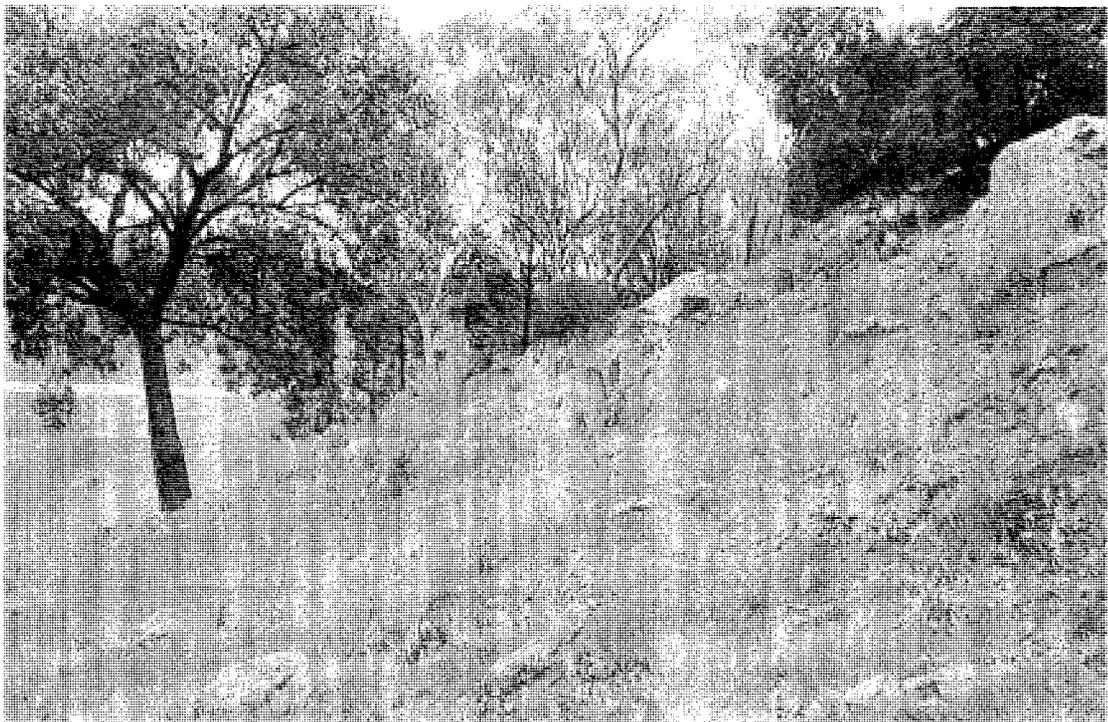


Figure 9 – Looking northwards along the western scarp of the ridge.



Figure 10 – Looking northwards along the rail load-out road route to the west of the ridge.

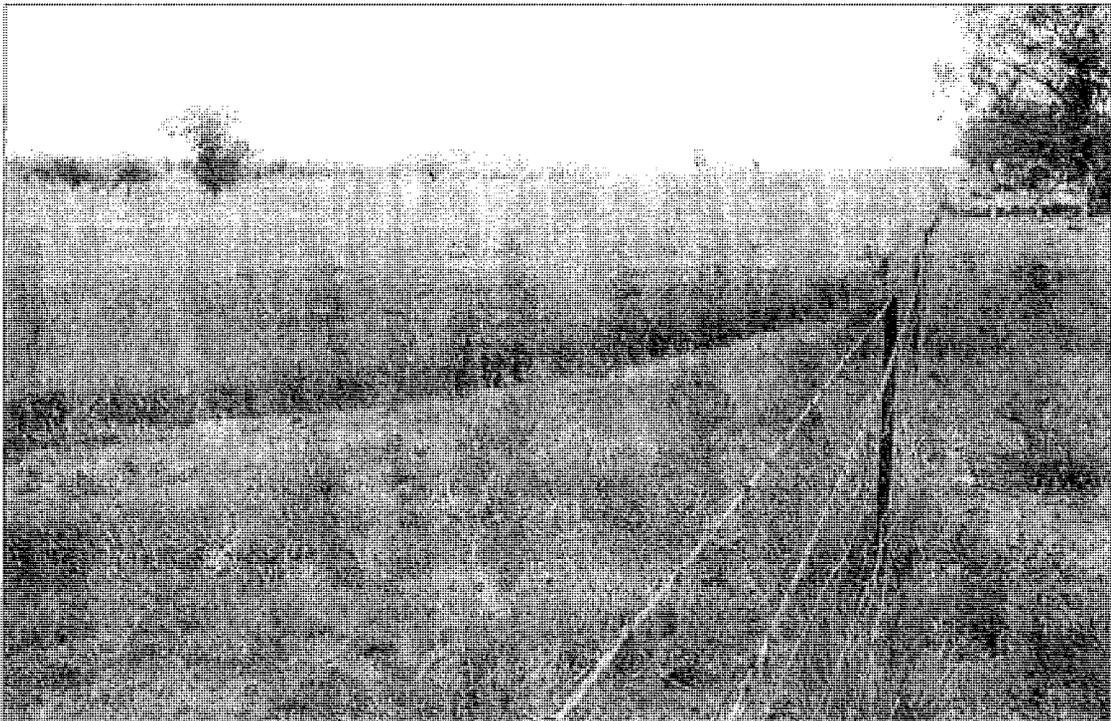


Figure 11 – Looking northwards along the rail load-out road route from the northern end of the ridge.



Figure 12 – Looking southwards towards the north-western corner, from upslope of the colliery coal-feeder (visible as a low ramp going from left to right).

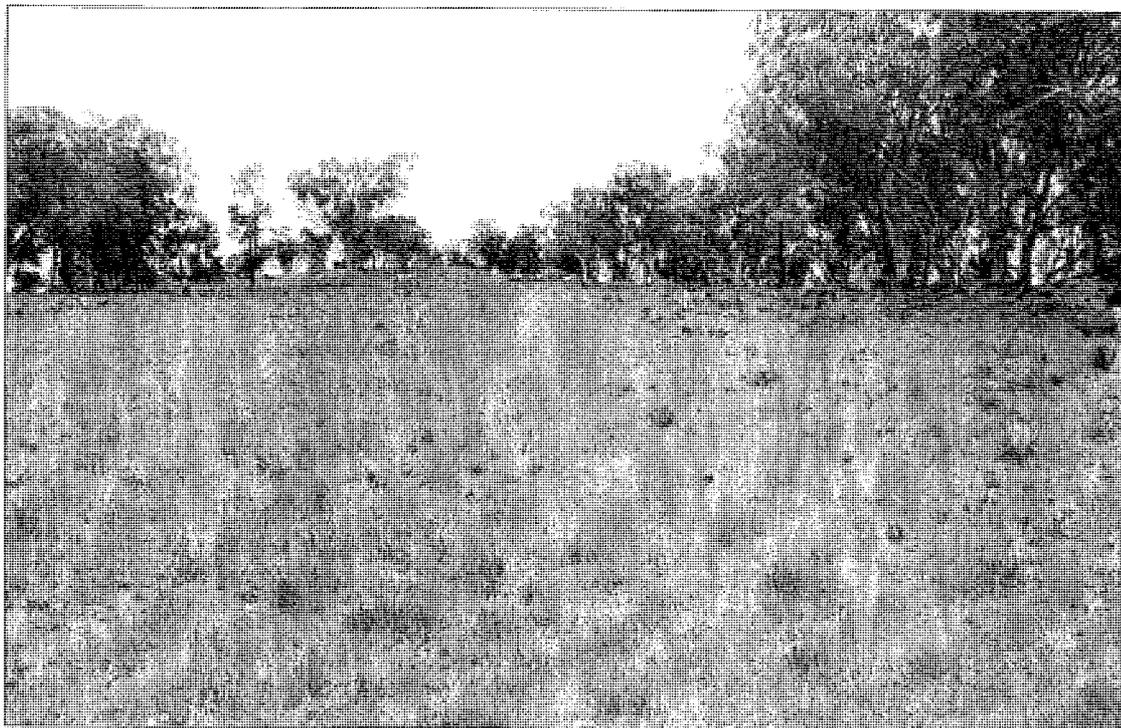


Figure 13 – Looking southwards along the western rim of the ridge.

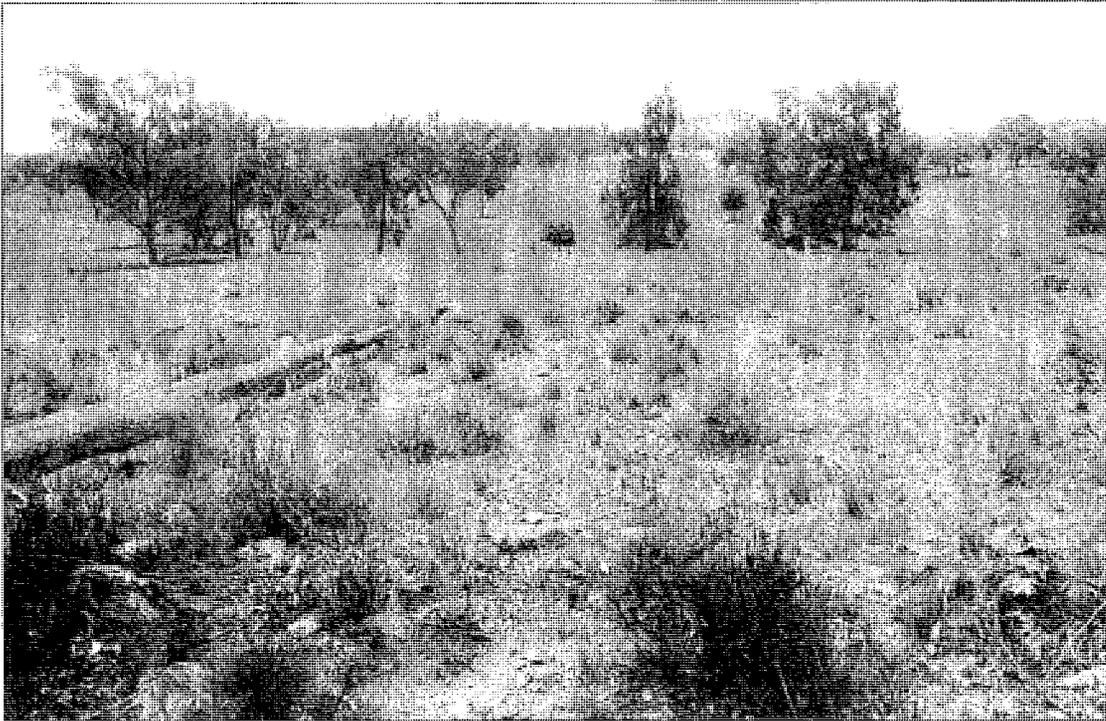


Figure 14 – Looking eastwards across the proposed open cut area, from the ridge.



Figure 15 – Looking towards the south-east across the proposed open cut area, from the ridge.



Figure 16 – Looking southwards down the line of the sandstone exposure, along the southern end of the ridge.



Figure 17 – Looking northwards along the sandstone exposure on the eastern side of the ridge

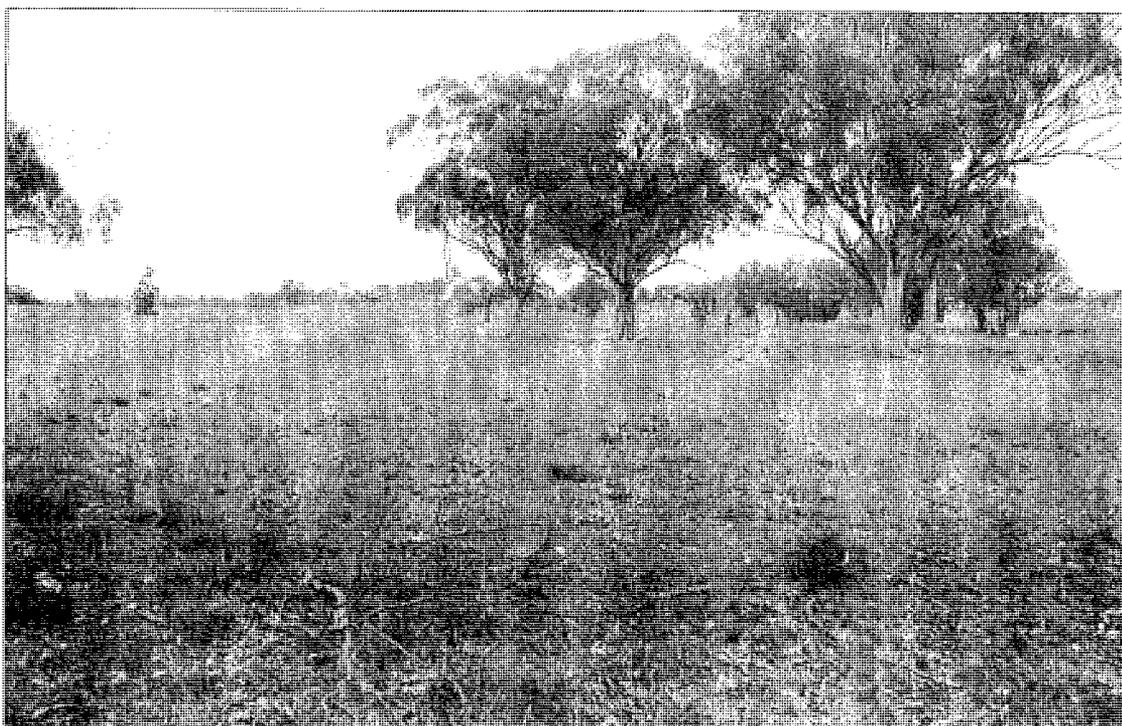


Figure 18 – Looking northwards along the eastern section of the study area.



Figure 19 – Looking northwards along a gully along the eastern boundary of the study area



Figure 20 – Looking southwards along the proposed rail load-out road route, from Escott Road



Figure 21 – Looking northwards along the proposed rail load-out road route towards the railway, from Escott Road

6.5 EFFECTIVE COVERAGE

Figure 5 shows the effective survey coverage based on the assumption that most artefactual material if exposed and visible can be observed for up to 5m to either side of the path of the observer. Clearly this would vary significantly between a path walked through dense vegetation, and a path across a claypan, and is given as a guide only.

7 THE RESULTS

7.1 INDIGENOUS SITES

A site comprising of 25 or more axe-grinding grooves, was recorded on the southern end of the western rim of the ridge.

Site name: **“Narrawolga”**

Site type: Axe-grinding grooves

Location: A linear area approximately 90m long by 35m wide, between AMG: 0275094 6523542 ± 4 m, and 275134 6523452 ± 4 m
Quipolly 9035-III-S, 1: 25,000 Topographic Map
(Previously recorded as site # 29-2-0005 at 274800 6523300 – probably on 1: 250 000 scale map)

Geological location:

Linear outcropping of tilted sandstone on the middle slopes to a low ridge.

Environment: Dry sclerophyll woodland dominated by white box

Nearest water: Dry drainage line 30-50 m. Nearest ephemeral creek is an unnamed tributary over two kilometres to the north-west, which eventually flows into Werris Creek, a further 6km downstream.

Other sites in the locality: Nothing known within 5km radius.

Site Dimensions:

Approximately 90m from north to south, and 35m wide at its widest.

Aspect: The site occurs on a southerly-facing slope, however its aspect is probably more west to south-west.

Deposits: None. Surrounding area concealed beneath agricultural grasses.

Archaeological features:

The site comprises of at least 25 axe-grinding grooves, mostly aligned north/south. The surface of the grooves are highly weathered but vary significantly in definition. It is unknown whether the variation is a consequence of differences in resistance of the rock surfaces to weathering and deterioration, or whether the differences are because of the grooves were made at different times. If however it is because of the latter then the grooves were made over a considerable length of time.

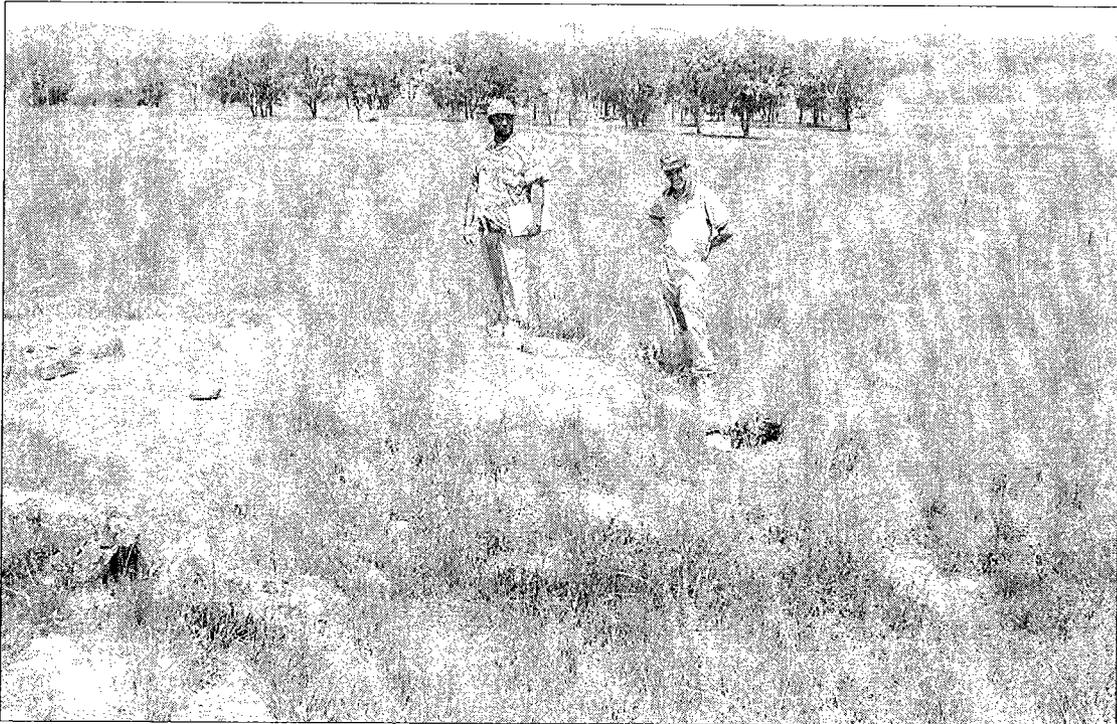


Figure 22 – Shane Allan and Peter Allan standing on the southern end of the site.

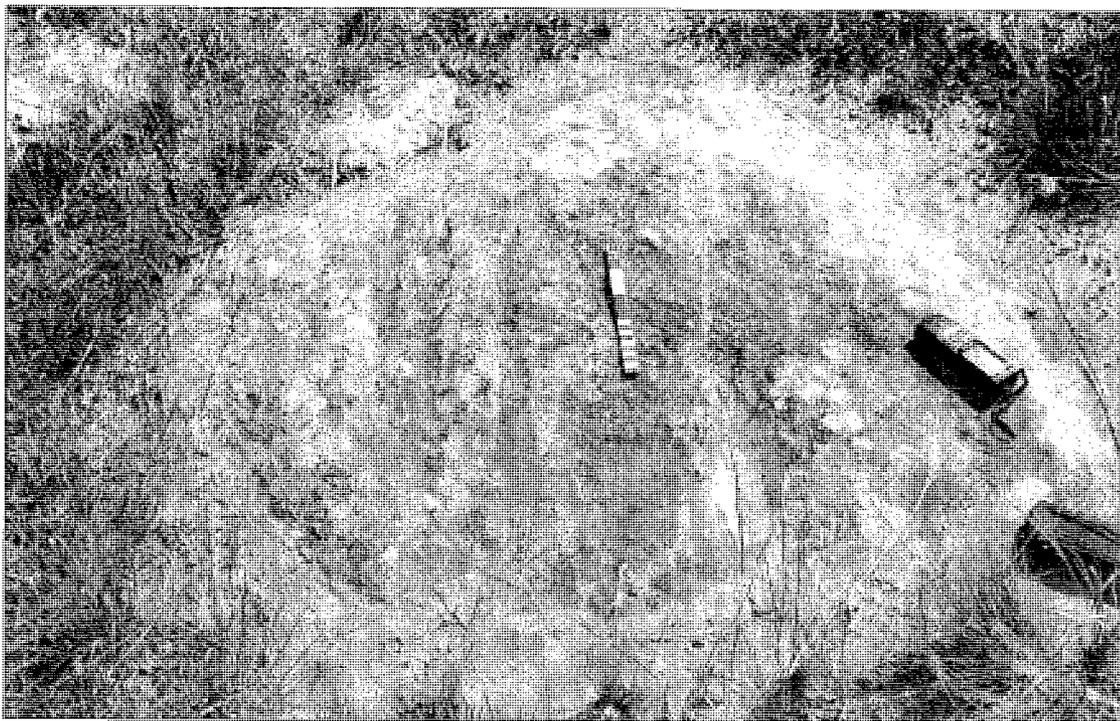


Figure 23 – Five axe-grinding grooves. Scale 25cm.

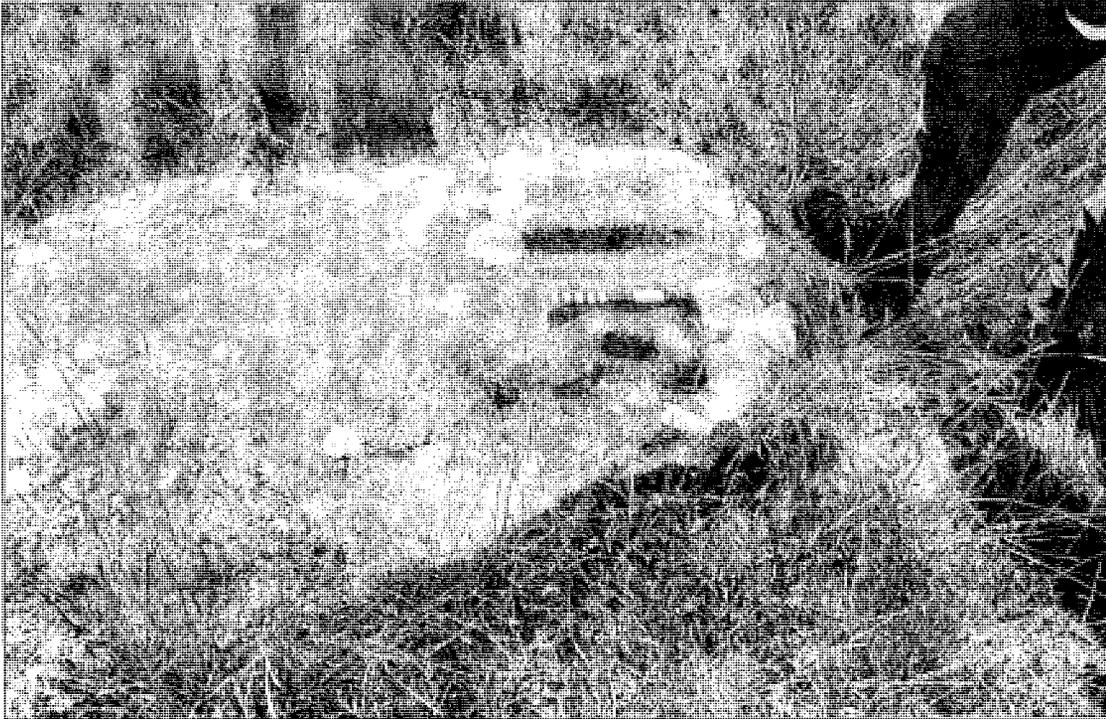


Figure 24 – A very deep groove. Scale 25cm25cm.

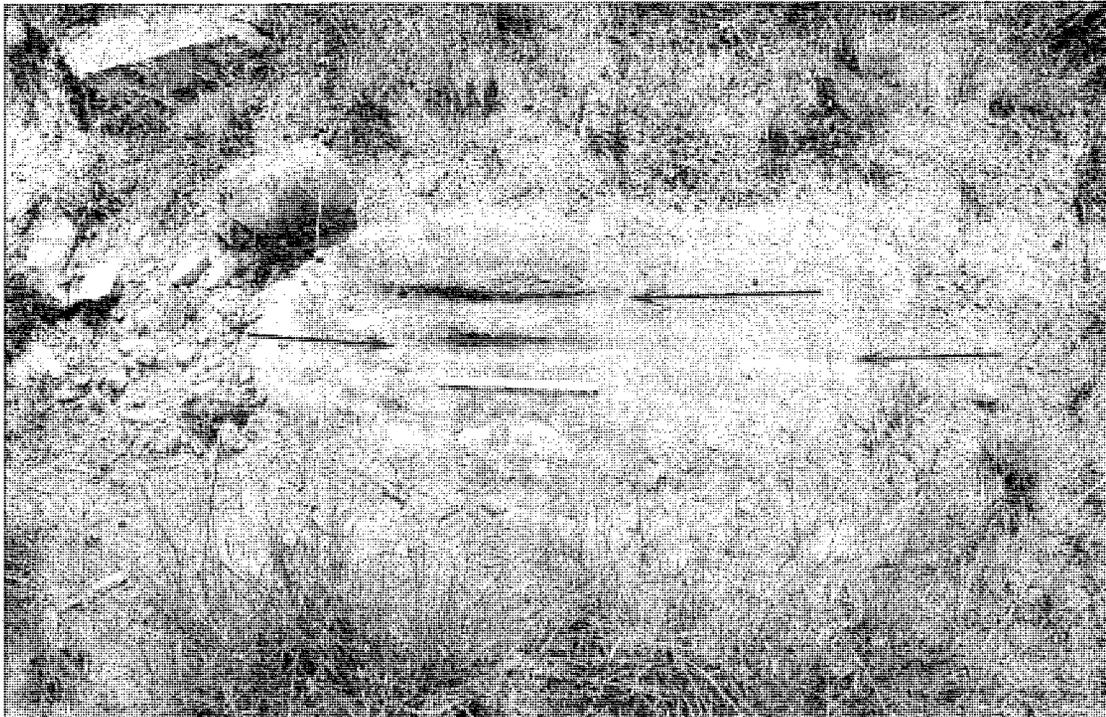


Figure 25 – Three more grooves. Scale 25cm.

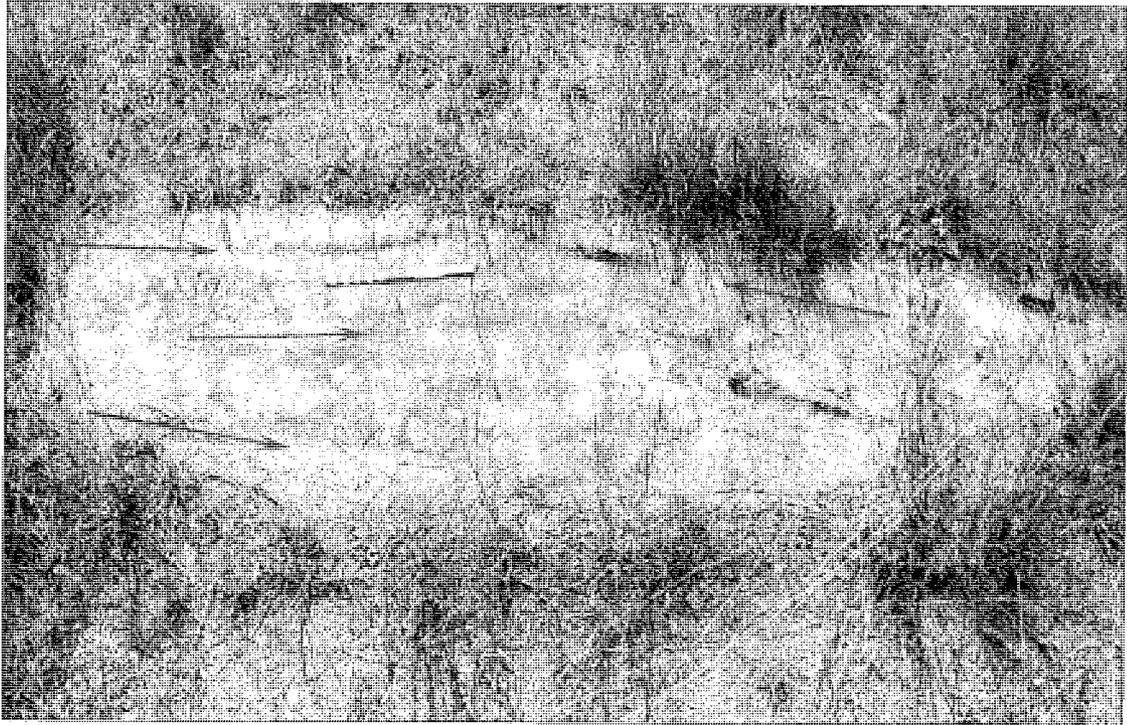


Figure 26 – Group of at least four weathered grooves. Scale 25cm.



Figure 27 – Four more, very weathered grooves. Scale 25cm.

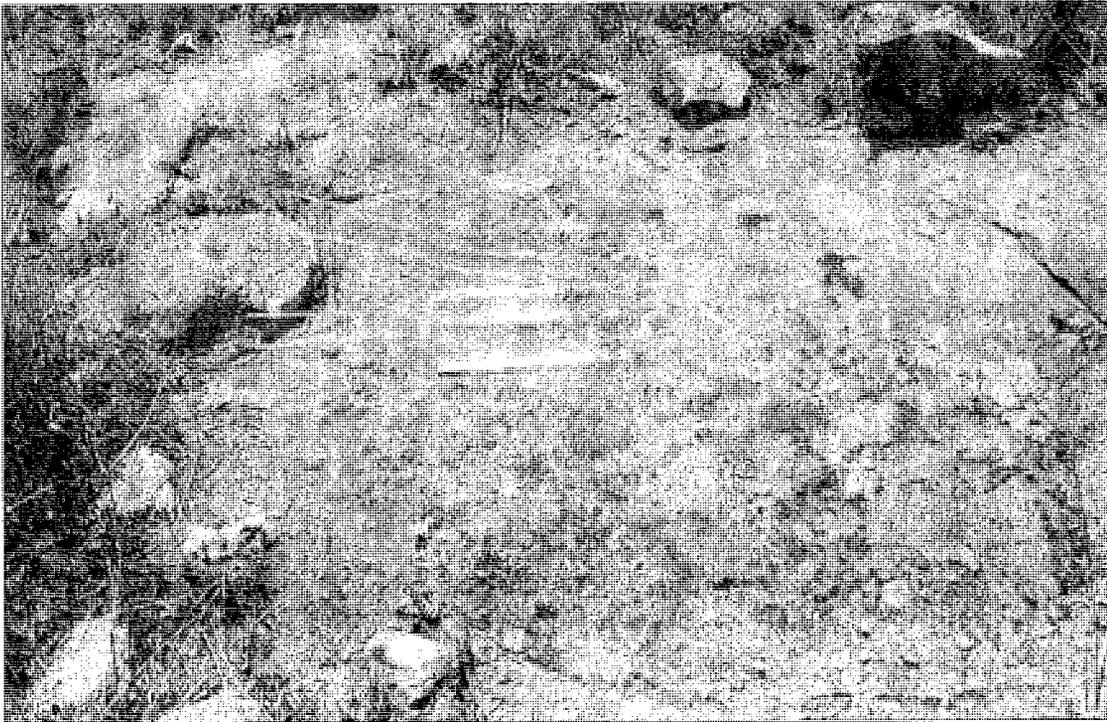


Figure 28 – Group of five grooves. Scale 25cm.



Figure 29 – Three more grooves. Scale 25cm.

7.2 EUROPEAN HERITAGE SITES

As referred to previously the brief required an investigation of an additional area for any items, relics or features of heritage significance that might be impacted upon by peripheral activities or by fly-rock. The area to be surveyed was to the north of the proposed open cut (the area is outlined in blue in **Figure 1**), in which the Werris Creek Colliery had operated until the 1950s. Unfortunately, the present owner refused access to ASR to investigate the colliery remains and so only that part of the colliery area to the southwest of the main workings was surveyed.

The few remains occurring within the area surveyed consisted of a coal-loading ramp and chute, part of which remained on site. The only other recognisable feature that could be associated with the colliery was a graded rail load-out road to the coal-loading ramp. A creek-line running parallel to the track from the direction of the colliery workings appeared to have been either mechanically constructed, or had been a natural drainage line that had been widened and deepened by water discharge from the colliery. No other features of heritage interest were observed in the study area. The following plates show the remains of the coal-loading ramp and chute, and long-distance images of the only other apparent remaining surface structure of the colliery, which was a stack or chimney of unknown purpose.

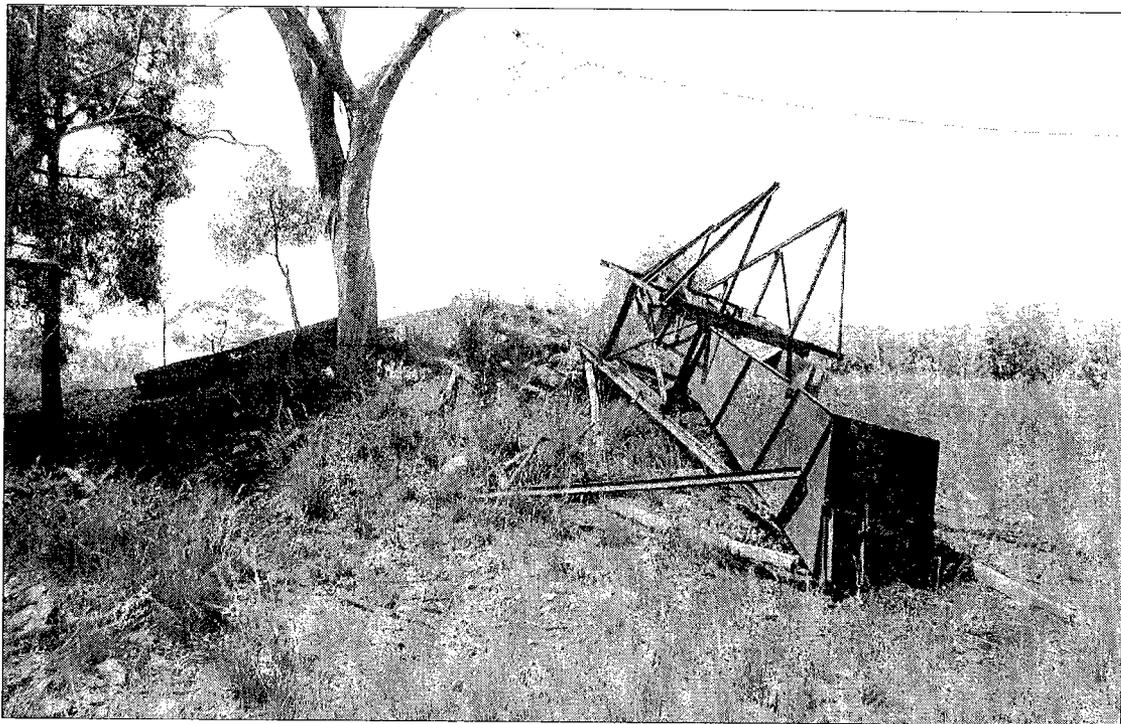


Figure 30 – Remains of the coal-loading chute and ramp.



Figure 31 – Werris Creek Colliery. Stack, and overburden, bund or causeway on the left, viewed from Werris Creek-Quirindi Road.

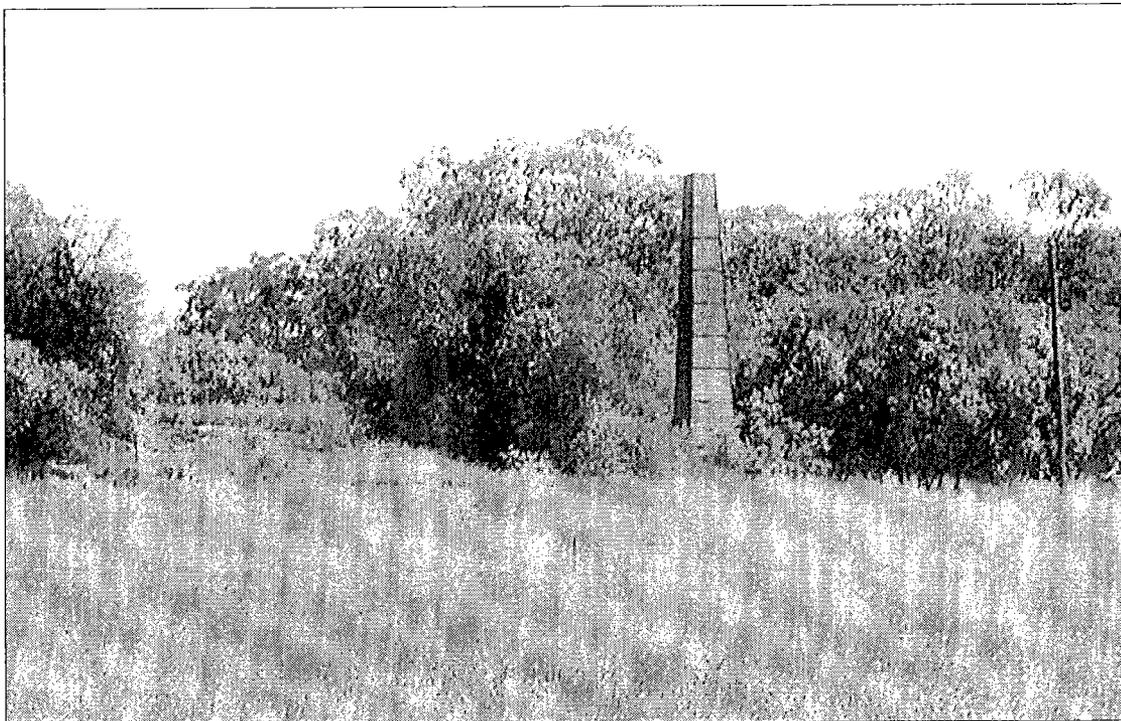


Figure 32 – Enlarged detail of the stack viewed from Werris Creek-Quirindi Road.

8 DISCUSSION

The Project Site occurs in an area in which only one site has been recorded within the map coverage of **Figure 1**. The “Narrawolga” site is therefore unique and of archaeological significance. This is particularly so because of the scarcity of surface water, which would suggest that the site was not associated with a camp site. While it is possible that this was the only outcropping sandstone in the area suitable for sharpening axes, nevertheless, it represents a location that was the focus of a specific activity. What it is uncertain is whether that activity was only to sharpen axes, or whether the site was also associated with ritual.

The study area has been significantly altered by clearing and by agricultural activity, and as a consequence little of the ground surface remains unaltered. From an archaeological aspect the combination of a significantly altered ground surface and poor archaeological visibility created a situation in which it was extremely unlikely that any artefactual material would be observable in the Project Site.

When the axe-grinding grooves were first observed it was unclear as to whether they had been caused by the underside of farming machinery, or whether Aboriginal people had made them. Upon returning to the site in much better light conditions Appleton observed that there were more marks than had been noted in the earlier visit. It was also clear that from the alignment of the grooves with the outcropping that they could not have been made by machinery crossing over the outcrop which would have produced grooves perpendicular to the alignment of the outcrop, and that if they had been made by machinery moving over and along the outcrop that the grooves would have also occurred in other places and have been of varying lengths. Finally, upon closer inspection it appeared that all of the grooves were of similar dimensions. That is, in the order of 25-35cm long, 10-15cm wide, and 1-5cm deep. Appleton has reported elsewhere that axe-grinding grooves are typically of similar dimension (Appleton 1998, 1999, 2001, 2003, and observations at Yetman and along the McDonald River Valley)

As described earlier the Project Site would have been a habitat rich in potential food resources, but there is no archaeological evidence within the Project Site that people utilised these resources. However, one of the frequent uses of ground-edged axes was to cut holes in box trees to gain access to the various food resources that were inside the hollow limbs and trunk, and the presence of the axe-grinding grooves suggest that it was probable that at least some of the potential resources associated with box-gums were utilised.

Given the absence of a knapping-stone source within the survey area the absence of stone artefacts was not surprising. Any stone tools or implements brought into the area would have been sourced elsewhere, and so any artefacts that might have been discarded during hunting and collecting were likely to be in very low densities, as the stone was not readily replaceable. If any artefacts were present in the Project area they would have been likely to consist of small trimming or maintenance flakes of less than 5mm long, or of discarded ground-edge axes. While the groundcover would make it almost impossible to observe the former in all but erosion features, the latter might be present, but would only be found by chance.

In summary, although the survey area occurred in a region in which there is a potential for sites to occur, there was only a very low potential for the actual Project Site to contain archaeological material. If however archaeological material other than the axe-grinding grooves was present, it was likely to consist of very small isolated artefacts or isolated stone axes, none of which would be observed other than by chance.

Revised Project Area

Partly as a consequence of the results of the field investigation, Werris Creek Coal chose to revise the layout of the proposal, in order to avoid impacting directly on the archaeologically sensitive area. The recording of the axe grinding-groove necessitated the relocation of the proposed limit of mining, overburden emplacement (in the vicinity of the site). The site layout is shown on Figure 33. The following map in **Figure 34** is a composite plan showing the original Project Site, outlined in red, the additional area surveyed for Heritage sites, outlined in blue, the revised Project Site, outlined in green, and the area that was surveyed for archaeological remains, shaded in pink.

While the field survey did not include all of the revised proposed rail load-out road corridor, or all of the extended southern section, the results of the investigation of the preliminary Project Area are considered to be representative of the larger, revised Project Area. As can be seen from the aerial photographs and photographic record the extended area occurs in pasture and cropped areas, in which there were neither any distinct drainage lines, nor any specific geological features that might contain resources that would have been potentially useful to the Aboriginal occupants of the region.

In terms of the effective coverage of the field survey in relation to the revised Project Area it is estimated that while 70% of the preliminary Project Site was effectively surveyed, the area surveyed represents approximately 55% of the revised Project Site. It should be stressed however that the surveyed area included all geological features and environments in which artefactual material was most likely to occur, and those areas of the revised Project Site that were not surveyed were areas in which artefactual material was least likely to occur.

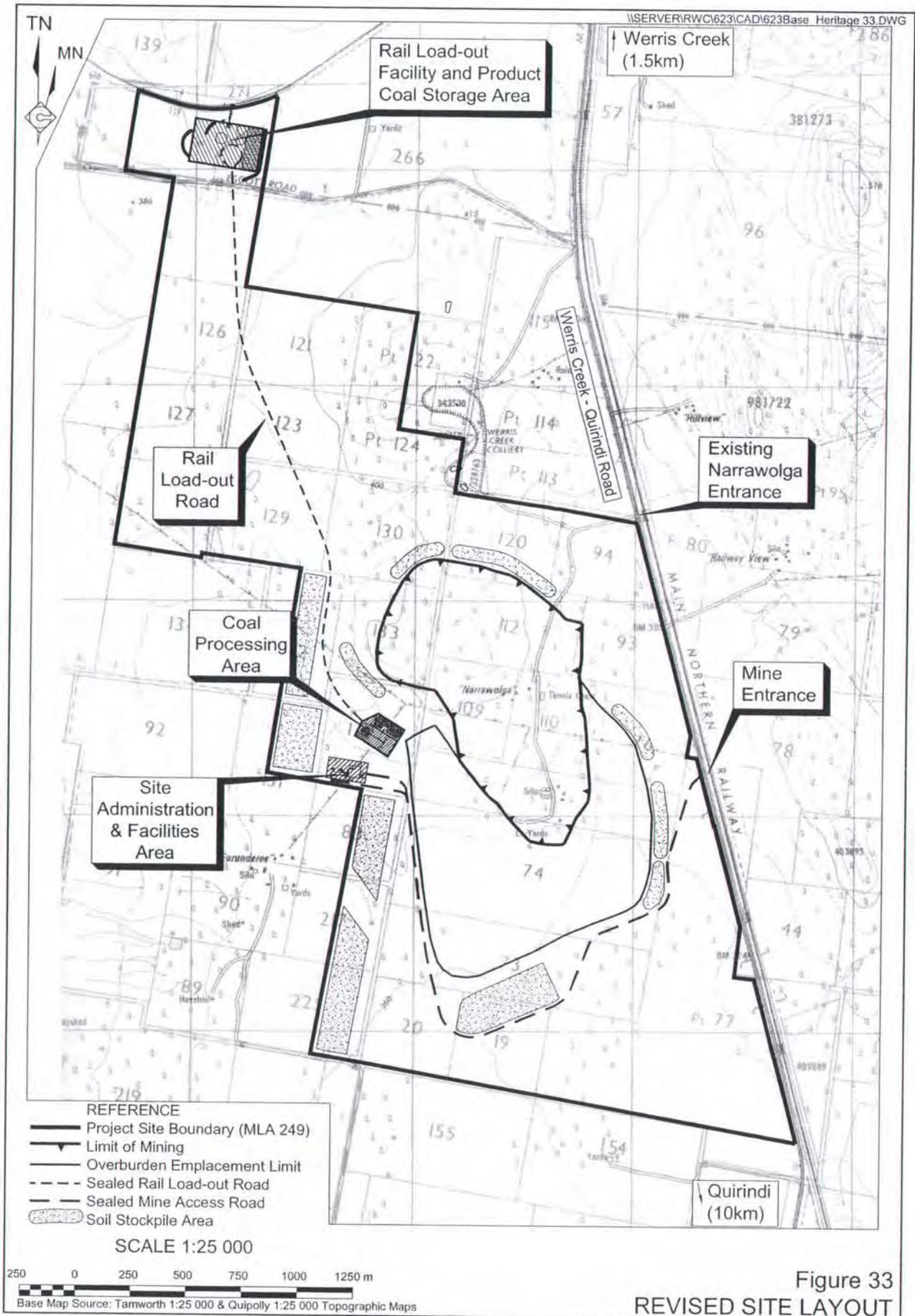
9 SIGNIFICANCE ASSESSMENT

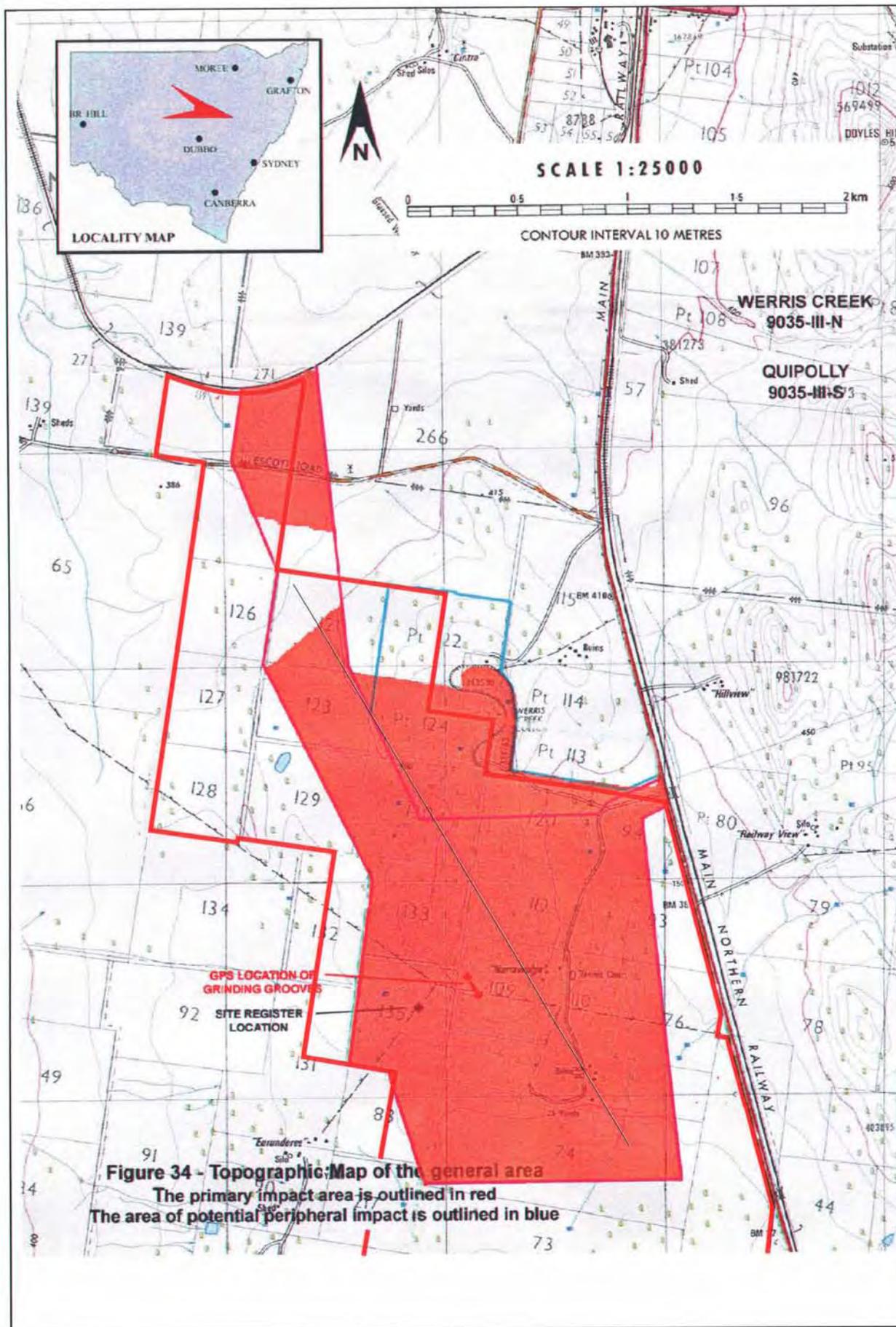
The NPWS policy to safeguard all sites, Aboriginal places, and archaeological material of significance wherever possible requires that some means of assessing the significance of the sites is necessary. This is not only for the purpose of determining whether the proposed development can proceed as proposed, but also to provide Cultural Resource Managers with the information for future management of the area.

9.1 CULTURAL SIGNIFICANCE

The Aboriginal or cultural significance of Aboriginal relics and sites can only be assessed by the Aboriginal community, and in particular, the Elders. It is the responsibility of the archaeologist to ensure that the Elders, or elected representatives of the Aboriginal community are advised of the survey results, and are consulted as to their knowledge and opinion of the significance of the area, and to transcribe and present those expressions in report form.

When Peter Allen reported the finding of the axe-grinding groove site to the members of the Nungaroo LALC they agreed that the site was of high cultural significance to the Aboriginal Community, and that the site should be preserved *in situ* – however, the members were also anxious not to prevent mine operations that will have the potential to invigorate the local economy as well as provide both direct and indirect employment opportunities. From that point it became an issue of how to proceed in such a way that would both preserve the site *in situ* and allow mining to proceed.





As discussed in Section 2 the Nungaroo LALC was directly involved in the consultation process from the commencement of the archaeological investigation, and following the recording of the site, was fully appraised of both the potential constraints that preservation of the site would place on the operation of the proposed coal mine, and the various options available to it, both in terms of the future management of the site and the future operations of the coal mine. A deliberate attempt was made by ASR to give the Land Council sufficient time, space and information to allow it to discuss and consider its options before discussing them further with the management of Werris Creek Coal.

As a consequence an agreement was reached between Nungaroo LALC and Werris Creek Coal which will allow the coal mining operations to proceed to within 100m of the site, while affording protection and preservation of the axe-grinding site until such time as there is more accurate information upon which to base further discussion of management options for continuing operations within the buffer zone. A copy of the agreement was received by ASR on 29th July 2004, and is included as **Appendix 4**.

9.2 RESEARCH POTENTIAL

As described previously the site is of archaeological significance, primarily because of the absence of other known sites in the area, but perhaps more importantly because the discrete distribution of the grooves occurs in a location where there is an absence of surface water, which suggests either that the site was either an activity-specific site, an axe-sharpening site – or the site had some ritual significance.

While the site is archaeologically significant, there is little more than can be learnt from the site, as there are no stone artefacts nor scarred trees in the vicinity that might explain why the site is where it is. Therefore, in terms of further research potential the axe-grinding groove site is assessed to be of low research significance.

10 RECOMMENDATIONS

The recommendations of the Nungaroo LALC are:

That no mining should occur within 100m of the axe-grinding groove site until the results of mining and blasting in the section beyond the buffer zone are known. Werris Creek Coal is to monitor the effects and impacts from mining and blasting in the eastern section to determine the effects on the sandstone substrate on which the axe-grinding grooves occur. When the results of monitoring are known Werris Creek Coal should consult further with Nungaroo LALC to determine the appropriate management strategy for the continued operation of the mine, and the appropriate conservation or preservation strategies for the care and management of the axe-grinding groove site.

In addition, the proponents are advised of the following provisions: All developers, contractors and their employees are bound by the provisions of the *National Parks and Wildlife Act 1974* as amended, which was in part designed to mitigate impact to the Indigenous archaeological record.

Under the provisions of the *National Parks and Wildlife Act 1974*, all earthmoving contractors and operators should be instructed that in the event of any bone or stone artefacts, or discrete distributions of shell, being unearthed during earthmoving, work should cease immediately in the area of the find, and the Nungaroo Local Aboriginal Land Council, and officers of the National Parks and Wildlife Service, informed of the discovery. Work should not recommence in the area of the find, until those officials have inspected the material and permission has been given to proceed. Those failing to report a discovery and those responsible for the damage or destruction occasioned by unauthorised removal or alteration to a site or to archaeological material may be prosecuted under the *National Parks and Wildlife Act 1974*, as amended.

In the event that a relic or item is discovered during earthworks details of the discovery should be communicated to: The Archaeologist, NPWS Metropolitan Zone, and to The Chairperson, Nungaroo Local Aboriginal Land Council (addresses at the front of this report).

11 GENERAL GLOSSARY

The definitions that follow are for terms used in this and other reports written by the author, and do not necessarily apply to their use in different contexts.

ADZE : A modified flake with at least one steeply-retouched working edge. While all adzes are generally considered to be wood-working tools it is probable that some also served as cores and others as scrapers. Adzes with a uniform butt were frequently hafted to make a chisel-like tool, but the intended use of the adze determined the size of the adze and whether it was hafted (Flenniken and White, 1985).

AHD: Australian Height Datum

ANTHROPOMORPH: A figure of human form (Walsh 1988).

ARCHAEOLOGICAL DEPOSIT :
Sediments which contain evidence of past Aboriginal use of the place, such as artefacts, hearths, burials etc.

ARTEFACT : Any object that has attributes as a consequence of human activity (Dunnell, 1971). In this report 'artefacts' has been used generally to describe pieces of stone that have been modified to produce flakes, flaked pieces, cores, hammerstones, or axes.

BACKED BLADE :
A stone tool manufactured from a flake on which one margin has been modified by the removal of small flakes to blunt the edge or margin opposite the cutting edge.

BORA GROUND :
A ceremonial site comprising of one or two connected circles composed of compacted or mounded earth, or defined by an arrangement of stones, of 2 to 30m diameter, generally used in male initiation rites.

CAMPSITE : A place at which the density of artefacts and the variety of material indicates that people 'frequently' used the place as a stopping or resting place. Such places are also likely to contain or be close to water resources, food resources, or stone material resources. In this report a campsite is used to describe artefact scatters that are associated with hearths or fireplaces, as distinct from scatters that are not associated with hearths or fireplaces, which are described as Open Scatters.

CHALCEDONY :
A form of silica (partially translucent), which occurs as linings in cavities in rocks. When banded it is known as AGATE (Department of Mines, 1973). Chalcedony is uniformly coloured and agate has curved bands or zones of varying colour (Cook & Kirk, 1991).

CHERT : Another name for sedimentary chalcedony. It occurs most frequently in limestones, or in marine sedimentary rock, or as pebbles in sedimentary rock. In its depositional context it is often concentrated in bedding planes. Chert found in deep-water limestones is formed from radiolaria and diatoms (siliceous planktonic micro-organisms) (Cook & Kirk, 1991).
Chert is a form of amorphous or extremely fine-grained silica, partially hydrous, found in concretions and beds. It is classified as a chemical sedimentary rock although it may be precipitated both organically and inorganically (Department of Mineral Resources, n.d.).

CONGLOMERATE :
Naturally cemented gravel. Conglomerate is a coarse-grained clastic sedimentary rock composed of generally rounded fragments of other rock types larger than 2mm in diameter, set in a fine-grained matrix of sand, silt, or any of the common natural cementing materials (Department of Mineral Resources, n.d.).

CORE : A piece of stone from which flakes have been removed, that cannot otherwise be described as a retouched or modified artefact.

CORTEX : The naturally altered surface of stone – eg. the water-worn surface of river pebbles.

DEBITAGE : The small waste material observed in knapping floors. Generally, waste material is described as all those fragments having a maximum dimension of less than 10mm

- FLAKE :** A fragment of stone exhibiting features indicating that it has been deliberately removed from a core piece. These features are evident as:
- i) Platform: Plane or point at which a blow was delivered to remove the flake.
 - ii) Bulb of Percussion: Convex surface that occurs on the face or ventral surface of a flake, radiating from the point of impact, produced as a consequence of the force pattern.
 - iii) Erailure: see below.
- Other terms:
- i) Dorsal: The back or outer face of a flake as it would have been prior to removal from a core. Frequently either ridged or exhibiting negative flake scars when removed in secondary flaking, with a natural weathered cortex when removed in primary flaking.
 - ii) Ventral: The 'chest' or inner face of a flake as it would have been prior to removal from the core. The surface upon which the Bulb of Percussion occurs.
 - iii) Platform Preparation: The removal of flakes from a surface to produce a level platform. May be evidenced by retouch scars to the platform.
 - iv) Retouch: The removal of small flakes from an edge or margin of an artefact to modify its shape or sharpen its edge.
 - v) Proximal: The end of a flake closest to the striking platform.
 - vi) Distal: The end of a flake furthest from the striking platform.
 - vii) Margin: The edge of an artefact.
 - viii) Erailure: A small circular to elliptical negative flake scar occurring on the surface of the bulb of percussion on flakes of very fine-grained or highly silicified material. It occurs 'naturally' as a consequence of internal forces generated at the time of flake removal.
 - ix) Split Cone: Occurs when the flake splits down its axis frequently removing part of the striking platform. Generally believed to be produced by faulty knapping technique, but is also probably a consequence of flawed material.
 - x) Transverse Snap: Occurs when a flake snaps across its axis. Generally believed to be caused by post-depositional impacts such as human or stock treadage, or vehicular traffic.

FLAKED PIECE : A fragment of stone exhibiting flake scars indicating that it is an artefact, but not displaying diagnostic features, such as a Bulb of Percussion, Striking Platform, or an Erailure.

GREYWACKE :
A type of sandstone, grey or greenish-grey in colour, tough and well indurated and typically poorly sorted (Clark & Cook, 1986).
A generally poorly sorted, dark sandstone containing feldspar and sand-sized rock fragments of metamorphic or volcanic rocks (Department of Mineral Resources, n.d.).
Usually a dark and coarse-grained rock compared to mudstones and siltstones that are much finer-grained and better sorted.

HOLOCENE PERIOD :
The period from 10,000 years ago to the present.

IGNEOUS ROCK :
Rock formed by the cooling and solidification of magma on or below the earth's surface (Geography Dictionary, 1985).

In situ : In its original place – as deposited.

ISOLATED ARTEFACT :
A solitary stone artefact, at least 50m from its nearest neighbour. This is based on NPWS policy that two artefacts within 50m of each other constitute a site.

KNAPPING FLOOR:
A discrete scatter of artefacts in which at least two artefacts are recognisably of the same material, and derive from the same piece of stone. Also described as a stone tool manufacturing site or floor.

LOCATION : The place at which an artefact is found, or a place identified as having either archaeological or Aboriginal significance.

MEASUREMENT :

- I) Flake:
 - i) Length: Measured along the percussion axis at right angles to the platform.
 - ii) Width: The greatest width measured at right angles to the percussion axis.
 - iii) Thickness: The greatest thickness measured at right angles to the percussion axis.
- II) Flaked piece:
 - i) Length: The longest dimension
 - ii) Width: The greatest width measured perpendicular to the length.
 - iii) Thickness: The greatest thickness measured perpendicular to the length.
- III) Core:
 - i) Length: The longest dimension.
 - ii) Width: The greatest width measured perpendicular to the length.
 - iii) Thickness: The greatest thickness measured perpendicular to the length.

MIDDEN : A refuse heap or stratum of food remains, such as mollusc shells, and other occupational debris (Dortch, 1984 – see also Meehan, 1982).

MUDSTONE : A fine-grained detrital rock, usually quite massive and well consolidated. May be black through grey to off-white, browns, reds and dark blues/greens. Frequently found in association with sandstones (Cook & Kirk, 1991).

Identification is often aided by colour variations in layering. A source for stone material tool manufacturing material found as river pebbles in creek beds, and artefacts often display a water-worn cortex.

NEGATIVE FLAKE SCAR :

A concave surface resulting from the removal of a flake, occurring on the surface of the rock from which a flake has been removed.

PANARAMITEE: The name given to a style, tradition or method of applying motifs to a rock surface first identified by Robert Edwards in the 1960s. The motifs, which comprise mainly of circles and animal tracks, but which include human footprints, plan aspects of animals, and linear designs, were pecked into the rock surface using indirect percussion – ie. using a pecking-tool and a hammerstone.

PLEISTOCENE PERIOD :

The period from about 10,000 years ago to 2 million years ago.

POTENTIAL ARCHAEOLOGICAL DEPOSIT (PAD) :

Synonymous with Potentially Archaeologically Sensitive : Having the potential to contain archaeological material although none is visible.

QUARTZITE :

Quartzites are formed by the regional or contact metamorphism of quartz arenites, siltstones, and flints (cherts). They are composed essentially of quartz, and usually have a fine-grained granoblastic (grains are roughly the same size) texture. Generally massive, but may sometimes show sedimentary structures (Cook & Kirk, 1991).

ROTATION :

The removal of flakes from a core by blows directed at different angles, to different platforms. May be evident on the dorsal surface of a flake as negative flake scars, which do not follow the same direction as the percussion axis of the flake. This may be confused with scars produced during core preparation.

SCAT : The solid waste material produced by an animal – dung, droppings, manure (Triggs, 1985).

SCATTER : Two or more artefacts occurring within 50m. Scatter may also be used in the context of 'background scatter', meaning the general distribution of artefacts across the landscape that cannot be recognised as discrete concentrations.

- SILCRETE : A near surface or surface siliceous induration (Desen & Peterson, 1992).
A conglomerate consisting of surficial sand and gravel cemented into a hard mass by silica.
A siliceous duricrust (Bates & Jackson, 1980).
Crusts may form as a result of low, infrequent rainfall, on reasonably flat surfaces. These are known as duricrusts – those cemented by silica are known as silcretes (Clark & Cook, 1986), sometimes referred to locally as 'billy' (Gentili, 1968), or 'grey billy'.
Silcrete on the northern tablelands of NSW forms at the surface contact between sediments of the Sandon Beds and the Armidale Beds with overlying basalt, where groundwater (more rich in silica than surficial water) interacts with surficial water and precipitates new quartz as the matrix to the sediments (N.D.J. Cook, Dept. of Geophysics, UNE, pers. Comm.).
In softer formations of quartz sands, groundwater has apparently been responsible for the formation of concretionary layers of silcrete. Under altered climatic conditions, the less competent beds erode away leaving concretions. Since they are often the size of old-fashioned woolsacks and are greyish and white, they are popularly known as gray billy (slang for billy goat) (Fairbridge, 1968).
- SITE : A discrete area or concentration of artefactual material, place of past Aboriginal activity, or place of significance to Aboriginal people.

12 SOIL SCIENCE TERMS

(taken from Banks, 1995, and others as referenced)

- BEDROCK :** Outcrop of *in situ* rock material below the soil profile.
- BENCH :** A strip of relatively level earth or rock breaking the continuity of a slope.
- BLOWOUT :** A closed depression formed in the land surface by wind eroding sands and depositing them on adjacent land.
- CHERT:** A very fine-grained amorphous silicate sedimentary rock, commonly a layer of chemical precipitate or micro-organism skeletal remains (Milford 1999).
- CLAY:** Soil material composed of very fine particles less than 0.002mm size. When used to describe a soil texture group, such a material contains more than 35% clay (Milford 1999).
- CLAYPAN :** A depression caused by the aeolian deflation of sediments, or by the presence of a prior lake.
- CONGLOMERATE:** A poorly-sorted detrital sedimentary rock composed of rounded gravels, stones or cobbles in a matrix of much finer material (Milford 1999).
- DUNE :** A ridge built up by wind action composed of sands, silts, or sand-sized aggregates of clay.
- FLOODPLAIN :** A large flat area, adjacent to a watercourse, characterised by frequent active erosion and aggradation by channelled and overbank stream flow.
- GIBBER :** A level surface covered by a thick deposit of gravel or broken siliceous pebbles, occurring in the more arid parts of the continent, thought to have been formed from the break-up of a siliceous (silcrete) surface crust, and termed gibber plains (Whittow, 1984) – see also silcrete.
- GILGAI :** Surface microrelief associated with soils containing shrink-swell clays. Gilgai consists of mounds and depressions, or irregularly distributed small mounds and subcircular depressions varying in size and spacing. Vertical interval usually <0.3m; horizontal interval usually 3-10m, and surface almost level. Sometimes called 'crab-hole' soils.
- GREYWACKE:** A tough, well-indurated type of sandstone distinguished by detrital quartz crystals and rock fragments set in a finer-grained matrix (Milford 1999).
- GULLY :** An open incised channel in the landscape generally greater than 30cm deep and characterised by moderately to very gently inclined floors and steep walls (Milford 1999).
- HUMMOCK :** A small raised feature above the general ground surface.
- LANDFORM ELEMENTS :**
Crest : Landform element standing above all points in the adjacent terrain.
Flat : Neither a crest or a depression <3% slope.
Upper slope : Adjacent to and below a crest or flat but not a depression.
Midslope : Not adjacent to a crest, a flat or a depression.
Lower slope : Adjacent to and above a flat or a depression but not a crest.
- LITHOSOLS :** Shallow soils showing minimal profile development and dominated by the presence of weathering rock and rock fragments.
- METAMORPHIC:** Rocks whose composition, texture and/or structure have been altered through tectonic pressure and/or heat (Milford 1999).
- METASEDIMENTARY:** Partially-metamorphosed sedimentary rock (Milford 1999).
- MUDSTONE:** A fine-grained dark-coloured sedimentary rock, formed from lithified mud; similar to shale but more massive (Milford 1999).

- pH : A measure of the acidity or alkalinity of a soil. A pH of 7.0 denotes neutrality, higher values indicate alkalinity, and lower values indicate acidity. The pH scale is logarithmic, i.e., a pH of 4.0 is ten times as acid as a pH of 5.0, and one hundred times as acid as a pH of 6.0. (DLWC 1999).
- RILL : A small channel cut by concentrated runoff through which water flows during and immediately after rain.
A small ephemeral channel, generally no more than 30 cm deep, created by concentrated runoff (Milford 1999).
- RUNOFF : That portion of precipitation not immediately absorbed into or detained upon the soil and which thus becomes surface flow.
- SCARP/CLIFF : A steep slope terminating a plateau or any level upland surface.
- SCRUB : vegetation structure consisting of shrubs 2-8m tall.
- SHEET EROSION : The removal of the upper layers of soil by raindrop splash and/or runoff.
- SOIL PROFILE :
- "A HORIZON" : The top layer of mineral soil. This may consist of two parts:
 - A₁ HORIZON: Surface soil and generally referred to as the topsoil.
 - A₂ HORIZON: similar in texture, but paler in colour, poorer in structure, and less fertile.
 - " B HORIZON" : The layer below the A Horizon. This consists of 2 parts:
 - B₁ HORIZON: A transitional horizon dominated by properties characteristic of the underlying B₂ horizon.
 - B₂ HORIZON: typically contains concentrations of silicate clay and/or iron, and/or aluminium and/or translocated organic material.
 - "C HORIZON" : The parent rock. Recognised by its lack of pedological development, and by the presence of remnants of geologic organization.
 - "R HORIZON" : Hard rock that is continuous (Charman & Murphy, 1993; 350-1).
- SPUR : A ridge which projects downwards from the crest of a mountain as a water-parting (Whittow, 1984).
- SUBSOIL : Sub-surface material comprising the B and C Horizons of soil with distinct profiles; often having brighter colours and higher clay contrasts.
- SURFACE CONDITION :
- Gravelly : Over 60% of the surface consists of gravel (2-69mm).
 - Hardsetting : Soil is compact and hard.
 - Loose : Soil that is not cohesive.
 - Friable : Easily crumbled or cultivated.
 - Self-mulching : A loose surface mulch of very small pedes forms when the soil dries out.
- SWALE : A linear level-floored open depression excavated by wind or formed by the build-up of two adjacent ridges.
- SWAMP : Watertable at or above the ground surface for most of the year.
- TOPSOIL: The surficial layers of the soil profile, typically the A Horizon, which is usually darker, more fertile, better structured and contains more organic matter than underlying soil materials (Milford 1999).
- TERRACE : A flat or gently inclined surface bounded by a steeper ascending slope on its inner margin and a steeper descending slope on its outer margin (Whittow, 1984).
- TOPSOIL : A part of the soil profile, typically the A₁ horizon, containing material that is usually darker, more fertile and better structured than the underlying layers.
- UNDERSTOREY : A layer of vegetation below the main canopy layer.
- WEATHERING: The physical and chemical disintegration, alteration and decomposition of rocks and minerals at or near the earth's surface by atmospheric and biologic agents (Milford 1999).

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APPENDICES

(No. of pages excluding this page = 17 + App 8)

- Appendix 1: Correspondence from Nungaroo LALC to Northern Aboriginal Heritage Unit**
- Appendix 2: Correspondence from RWC to ASR dated 22nd June 2004 - Blasting Impacts on Aboriginal Site**
- Appendix 3: Correspondence from Nungaroo LALC to Werris Creek Coal signed 12th July 2004**
- Appendix 4: Aboriginal Heritage Site Management and Agreement**
- Appendix 5: Details of the Search of the AHIMS Site Register**
- Appendix 6: Site Recording Form of May 1964**
- Appendix 7: Site Types**

APPENDIX 1

(No. of pages excluding this page = 1)

Correspondence from Nungaroo LALC to Northern Aboriginal Heritage Unit



Manager
Northern Aboriginal Heritage Unit
Claude McDermot

Dear Sir,

Re: Werris Creek Coal Mine

At our recent Ordinary Meeting on the 30th March 2004, the Members of the Nungaroo LALC expressed deep concern for the proposed Coal Mine at Werris Creek going ahead without consultation with them. The NP&WS have informed us that they have not issued Consent to Destroy Order therefore we would like to see this order reinforced so that appropriate action can take place.

It is important that we have a meeting with the correct people as soon as possible because for too long our Aboriginal Sites have been destroyed and our feelings in this have been ignored.

It is important that before anything is done the Members at the meeting have requested for me to seek a meeting with the NP&WS representative Ron Naden, Liverpool Shire Council and people from the Coal Mine.

Rhonda Hilt
Coordinator
19th April, 2004

c.c. John Appleton

P.O. Box 28, QUIRINDI NSW. 2343
Telephone: (02) 6746 2356. Facsimile: (02) 6746 2670. Mobile: 0427 462 356
Email: nungaroo@hotmail.com.au

APPENDIX 2

(No. of pages excluding this page = 6)

**Correspondence from RWC to ASR dated 22nd June 2004 -
Blasting Impacts on Aboriginal Site**

R.W. CORKERY & CO.
PTY. LIMITED ABN 11 02 80 712
GEOLOGICAL & ENVIRONMENTAL CONSULTANTS



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22 June 2004

Mr John Appleton
Archaeological Surveys & Reports
16 Curtis Street
ARMIDALE NSW 2350

No. of pages including this page : 2

Originally sent by Faecsimile: 02 6772 4567

Dear John

Re: Werris Creek – Blasting Impacts on Aboriginal Site

I've attached a series of plans/sections for your information and use to resolve the issue regarding the impact of blasting on the grinding grooves.

Figure 1 shows the proposed limit of mining and the location of the archaeological site as we have recorded it. **Figure 2** shows a geological section through the hillside together with the projected NW corner of the archaeological site (based on GPS coordinates supplied by yourself). This section shows that the rocks on which the grinding grooves are located occur within the interburden between the F and G Coal Seams. The dotted lines shown with "?" represent the predicted continuation of the geological formations to the land surface.

Figure 3 shows how the first and second excavation would occur in the vicinity of the site. The first excavation (involving blasting) would remove material from above the sandstone on which the grinding grooves are located. The second excavation (also involving blasting) would remove the remaining interburden to the top of the G Seam. It would be this blast that would have the potential to damage the grinding grooves as the potential exists for ground vibrations to preferentially travel through the sandstone to the surface.

We are currently seeking advice from blasting experts on:

- (i) what would be an acceptable level of ground vibration not to damage the grinding grooves; and
- (ii) how close to the site could blasting get without exceeding the nominated ground vibration determined in (i). I have depicted this on **Figure 3(b)** as "X" metres.

04 August 2004

- 2 - (E:\06x\93) to 1006\623-Prop April 2004\02\01 Letters\Letters\623-2214a.doc

In the event that "X" metres is excessive and would lead to a substantial reduction in the amount of coal that can be mined, the Company would consider constructing a protective barrier at depth around the site. Figure 4(C) and (d) show two possible examples.

- 4(c) -shows a section displaying a protection barrier formed by a series of closely spaced drill holes.
- 4(d) -shows a section displaying a trench backfilled with sand.

Both of these measures would assist to substantially reduce the level of ground vibration received at the surface.

Given the above approach, I would appreciate it if you could discuss this information with the Aboriginal Community representatives and establish if they could give their conditional support to this approach. It would be necessary for the Company to gain further information about the sandstone unit at depth on which the grinding grooves are located. Furthermore, as mining would not be starting near the site, it would be possible to measure ground vibration levels further away from site well ahead of when mining approaches the site.

It would be my preference that at this late stage we don't commit to an exact distance/offset from the site. Rather, it would be preferable as mentioned above, if the letter from the Land Council (included in your report) simply committed to the approach to protect the site - based on real monitoring data and detailed assessment during the mine life and well ahead of the activities near the site. I trust this information assists you in your discussions.

I acknowledge that you are to meet with Rhonda Gray of the Nungaroo Local Aboriginal Land Council and a representative from the DEC Cultural Heritage Unit at 11.00am on 29 June 2004. As discussed, it remains the Company's preference to relocate the grinding grooves. We would appreciate it if you could commence your discussions regarding this option. Clearly, if relocation is not an option and protection is, I trust they can embrace the approach suggested. Whatever the outcome, the critical issue is timing. We trust you can leave the meeting with a letter to include in your report and that you can submit your report by close of business 2 July 2004.

If you would like to discuss any of the information supplied, please contact either Alex Irwin or myself.

Regards

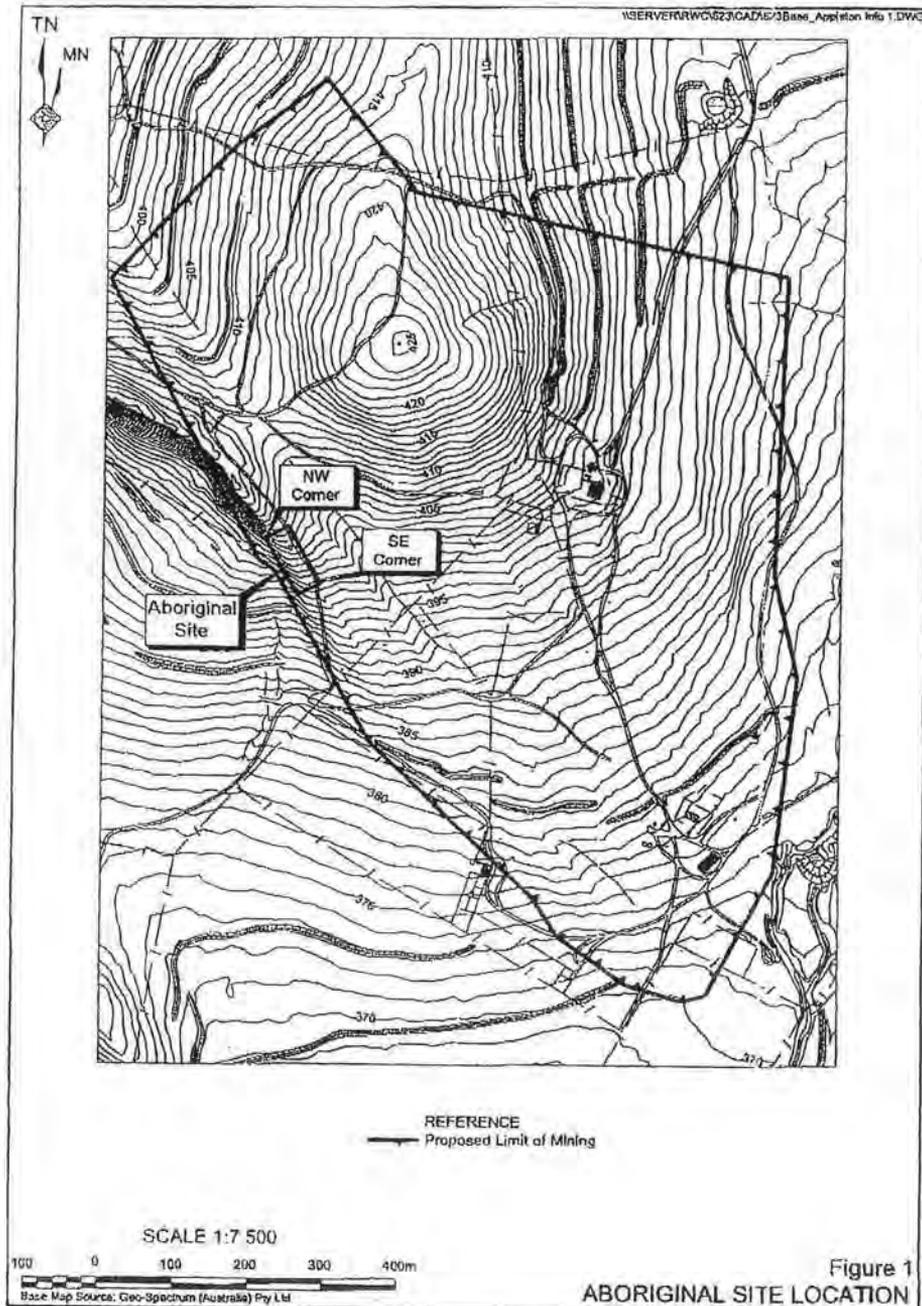
Rob Corkery

Encl: Figures 1 to 4 (3 sets)

Copy: Werris Creek Coal

CORRESPONDENCE TO J. APPLETON
Tuesday 22 June 2004

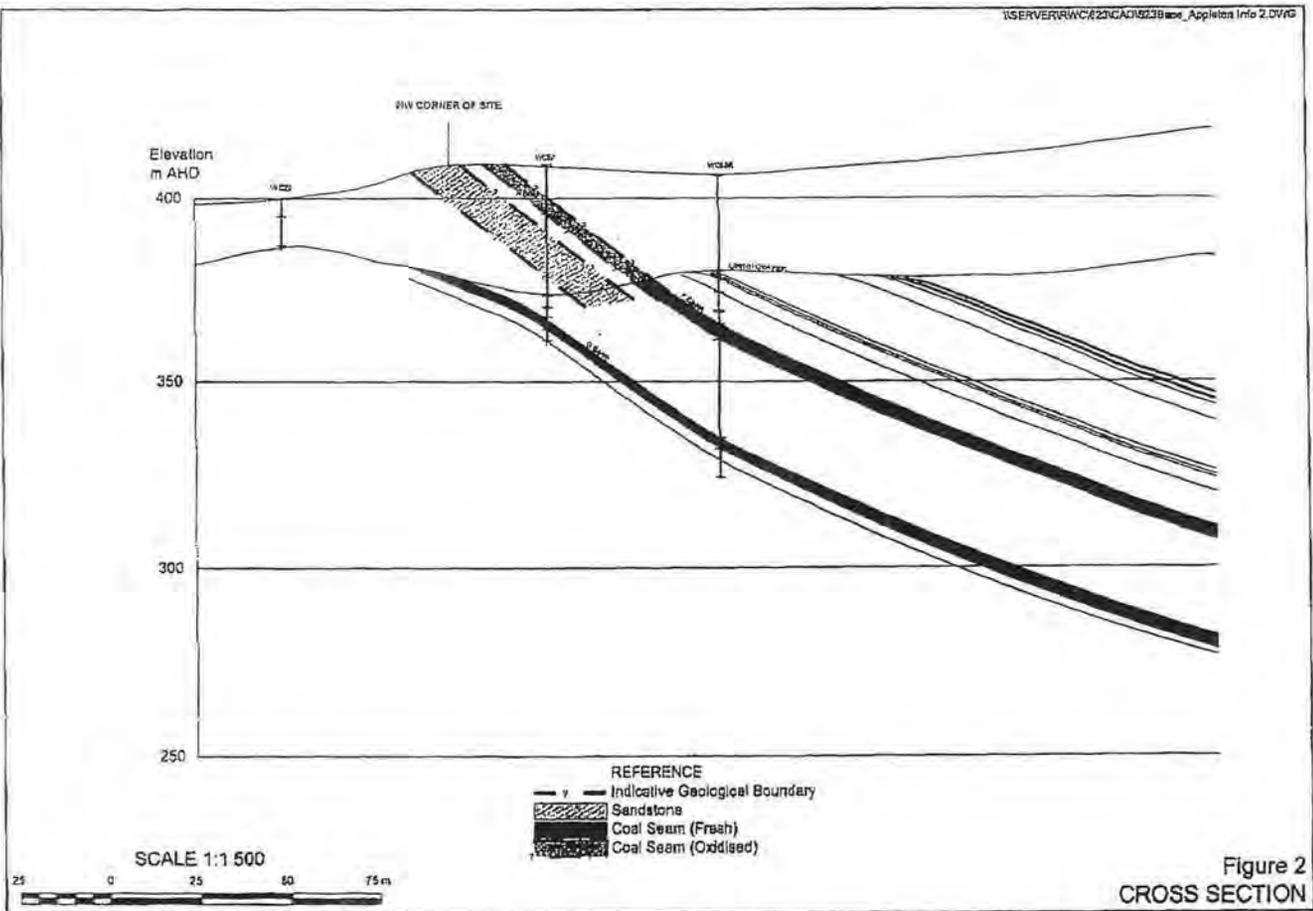
WERRIS CREEK COAL PTY LTD
Proposed Werris Creek Coal Mine



R.W. CORKERY & CO. PTY. LIMITED

CORRESPONDENCE TO J. APPLETON
Tuesday 22 June 2004

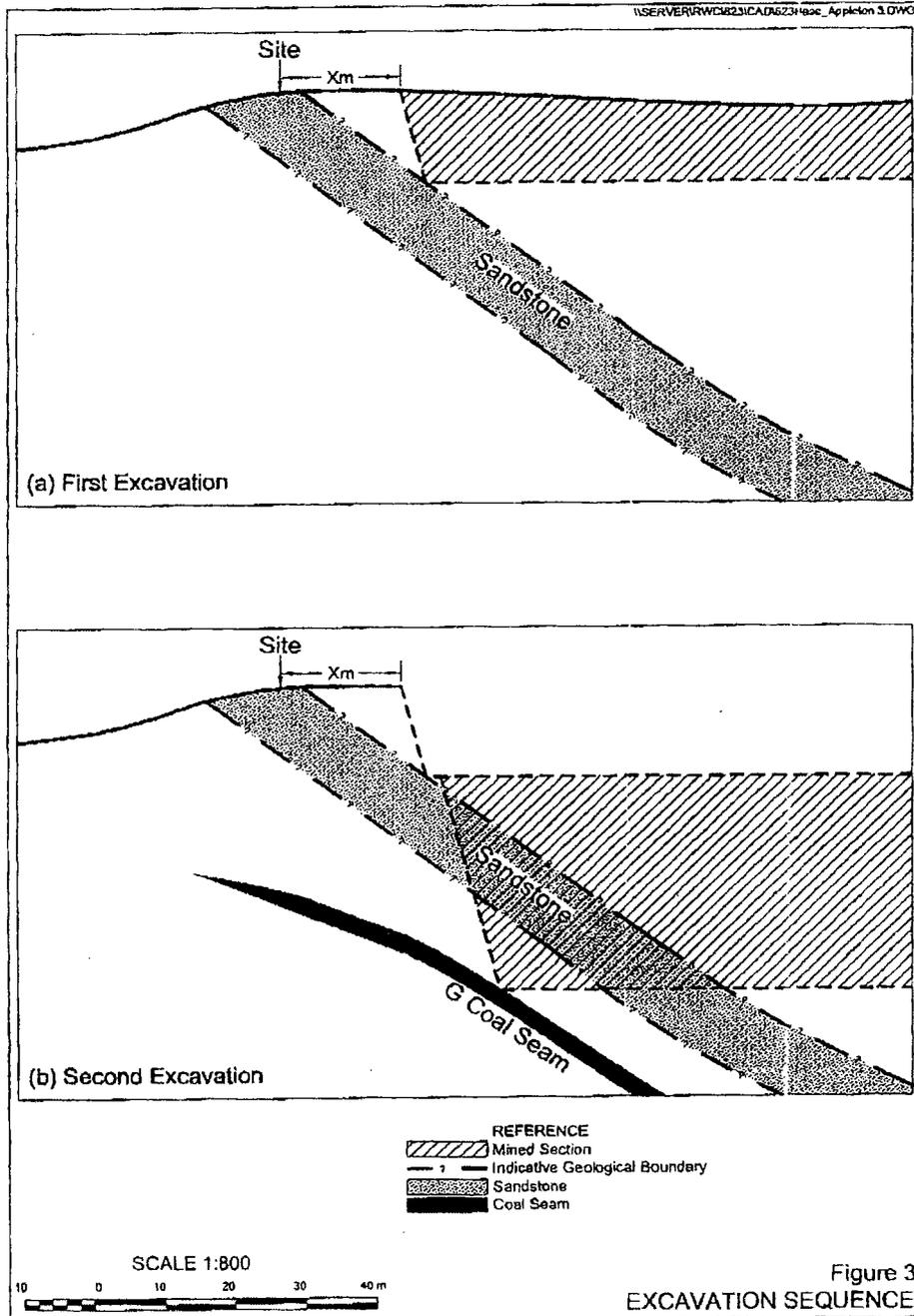
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Tuesday 22 June 2004

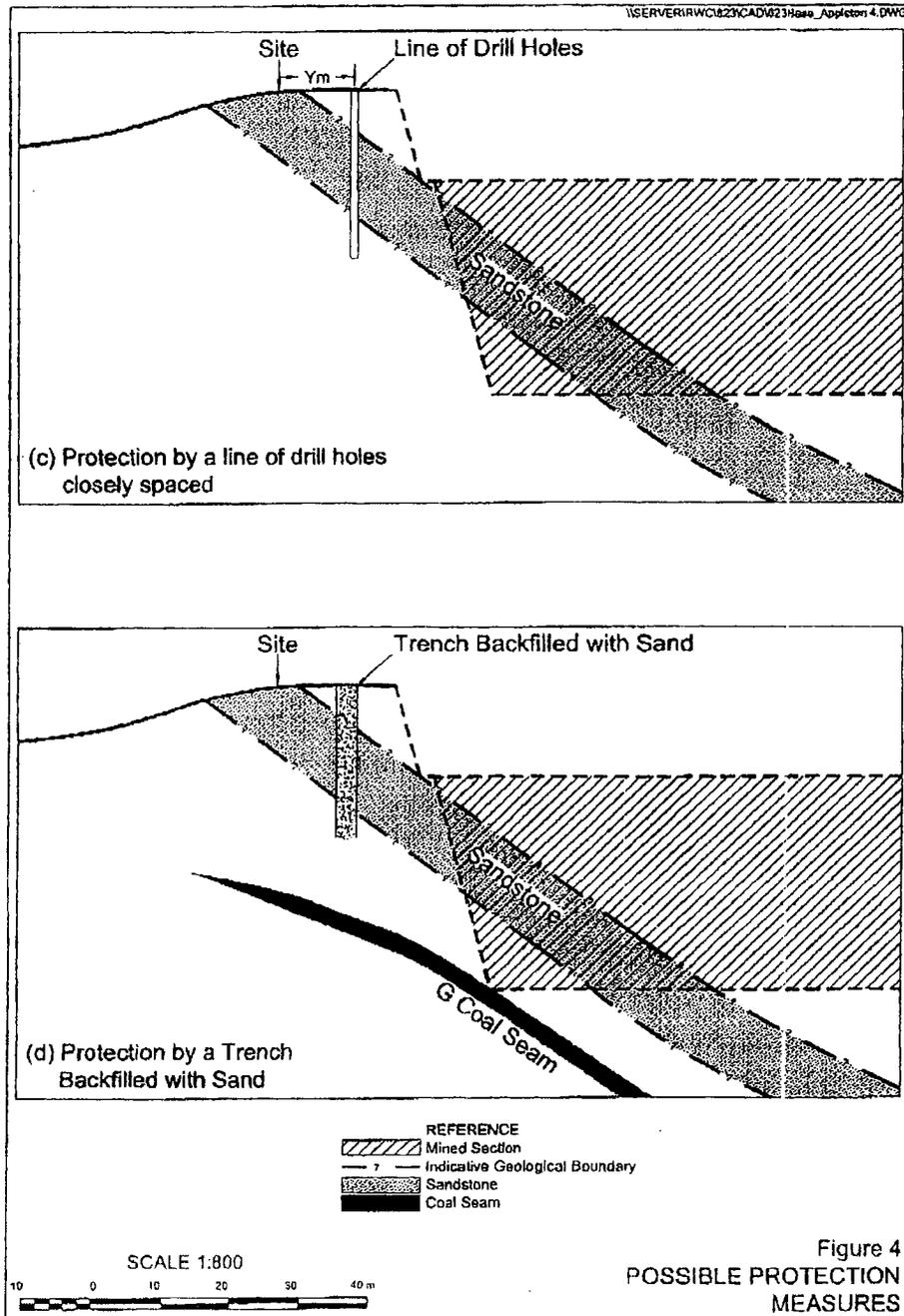
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CORRESPONDENCE TO J. APPLETON
Tuesday 22 June 2004

WERRIS CREEK COAL PTY LTD
Proposed Werris Creek Coal Mine



 R.W. CORKERY & CO. PTY. LIMITED

APPENDIX 3

(No. of pages excluding this page = 1)

**Correspondence from Nungaroo LALC to Werris Creek Coal
signed 12th July 2004**



R.W Corkery & Co Pty. Limited
GEOLOGICAL & ENVIRONMENT CONSULTANTS
'Braemar',
75 Kite Street,
Orange.
P.O. Box 80,
Orange NSW 2800

Re: Werris Creek Coal

On Thursday 8th July, 2004 Peter Allan and Rhonda Hilt attended a meeting at Nungaroo LALC in consultation with the General Manager of Werris Creek Coal Keith Ross, Director Graham Holley and Alex Urwin Environmental Consultant for R.W. Corkery & Co.

The meeting recognised issues of concern by the members of Nungaroo LALC in relation to the Aboriginal Site that is present on the edge of the Coal Mine surrounding area. We also discussed possible solutions to protect the Site. It was decided to adopt the suggestion made by R. W. Corkery & Co to place a buffer zone along the sandstone passage and to monitor all blasting within 100 metre radius of the Site. If this is effective it would be the best way to protect it. Alex is 95% sure this will work.

Rhonda Hilt raised the issue for possible Local Aboriginal Employment at the Werris Creek Coal Mine and both Keith Ross and Graham Holley are receptive to the suggestion and have agreed that at Nungaroo LALC's invitation will attend regular meetings with the Aboriginal Community to explore this in more detail and to give up-dates. Currently there are 3 Aboriginal people employed with Werris Creek Coal.

It was agreed that Peter Allan be the nominated Site monitor to be present throughout the blasting process near the Site area.

On behalf of Nungaroo LALC Peter Alan and Rhonda Hilt agree that Werris Creek Coal to go ahead with the proposal.

Peter Allan
Site Officer
27th July, 2004

Rhonda Hilt
Coordinator
27th July, 2004

P.O. Box 28, QUIRINDI NSW. 2343
Telephone: (02) 6746 2356, Facsimile: (02) 6746 2670, Mobile: 0427 462 356
Email: nungaroo@hotmail.com.au

APPENDIX 4

(No. of pages excluding this page = 3)

Aboriginal Heritage Site Management and Agreement

ABORIGINAL HERITAGE SITE MANAGEMENT AND AGREEMENT

1.0 introduction

Werris Creek Coal Pty Ltd (the “Proponent”) is a joint venture Company set up especially to design, develop and operate a medium scale open cut coal mine south of Werris Creek. The site of the proposed mine (the “Project Site”) is located approximately 4km south of Werris Creek, immediately west of the Werris Creek-Quirindi Road and encompasses most of the “Narrawolga” property and sections of the “Eurunderee” and “Cintra” properties. The Project Site is located within the region managed by the Nungaroo Local Aboriginal Land Council (LALC). During the course of an inspection of the Project Site by an archaeologist (Mr John Appleton) and representative of the Nungaroo LALC (Mr Peter Allan), a site of Aboriginal heritage significance was located (the “Site”). For the purposes of this document, the Site is defined by a 100m x 10m rectangular area on the western side of a ridge on the “Narrawolga” property (see **Figure A**).

The Site, containing a number of grinding grooves, was located within the proposed “limit of coal mining” with the Proponent initially suggesting its relocation to a location specified by the Nungaroo LALC. Representatives of the Nungaroo LALC considered relocation of the rocks containing the grinding grooves was inappropriate and accordingly the Proponent re-designed the western boundary of the open cut mine to avoid the Site. This document records the agreement between the Proponent and the Nungaroo LALC regarding the manner in which the Site should be managed such that it remains undisturbed during, and following, the development and operation of the proposed mine. This document also serves to record the commitment for continued consultation and cooperation between the Proponent and the Nungaroo LALC with particular emphasis placed on encouraging and maintaining employment opportunities for members of the local Aboriginal community.

2.0 MANAGEMENT OF THE SITE

The Nungaroo LALC agrees to support the development and operation of the proposed mine on the basis that the Site is not materially disturbed by any activity undertaken by or on behalf of the Proponent. In order to ensure the Site remains undisturbed by mining, blasting or overburden placement activities, the following procedures would be followed.

- (i) As the development of the open cut mine encroaches within 100m of the Site, the Proponent will commission a comprehensive monitoring program of blasting impacts principally with respect to ground vibration.
- (ii) Mr Peter Allan, or another nominated representative of the Nungaroo LALC, would be employed to oversee the blasting and blast monitoring when it encroaches within 100m of the Site.

- (iii) An independent blasting expert would be commissioned by the Proponent to assess the level of impact at a distance of 100m from the Site and to predict the likely impact of blasting on the Site as blasting approaches towards the Site, taking into account the geological structure of the Project Site, blast size and blast frequency.
- (iv) The blasting expert would be requested to provide recommendations with respect to the required setback from the Site, size of blasts and any other technical aspects of blast design.
- (v) The Proponent would present these recommendations to Nungaroo LALC with a commitment to follow all recommendations provided.

3.0 EMPLOYMENT OPPORTUNITIES

The Proponent has committed to employing local residents whenever possible with suitable training to be provided to ensure the development of the core skill levels required of employees of the proposed mine. A representative of the Proponent would meet regularly with the Nungaroo LALC to assess employment levels, discuss existing/future job availability/training and the possible placement of members of the Aboriginal community in these positions. A representative of the mining contractor appointed by the Proponent would also be present at these meetings with a requirement of the contractor to work with both the Proponent and Nungaroo LALC in the placement of suitably qualified/capable members of the local Aboriginal community within their workforce.

Ultimately, the Proponent would like to have a percentage of the workforce employed at the proposed mine representative of the Aboriginal population within the Werris Creek / Quirindi region.

4.0 ADDITIONAL ABORIGINAL HERITAGE ISSUES

It is agreed by the Proponent to consult with the Nungaroo LALC should any suspected item of Aboriginal heritage significance be identified within areas to be disturbed within the Project Site. In addition, employees of the proposed mine would be educated through the induction process regarding the Site already identified and a procedure to follow should they identify a suspected item of significance.

5.0 summary

The agreed approach to the protection of the Site and ongoing cooperation between the Proponent and the Nungaroo LALC is as follows.

1. An independent blasting impact assessment, overseen by the Nungaroo LALC, will be undertaken once mine development encroaches within 100m of the Site.

2. The Proponent will follow all open cut design and blasting recommendations arising from the independent blasting assessment.
3. Representatives of the Proponent and mining contractor will meet regularly with the Nungaroo LALC to assess existing employment levels and discuss employment and training opportunities for members of the local Aboriginal community.

Attachments: Figure A
Attachment 1

APPENDIX 5

(No. of pages excluding this page = 3)

Details of the Search of the AHIMS Site Register



NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

ABN 30 841 387 271

Your Ref:
Our Ref: AHIMS #8528

Archaeological Surveys and Reports
10 Roslyn Avenue
Armidale NSW 2350

Monday, 20 October 2003

Attention: John Appleton

Dear Sir or Madam:

**Re: AHIMS Search for the following area at Werris Creek
Zone 56 Eastings: 270000-280000 Northings: 6519000-6529000**

I am writing in response to your recent inquiry in respect to Aboriginal objects and Aboriginal places registered with the NSW National Parks and Wildlife Service (NPWS) at the above location.

A search of the NPWS Aboriginal Heritage Information Management System (AHIMS) has shown that 3 Aboriginal objects and Aboriginal places are recorded in or near the above location. Please refer to the attached report for details.

The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not to be made available to the public.

The following qualifications apply to an AHIMS search:

- AHIMS only includes information on Aboriginal objects and Aboriginal places that have been provided to NPWS;
- Large areas of New South Wales have not been the subject of systematic survey or recording of Aboriginal history. These areas may contain Aboriginal objects and other heritage values which are not recorded on AHIMS;
- Recordings are provided from a variety of sources and may be variable in their accuracy. When an AHIMS search identifies Aboriginal objects in or near the area it is recommended that the exact location of the Aboriginal object be determined by re-location on the ground; and
- The criteria used to search AHIMS are derived from the information provided by the client and NPWS assumes that this information is accurate.

All Aboriginal places and Aboriginal objects are protected under the *National Parks and Wildlife Act 1974* (NPW Act) and it is an offence to destroy, damage or deface them without the prior consent of the NPWS Director-General. An Aboriginal object is considered to be known if:

- It is registered on AHIMS;
- It is known to the Aboriginal community; or
- It is located during an investigation of the area conducted for a development application.

Head Office
43 Bridge Street
PO Box 1967
Hurstville NSW
2220 Australia
Tel: (02) 9585 6444
Fax: (02) 9585 6555
www.npws.nsw.gov.au

If you are considering undertaking a development activity in the area subject to the AHIMS search, NPWS would recommend that an Aboriginal Heritage Assessment be undertaken. You should consult with the relevant consent authority to determine the necessary assessment to accompany your development application.

Yours Sincerely



Vanessa Kendall
Aboriginal Information Officer
Information Systems Unit
Cultural Heritage Division
Phone: (02) 9585 6345
Fax: (02) 9585 6325





List of Sites (List - Short)

ahims#8528

Grid Reference Type = AMG Zone = 56 Easting From = 270000 Easting to = 280000 Northing From = 6519000 Northing to = 6529000 Feature Search Type = AHIMS Features

Site ID	Site Name	Grid.Ref Type	Zone	Easting	Northing	Site Features	Site Types <small>(recorded prior to June 2001)</small>	Recording <small>(Primary)</small>	Reports <small>(Catalogue Number)</small>
<u>29-2-0004</u>	<u>Escott;Werris Creek;</u>	AMG	56	272400	6526400	AFT,	Open Camp Site	Hammond,H (01-MAY-64)	
		Status Valid							
		Primary Contact							
<u>29-2-0005</u>	<u>Narrawolga;</u>	AMG	56	274800	6523300	GDG	Axe Grinding Groove		
		Status Valid							
		Primary Contact							
<u>29-2-0083</u>	<u>WC-OS-1;The Gap, Werris Creek;</u>	AMG	56	271630	6528500	AFT,	Open Camp Site	Kelton,J (12-AUG-97)	
		Status Valid							
		Primary Contact							

Number of Sites :3

Page 1 of 1

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This information is not guaranteed to be free from error omission. The NSW National Parks and Wildlife Service and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

APPENDIX 6

(No. of pages excluding this page = 1)

Site Recording Form of May 1964

21/11 '03 11:56 FAX 02 6651 6187 NPWS NORTH ZONE 002

57 (4) 903
 WERRIS CREEK N.S.W. [Escott/Alinga/ Narrawolga] SH56-13, 29-2-5
 Locality Area D AXE GRINDING GROOVES
 (Quirindi Area) May 1964
Military map/other reference 1:250,000 3615-445 Tamworth AMG. 2747.6524
Pastoral or other property, park "Narrawolga", property of Mr O'Donnell.

Description of site "On the property of Mr O'Donnell a couple of miles south of Werris Cree some evidences of grinding are visible half a mile west of the home." Information from Quirindi District Historical Society, from tape recording of Mr H.Hammond, Quirindi.

Length of site Width
Nearest water supply
Kind of rock
Number of grooves
Size of grooves
Associated with rock engravings rock paintings carved trees
 stone arrangements quarry campsite
 other relics

APPENDIX 7

(No. of pages excluding this page = 2)

Site Types

Site types associated with Indigenous activities and culture

The definitions that follow are for terms used in this report, and do not necessarily apply to their use in different contexts.

Art sites are defined as places where any medium has been applied to a rock surface either as symbols, characters, drawings, paintings, or any other rendition, recognisable as not being a natural discolouration or feature. They also include markings to a rock surface, either by engraving, abrading, or pecking, and which cannot be identified as being a natural feature.

Bora rings are circles of 2-30m diameter of compressed earth (from repeated treading or dancing), or stone arrangements, at which men performed initiation ceremonies, and are the most frequently recorded ceremonial sites. Sometimes they occur as two rings joined by a central track in a barbel configuration. They usually occur on level or low-lying country, which is usually the first topographical unit to be cultivated, or utilised for highways and roads, but they may also occur as circular stone arrangements on elevated rock platforms and hilltops. If they are or were present then they are usually either already known and have been recorded, or they have long since been destroyed.

Carved trees are readily recognised by even the untrained observer. The carving is incised either into the outer bark, or more commonly, into the living wood after removal of a section of the bark. The designs frequently consist of 'diamond cross-cuts', but may also consist of stylised animal motifs. Previously unrecorded carved trees are still discovered in relatively remote or inaccessible areas. Carved trees frequently occur near burial sites and/or Bora rings, but in some regions they may have been tribal boundary markers.

Fish traps may occur either in rivers or on seashores. They are recognisable as unnaturally formed stone arrangements that were constructed to trap fish (or eels or turtles) carried into the enclosure in deep water, and which are left stranded within the enclosure as the water level drops. The fish were then caught by nets, hand, or by spear.

Grinding grooves are usually observed on the surfaces of large sedimentary boulders or exposed shelves and outcrops of sedimentary rock along creek banks and beds, or near water. They have been produced by Aborigines using the rock surface to shape and sharpen the edges of stone to produce ground-edged axes, or to sharpen wooden spears (the latter tend to be narrow and deep). Water was used to lubricate the surface of the rock. The grooves frequently occur as linear abraded depressions in the rock, and may each be between 10 and 50 centimetres long, up to 15 centimetres wide, and 2 to 5 centimetres deep. Some sedimentary rock surfaces may exhibit shallow ground depressions of roughly round or elliptical shape, and these are more likely to be associated with seed grinding, root crushing, or other food preparation.

Middens may be identified variously as beach, lagoon, lacustrine, or estuarine, and are most likely to be observed at or above the water line where erosion, topsoil removal, or mining has exposed the shell. The size of the midden can vary enormously, with the smallest comprising a 'one off', "dinner-time camp" (Meehan. 1982), with as few as two or three shells, or a shallow lens of only a few centimetres. The largest middens may extend for many kilometres and may comprise of a number of lenses and layers of shell and ash up to several metres deep. These large middens may be evidence of continuous exploitation of the resource over many thousands of years. Middens of fresh water mussel shell may be found in eroding creek banks or in eroding terraces, particularly near both existing and defunct water holes.

Isolated shell or fragments may occur on any surface and in any situation. A single shell may have been discarded by a bird, but the presence of use-wear would indicate Aboriginal use of the shell as a tool, which was discarded after use. Such occurrence is likely to be where there is no immediate source of stone material suitable for tool manufacture.

Natural Mythological sites are places of significance to Aborigines, either because they are described in mythological stories or songlines, or because they were used in religious ceremonies. They may occur anywhere and while some are more predictable than others – as for example, permanent water holes, waterfalls, rock promontories, etc., others may have no particularly remarkable features. Seldom is there any recognisable artefactual evidence or anything to distinguish it from similar features in the vicinity. These sites must of necessity be identified by Aboriginal people with an association with the place.

Open sites, campsites, knapping floors, scatters, and isolated artefacts, are most likely to occur on eroded and exposed creek banks, particularly where slope wash or stock trails has removed the humic layer, or on eroded ridges and spurs, particularly near the junctions in watercourses. Open sites are most likely to be present in greatest numbers near a source of either raw stone material, or potential food resources, or in a natural corridor between two differentially preferred environmental zones, or at the contact between two environmental zones containing different resources.

Artefacts in open scatters are likely to be manufactured from the dominant raw material available; i.e. Greywacke on greywacke-sourced soils, quartz on granite-sourced soils, silcrete and chert on relict sedimentary soils.

Artefact assemblages in open scatters are likely to consist predominantly of discard material, i.e., cores, flakes, flaked pieces, and debitage.

Artefacts exhibiting retouch scars and backing are most likely to occur in sites where secondary activity took place peripheral to the central camp site, although this is a generality and can only be observed where there is sufficient surface visibility to identify peripheral sites. Fragments of flakes with retouch or backing may occur on knapping floors indicating breakage occurring during manufacture, or maintenance areas in which damaged tools have been replaced and discarded.

Isolated artefacts are likely to be most frequently observed where the groundcover obscures all but the larger artefacts, such as cores, and large flakes, or where there is little contrast between the texture of artefactual material and the surface upon which it lies. Artefacts of materials contrasting with the matrix may be visible regardless of size; eg. quartz artefacts may be far more visible than much larger basalt artefacts against a background of dark humic terrace soils.

PADs or Potential Archaeological Deposits are deposits, usually in shelters (but they may also be identified where there are intact deposits in open areas), which although not containing any visible archaeological material, are considered likely to contain archaeological material below the surface. These 'sites' are not recorded as sites on the Aboriginal Site Register, but are identified as places that require subsurface testing to establish whether a site exists or not.

Rock shelters with art or occupation deposits, are most likely to occur where the character of the parent rock is sufficiently massive or consolidated for it to retain a structure that weathers differentially to form shelters and overhangs.

Scarred trees are perhaps the most difficult site type to determine as having been caused by deliberate removal of the bark by humans and not as a consequence of natural events; such as abrasion from falling trees or branches, natural branch attrition, fire damage, or contact from vehicles or stock. They may occur in places wherever there are tree species that produce bark suitable for tool and implement manufacture. While some scars are clearly the consequence of deliberate bark removal by Aborigines (either evidenced by stone axe marks, or identified by Knowledge Holders), some scars were made by settlers, and stockmen, and surveyors who frequently blazed trails and property boundaries by scarring the trees, and by timber men who removed a strip of bark to test the suitability of a tree for logging.

Other site types such as hearths, burials, etc., are less easily predicted, although burials are frequently associated with carved trees, and Bora rings, and hearths with campsites, shelters, and shell middens.

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DOC04/13354

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GEOLOGICAL & ENVIRONMENTAL CONSULTANTS



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10 August 2004

The Archaeologist
NPWS Northern Zone
PO Box 914
COFFS HARBOUR NSW 2450

Dear Sir / Madam

Re: Proposed Werris Creek Coal Mine

Please find enclosed for your records one copy of the Aboriginal Heritage Assessment prepared by John Appleton of Archaeological Survey and Reports Pty Ltd for the proposed Werris Creek Coal Mine. A copy of the Environmental Impact Statement and Specialist Consultant Studies Compendium, which the enclosed assessment forms Part 6, will be forwarded to you by DIPNR.

Should you have any further questions regarding the information provided, please do not hesitate to contact me on 6362 5411.

Yours sincerely,

Alex Irwin
Environmental Scientist

Encls: Part 6 Aboriginal Heritage Assessment

