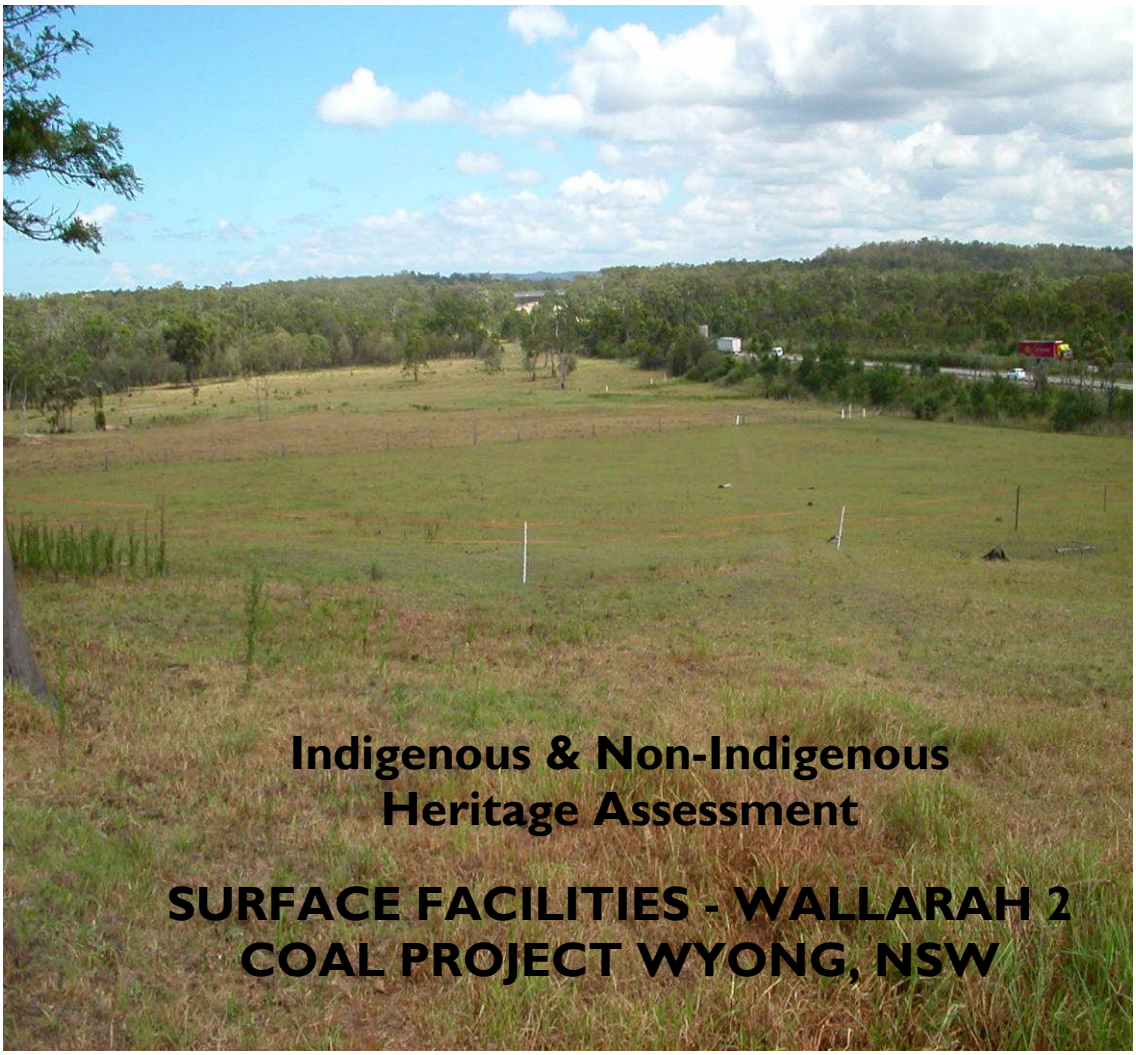

Indigenous & Non-Indigenous Heritage Assessment

SURFACE FACILITIES - WALLARAH 2 COAL PROJECT WYONG, NSW

October 2009

Report prepared by

OzArk Environmental and Heritage Management P/L

for

International Environmental Consultants P/L

on behalf of

Wyong Areas Coal Joint Venture

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1. INTRODUCTION

1.1 Background

OzArk Environmental and Heritage Management Pty Ltd (OzArk) have been commissioned by International Environmental Consultants Pty Ltd (IEC) on behalf of Wyong Areas Coal Joint Venture (WACJV) to undertake heritage assessments for the Wallarah 2 Coal Project (W2CP). This proposal comprises a continuation of earlier, related projects for which there is a considerable body of literature.

1.1.1 Proponent

The W2CP is being undertaken by the Wyong Areas Coal Joint Venture (WACJV). A change in majority share ownership saw a new project scope defined to manage resource extraction. A brief history of project ownership is as follows:

- WACJV was founded in 1995 at the invitation of the NSW Government to submit a competitive tender for the Wyong Coal Development Areas, as shown in Figure 1.
- The majority partner in the successful tender was Coal Operations Australia Ltd, with minority partners including WACJV and other Korean and Japanese interests. BHP Billiton subsequently became a majority shareholder through the acquisition of Coal Operations Australia Ltd.
- In 2005, Kores acquired the BHP Billiton interest in the WACJV, taking its equity in the venture to 82.25%. The WACJV proposes to develop the coal resource with a new project scope referred to as the Wallarah 2 Coal Project (W2CP). WACJV is undertaking final feasibility studies for a mining option re-configured from that which had been pursued in the past.

1.1.2 W2CP project overview

The W2CP will involve the underground extraction of export quality thermal coal with associated surface facilities and infrastructure. The project is comprised of an underground longwall mine, a coal handling plant (dry processing only) and storage facilities, rail loop and loading infrastructure, an underground drift entry, ventilation shafts and gas management facility.

The combined Wallarah Great Northern Seam, averaging around 6 m thick, will be mined by a longwall system, conveyed to the surface via a drift conveyor system and processed to produce 4-5 million tpa of product coal from the mine. The coal processing consists of crushing only and, because the mine will not require a coal washing plant, no tailings or bulk reject will be produced. Water generated by the mine will be used in the crushing and stockpiling process and any excess water will be treated before discharge or transfer to appropriate reuse. The mine will produce a single 14-18% ash product to be marketed for export and domestic electricity generation.

The mine will also produce natural gas as an integral part of the mining process, and this will be marketed for domestic electricity generation or other commercial uses.

The proposed mine area covers a 42 year period of underground mining operations. In order to provide certainty for the proponent and to secure mining title to the proposed mining area, a Project Approval will be sought for the entire mine area. The Project Approval will enable mining operations within a Mining Lease granted for a lesser period than 42 years.

The current study is confined to five locations within the W2CP project area. In turn, these study areas can be categorised as direct impact or off-set areas. They are:

Direct Impact Areas: These study areas will be directly impacted by the proposed works:

- Western shaft study area;
- Buttonderry study area; and
- Tooheys Road study area.

Off-set Areas: These study areas are outside any proposed impact and are being assessed to determine their conservation values as potential off-set conservation areas:

- Buttonderry off-set study area; and
- Hue Hue Road ecological offset investigation area.

1.1.3 Project background

Over the past 6 years a number of desktop and field studies have examined much of the proposed W2CP area. This previous work is summarised in **Table 1** and presented in more detail in Sections 4.2.1 and 5.2. It should be noted that the Buttonderry study area is also referred to as the Hue Hue Road site in some previous reports and the Tooheys Road study area is often referred to as the Bushells Ridge site. The Western Area is a term also often used and relates to the western exploration license areas which encompasses both Buttonderry and Tooheys Road study areas, as well as the area proposed for underground mining (**Figure 1**).

These studies were followed in May 2006 by OzArk EHM who prepared a desktop study, entitled *Wallarah No. 2 Coal Project. Gap Analysis & Methodologies for further Environmental Assessment: Terrestrial Ecology and Heritage* (OzArk 2006).

This report concluded that only the Tooheys Road study area had undergone physical assessment in terms of Indigenous heritage and that survey here was preliminary in nature. To ensure adequate assessment of all direct impact areas, the following were considered necessary:

- The Department of Environment, Climate Change and Water (DECCW) Aboriginal Heritage Information Management System (AHIMS) search required updating for Bushells Ridge (Tooheys Road study area) and to be undertaken for Buttonderry and Hue Hue Rd;

- Impact areas within each location needed to be more closely determined and if possible indicative survey pegs placed in the field such that direct impacts could be tied into the landscape requiring assessment;

Figure 1: Location of the current W2CP study areas.

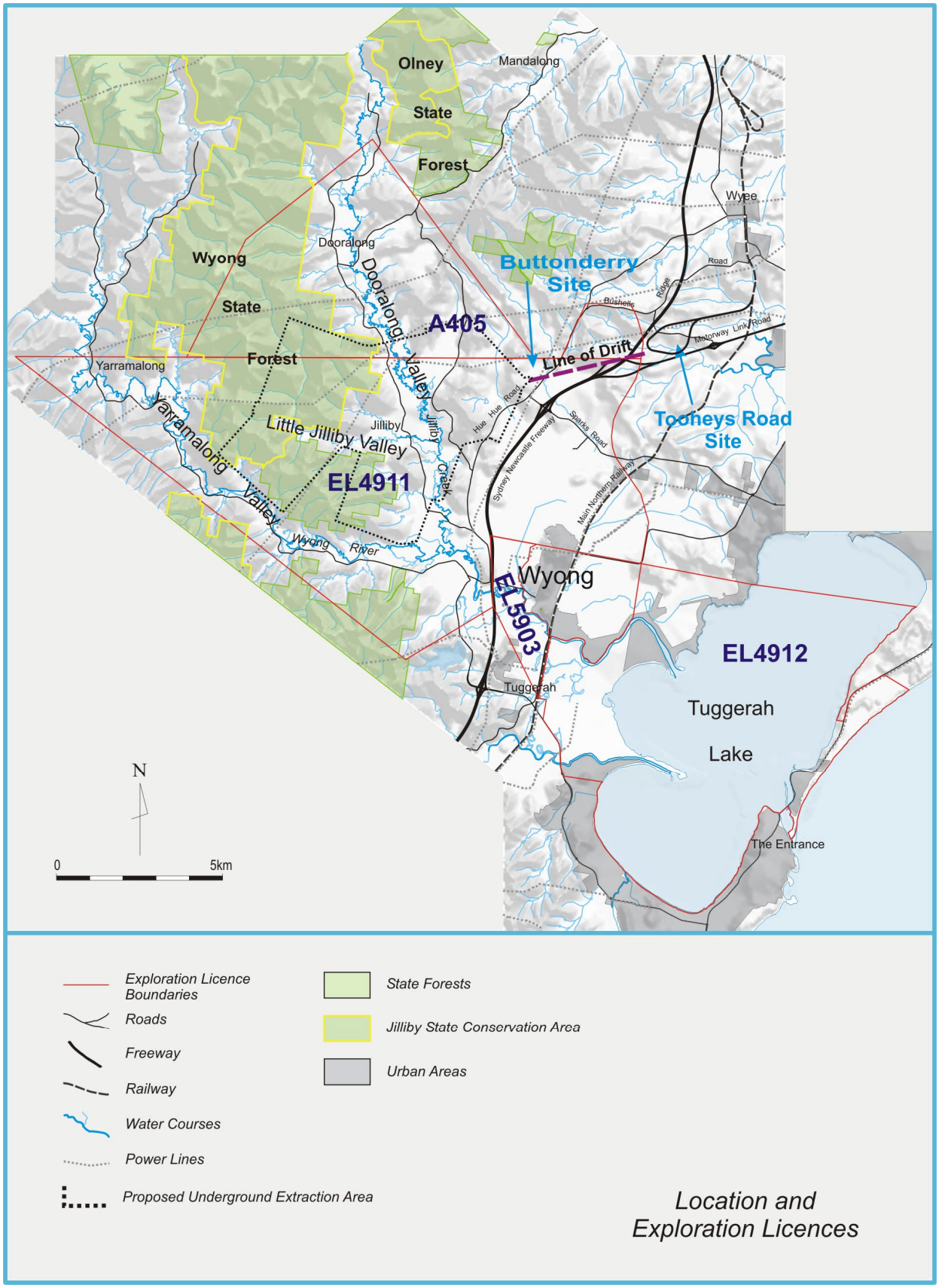


Table 1: Previous heritage studies by WACJV in the current study area.

Company / Author / Year Finalised	Title	Specialist components	Location
ERM 2001a	Indigenous Cultural Heritage Study – Western Area Study Methodology	Indigenous Heritage Desk top review only.	Entire Western Area
ERM 2001b	Wyong Project – Indigenous Cultural Heritage Assessment – Preliminary Survey of the Bushells Ridge Site	Indigenous heritage preliminary field survey to identify visible archaeological evidence, areas of archaeological sensitivity and areas for further investigation.	Tooheys Road study area
ERM 2001c	Wyong Project – Non-Indigenous Cultural Heritage Assessment – Preliminary Survey of the Bushells Ridge Site	Non-Indigenous heritage preliminary field survey to identify new features of potential heritage significance and areas for further investigation.	Tooheys Road study area
ERM 2001d	Wyong Project – Non-Indigenous Cultural Heritage Assessment – Preliminary Field Survey	Non-Indigenous Heritage Preliminary field survey to identify new features of potential heritage significance and areas for further investigation.	Entire Western Area

- Additional field survey at the Tooheys Road study area to ensure the appropriate coverage of impact areas and additional assessment of Wallarah Creek and the ridge line. This survey should focus on areas of greatest impacts from the coal handling facility and rail loop as well as targeting specific landforms to flesh out the predictive model as presented in ERM 2001a; and

- Field survey of the Buttonderry study area and any other direct impact locations that had not been specifically targeted before.

To ensure adequate assessment of all no impact areas (potential conservation off-set properties), the following were considered necessary:

- DECCW AHIMS searches to establish if previously recorded sites exist in these areas;

- Landform assessment and relationship to predictive models developed for the other project areas to determine what sites are likely to occur;

- Sample survey of various topographical units and sensitive archaeological landforms to establish the general nature of the archaeological resource in each conservation area targeting specific landforms to test the adequacy of the predictive model.

With regards to non-Indigenous heritage, the OzArk methodologies report concluded that only the Tooheys Road study area had undergone assessment in terms of non-Indigenous heritage. To ensure adequate assessment of non-Indigenous in these areas, the following were considered necessary:

- Undertake appropriate register searches;
- Complete consultation with local property owners and local historical societies;
- Survey of Buttonderry site and relocation of features at Tooheys Road; and
- Relate results to direct impacts to assess whether any Heritage Impact Statements will be required.

In the areas currently being considered for compensation, the report recommended to:

- Undertake register searches to establish if previously recorded sites exist in these areas;
- Undertake limited survey, focussing on areas of greatest potential.

The current study comprises the result of the recommendations set forth in OzArk 2006 and the outlined methodology provides the basis for the current heritage survey and report.

1.2 Project scope

This report is specific to direct impact and potential off-set areas at the Tooheys Road, Buttonderry and Western shaft study areas and potential off-set properties at Hue Hue Road and Buttonderry.

- Direct impact areas
    - Tooheys Road study area (Figures 1 & 2). This includes the Tooheys Road surface infrastructure and rail loop and a c. 1.8km portion of the rail loop proposed on Darkinjung Local Aboriginal Land Council (DLALC) land.
    - Buttonderry study area (Figures 1 & 3). This comprises land to be affected by direct surface impacts associated with the project; and
    - Western shaft study area (Figures 1 & 4). This study area is where the surface infrastructure for a proposed air ventilation shaft will be located within the Wyong State Forest; and
- Potential conservation off-set sites (Figures 1 & 5):
    - Buttonderry off-set study area. Land assessed outside direct impact areas to determine its conservation value; and
    - Hue Hue Road ecological offset investigation area. This study area is comprised of four rural/residential blocks between the F3 and Hue Hue Road.

This study encompasses pedestrian survey of all proposed surface facilities and completion of the current report. The survey was undertaken to identify items of Indigenous and non-Indigenous heritage significance and is in compliance with the DECCW *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* and the NSW Heritage Office *Heritage Manual*.

Survey focused primarily on areas of direct impact in the Tooheys Road, Buttonderry and Western shaft study areas. In the Buttonderry and Hue Hue Road ecological offset

investigation area, survey focused on landforms and locations where the predictive model (set forth in **Section 4.3**) indicated higher levels of potential to contain heritage items in the aim of gaining insight into the heritage values of these areas.

Based on the survey results and regional context developed for this project, the overall aim is to enable the formulation of appropriate management recommendations for the items / places of cultural heritage located within the direct impact study areas and an indication of the heritage values of the potential conservation areas to ensure that conservation efforts are focussed in the most appropriate locations.

1.3 Proposed works

WACJV will undertake a range of activities such as resource exploration, development of infrastructure, mine planning and the development of a project schedule to achieve its goal to have commercial quantities of coal and gas extracted by 2010.

This report is specific to works associated with surface infrastructure development for the proposed underground mine and land identified as proposed conservation off-sets. For the purpose of this report five study areas have been defined with the nature and extent of the impacts being different for each. The study areas are detailed in **Section 1.2** and the details of proposed works are as follows:

1.3.1. Direct impact areas

Tooheys Road study area: The proposed infrastructure for the Tooheys Road study area is detailed in **Figures 2 and 6** and includes:

- Rail spur and loop with coal loader and two rail overbridges along Tooheys Road;
- Office facility, inclusive of administration offices, bathrooms, training facilities;
- Site access roads including at least partial relocation of Tooheys Road;
- Mine access drift and portal;
- Gas extraction and treatment plant;
- Coal stockpiles and material handling facilities;
- Car parking facilities; and
- Mine water and surface runoff settling ponds. Note that one dam (as noted in **Figure 2**) has been shifted to avoid ecological and heritage issues.

Buttonderry study area: The layout of the Buttonderry study area is shown in **Figure 3** and consists of:

- Upcast ventilation shaft and fan for mine ventilation;
- Downcast ventilation shaft for mine ventilation and man-riding;
- Main office facility for 40 staff, inclusive of administration offices and training rooms;

- Bathroom and showers for 120 men and 20 women with the ability to vary the numbers; and,
- Car parking facilities for 150 cars.

The Buttonderry site will be accessed off Hue Hue Road via a sealed road. The road will have 3.5m lane widths and 2m shoulders. The width of the seal will be 9m. Tree screening and landscaping is proposed either side of the road up to the main administration building and adjoining car park.

Western shaft study area: A second (western) shaft site will be required by the tenth year of mining. This will be located adjacent to Brothers Road off Little Jilliby Road within the Wyong State Forest as shown on **Figure 4**. This shaft facility will house a downcast shaft only (for air intake).

Only limited facilities will be at this site but it will also serve as a secondary emergency access point. There will be a head-frame structure of approximately 8 x 8 x 15m (H) to allow for the emergency egress winder. The downcast ventilation shaft will be approximately 6m in diameter and sunk to c. 490m depth. An 11kV substation will be required during construction of the shaft and this will remain for the remaining life of the mine.

Brothers Road will be upgraded prior to construction and the shaft site will be fenced on completion.

1.3.2 Potential off-set areas (Buttonderry and Hue Hue Road ecological offset investigation area)

The location of these properties is detailed in **Figure 5**. Not all the land will be available for conservation off-sets. There may be other off-sets for agricultural land lost and possibilities are being investigated for some industrial land offerings.

Figure 2: Location of the Tooheys Road study area.

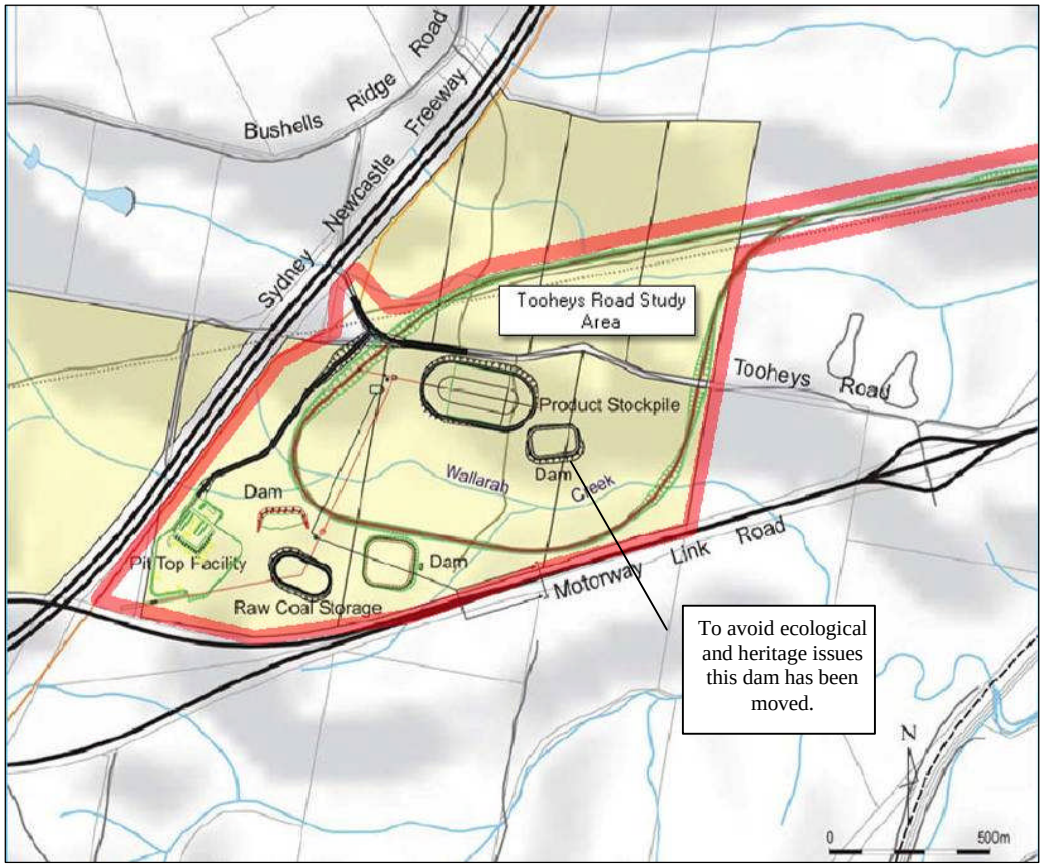


Figure 3: Location of the Buttonderry study area.

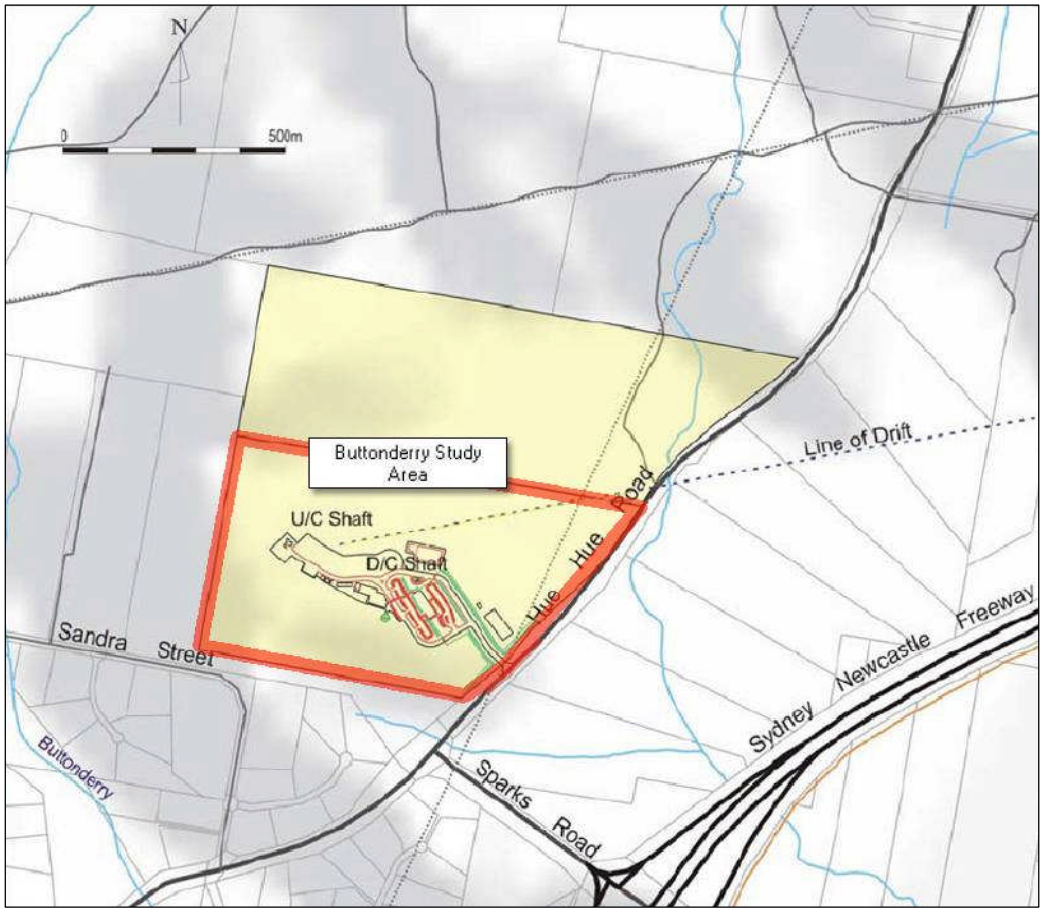


Figure 4: Location of the Western shaft study area.

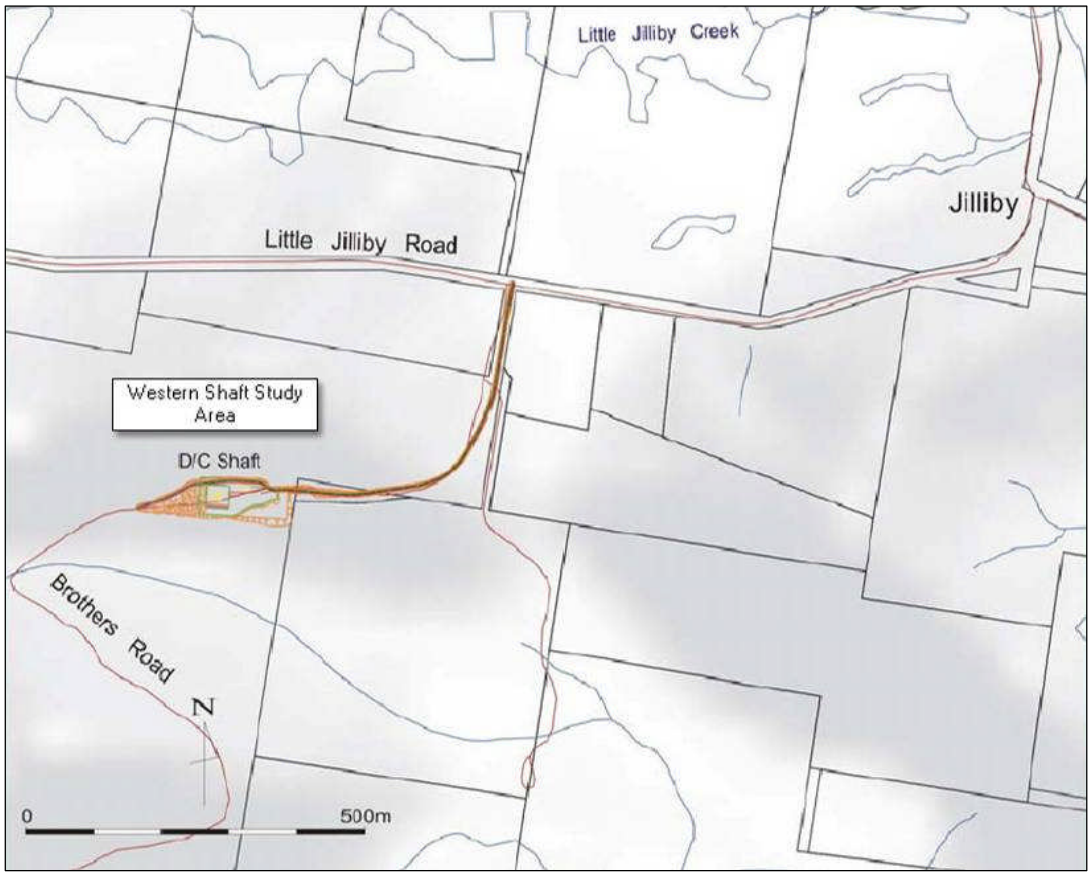


Figure 5: Location of the two potential off-set study areas.

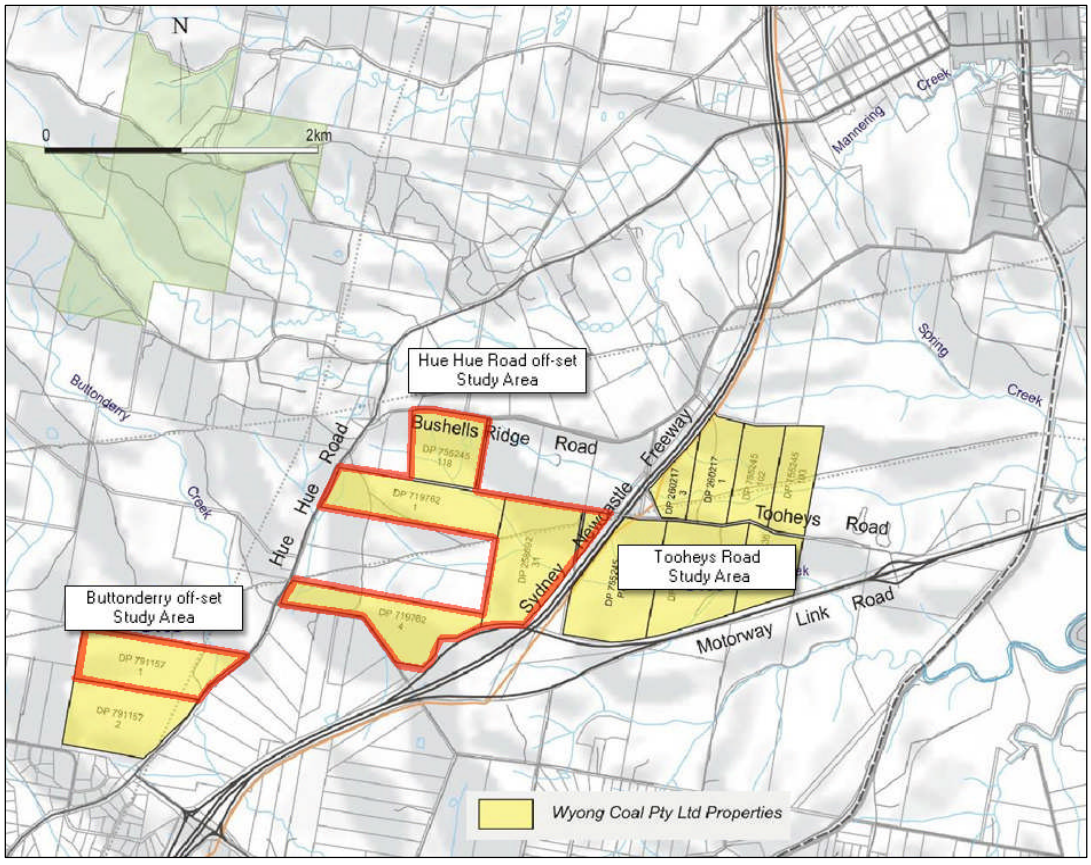
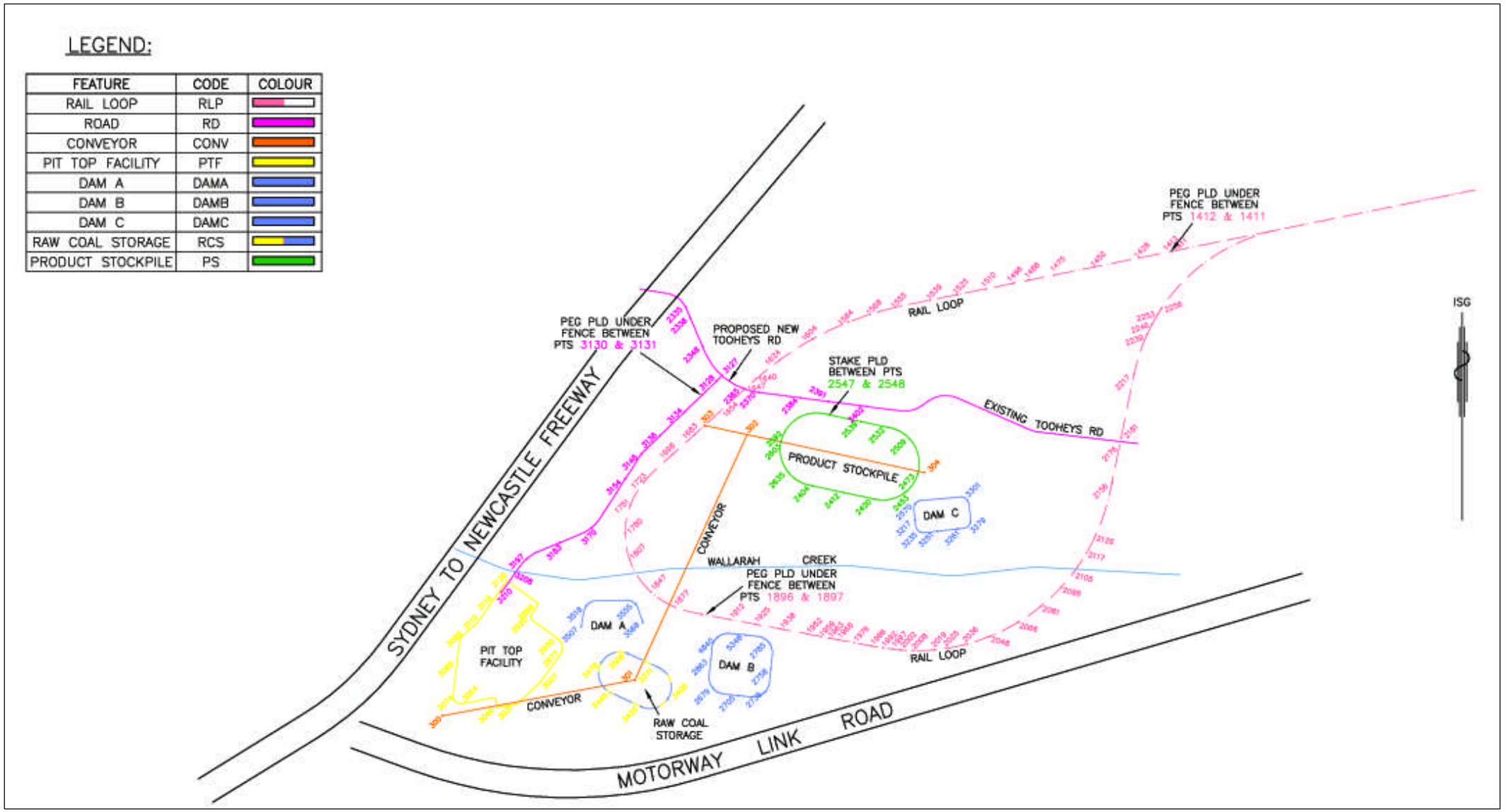


Figure 6: Proposed development impacts at the Tooheys Road study area.

Figure 7: Surveyors plan used during the survey to locate impact areas. Plan supplied by WACJV.



1.4 Project Constraints and Limitations

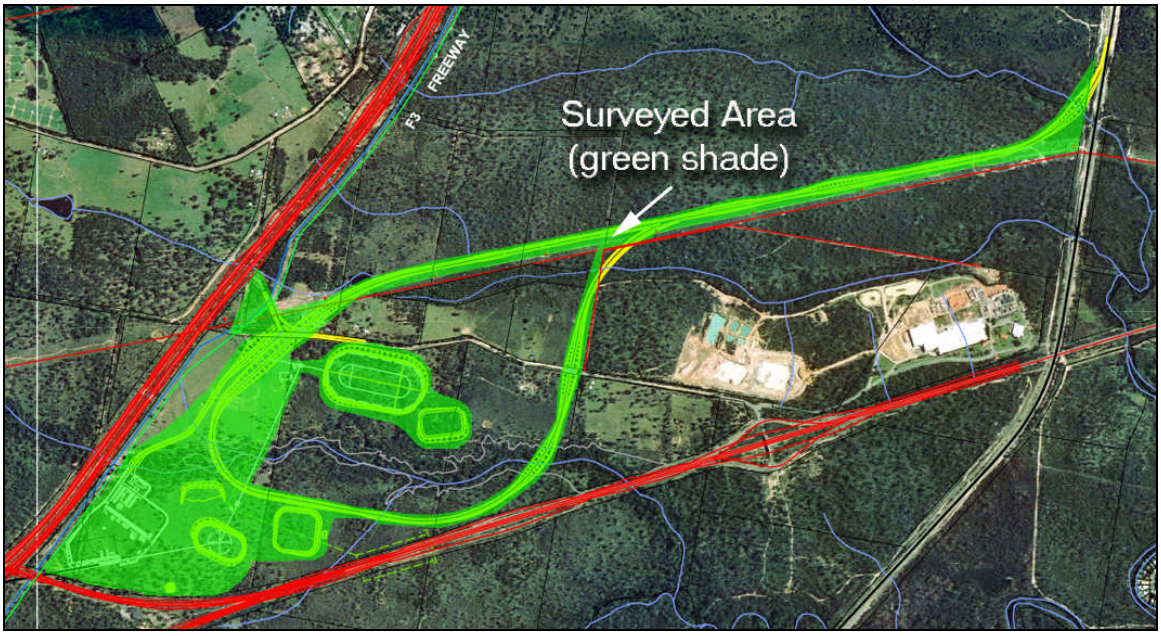
1.4.1 Direct impact areas

The current survey was limited to those areas that would be directly impacted by the proposed works. These impact areas were clearly marked in the field by surveyor's pegs which corresponded to a colour-coded map provided by the Proponent (**Figure 7**). Based on this information the heritage surveyors were able to be certain that they were surveying the correct locations.

Tooheys Road study area: **Figure 8** indicates the area actually surveyed in the Tooheys Road study area.

Other areas beyond the direct impact zones were not surveyed although the heritage survey did include a buffer area around each impact area to ensure that possible heritage items located just outside the impact corridors were assessed.

Figure 8: Surveyed portions of the Tooheys Road study area.



Ground Surface Visibility. In general, the ground surface visibility in all areas was assessed as low (less than 8 percent of the ground surface was visible across the Tooheys Road study area. **Table 2**, see **Figure 7** for peg locations). Although features such as farm tracks and areas of sheet erosion allowed good visibility in places, either grass cover or thick understorey vegetation prevented good visibility across the majority of the study area.

Buttonderry study area: **Figure 9** delineates the area surveyed portions of the Buttonderry study area and the pegged station numbers are referred to in the visibility table (**Table 3**). A buffer zone around this area was also surveyed.

Table 2: Ground Surface Visibility at the Tooheys Road study area.

Location	Ground Surface Visibility (%)	Reasons affecting visibility
Spring Creek	5	Undergrowth
Station 2 (west from Spring Creek)	25	Many vehicle tracks
Station 3 (ridge west Spring Creek)	10	Undergrowth
Station 4 (ridge west Spring Creek)	10	Undergrowth
Station 5 (west slope below ridge)	0	Thick undergrowth
Peg 2509	10	Grass cover
Peg 2473	30	Bare patches
Peg 2453	20	Sandy soil/bare patches
Peg 2420	80	Surface scraped by machinery
Peg 2412	50	Surface scraped by machinery
Peg 2404	5	Thick native grass cover
Peg 2635	10	Bare patches
Peg 2603	50	Slashed grass/bare patches
Peg 2532	30	Bare patches
Peg 3301	10	Native grass cover
Peg 303	0	Grass cover
Peg 1780	50	Sheet erosion
Peg 1807	10	Native grass cover
Peg 3183	20	Ploughed and sown
Peg 3197	30	Cleared/slashed
Peg 3170	30	Cleared/slashed
Peg 1751	0	Grass cover
Peg 1723	10	Grass cover
Peg 302	50	Sheet erosion
Peg 2338	0	Undergrowth
Peg 3127	5	Road/Undergrowth
Peg 2156	0	Grass cover
Peg 2126	0	Grass cover
Peg 2117	0	Thick undergrowth
Peg 2105	0	Thick undergrowth
Peg 2081	5	Native grass cover
Peg 2066	0	Native grass cover
Peg 2048	0	Native grass cover
Peg 2036	10	Native grass cover
Peg 2025	10	Native grass cover
Peg 2008	0	Native grass cover
Peg 2002	15	Bare patches
Peg 1992	0	Native grass cover
Peg 1986	15	Bare patches
Peg 1976	0	Native grass cover
Peg 1968	20	Farm track
Peg 1963	20	Bare patches
Peg 1952	5	Native grass cover
Peg 1938	20	Bare patches
Peg 1925	5	Native grass cover
Peg 1912	5	Native grass cover
Peg 1877	0	Grass cover
Dam B	5	Native grass cover
Pit Top Facility	15	Bare patches
Dam A	40	Bare patches

Location	Ground Surface Visibility (%)	Reasons affecting visibility
Peg 1624	40	Cleared/slashed
Peg 1604	5	Grass cover
Peg 1584	10	Grass cover
Peg 1568	0	Grass cover
Peg 1555	30	Bare patches
Peg 1539	0	Native grass cover
Peg 1525	0	Native grass cover
Peg 1510	0	Native grass cover
Peg 1496	0	Native grass cover
Average Ground Surface Visibility (%). n=59	**7.15%**	

Figure 9: Surveyed areas of the Buttonderry study area (see Figure 3 to contextualise this detail).

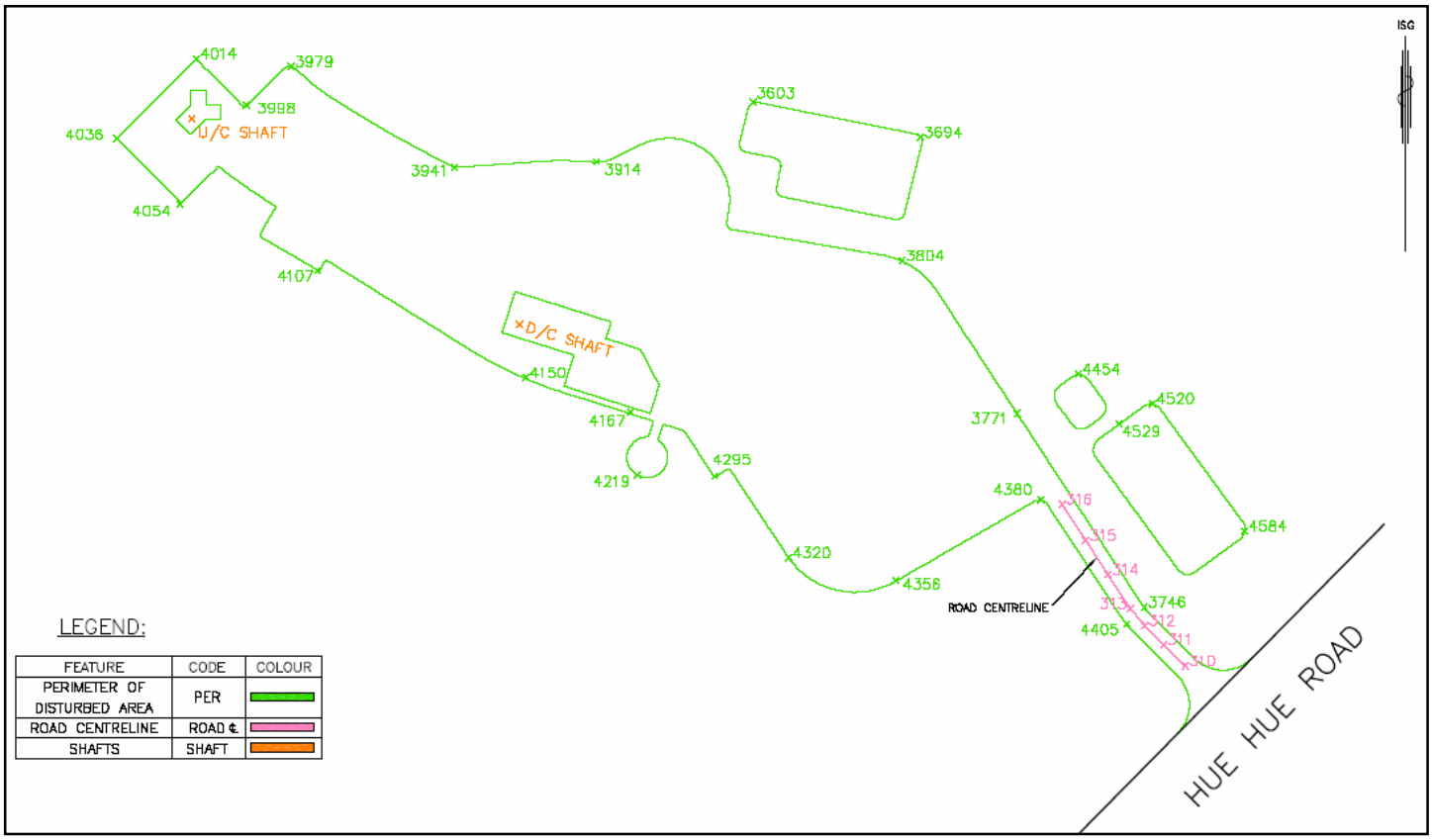
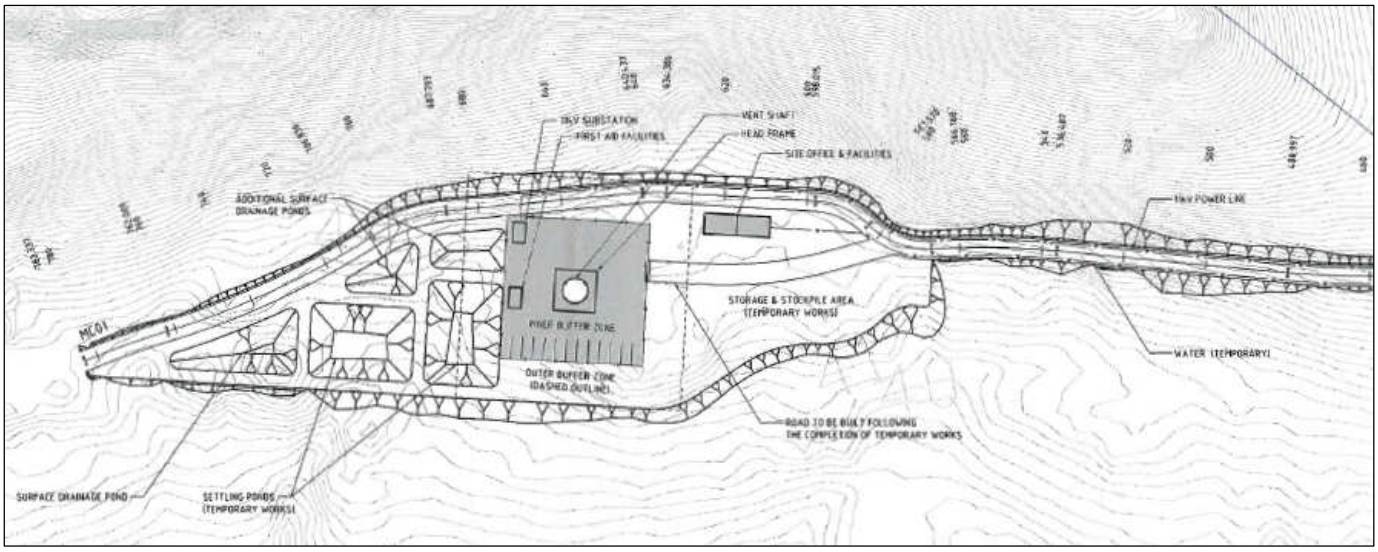


Table 3: Ground Surface Visibility at the Buttonderry study area.

Location	Ground Surface Visibility (%)	Reasons affecting visibility
Peg 4405	5	Grass cover, ploughed / scarified
Peg 3746	5	Grass cover, ploughed / scarified
Peg 4584	5	Grass cover, ploughed / scarified
Peg 4520	5	Grass cover, ploughed / scarified
Peg 4529	5	Grass cover, ploughed / scarified
Peg 4454	5	Grass cover, ploughed / scarified
Peg 4380	5	Grass cover, ploughed / scarified
Peg 3771	5	Grass cover, ploughed / scarified
Peg 3804	5	Grass cover, ploughed / scarified
Peg 3694	5	Grass cover, ploughed / scarified
Peg 3603	5	Grass cover, ploughed / scarified
Peg 2404	5	Grass cover, ploughed / scarified
Peg 4356	20	Bare patches in vicinity, near track
Peg 4320	25	Leaf litter, near dam, some exposures
Peg 4295	40	Bare patches
Peg 4219	90	Exposed vehicle track
Peg 4167	3	Leaf litter
Peg 4150	3	Leaf litter
Peg 4107	3	Leaf litter
Peg 4054	20	Leaf litter, on the edge of track
Peg 4036	3	Leaf litter
Peg 4014	3	Leaf litter
Peg 3998	3	Leaf litter
Peg 3979	3	Leaf litter
Peg 3941	3	Leaf litter
Peg 3914	3	Leaf litter
Average Ground Surface Visibility (%). n=26	**9.22%**	

Figure 10: Detail of the Western shaft study area (see Figure 3 for context).



The remaining area beyond this buffered direct impact zone was more generally assessed and is referred to as the Buttonderry off-set study area.

Western shaft study area: **Figure 10** delineates the area surveyed at the Western shaft study area. Due to the smaller size of this area and the guided nature of the inspection, we did not require the area to be pegged in the field. The area is densely vegetated and the only visibility is on the existing track.

1.4.2 Off-Set Areas

All potential off-set areas were assessed in less detail than those proposed for direct impact. The aim, as noted earlier (**Section 1.2**), was to build up an understanding of the likely heritage values of the proposed conservation areas to assist the Proponent in determining the best opportunities for heritage conservation. For both the Hue Hue Road ecological offset investigation area and Buttonderry off-set study area, survey focussed on any waterways, ridge tops and any areas of accessible ground surface visibility, particularly vehicle tracks and erosion scalds. These areas should not be considered as completely assessed as those destined for direct impact.

1.5 Report Authorship

The heritage surveys were undertaken by Ben Churcher and Dr. Jodie Benton (OzArk Cultural Heritage Management P/L) on the 13th October 2006 and 14th-16th November 2006. Community representatives accompanied the project teams on all surveys.

This report was written by Dr. Jodie Benton, Ben Churcher and Phillip Cameron (OzArk Environmental and Heritage Management P/L).

2. COMMUNITY INVOLVEMENT

Consultation for this project was undertaken according to the DECCW "Interim Community Consultation Guidelines" which became effective on the 1st January 2005. An advertisement was placed seeking expressions of interest from Indigenous groups and organisations in the Wyong area to participate in the heritage assessment. Letters were sent to local government and government agencies seeking knowledge of any Indigenous stakeholder groups to contact for inclusion in the consultation process. Letters seeking an expression of interest to participate in the heritage assessment for the proposed Wallarah 2 Coal Project were sent to Darkinjung Local Aboriginal Land Council (DLALC), Guringai Tribal Link Aboriginal Corporation (GTLAC) and Mur-Roo-Ma Inc. Responses were received from the DLALC and GTLAC. These two groups were then sent details of the planned field assessment and methodology.

The first field assessment for this project was undertaken on DLALC land and David Prosser represented the DLALC for this survey. This survey was undertaken on 12 October 2006 and Ben Churcher, Senior Archaeologist, represented OzArk Environmental & Heritage Management on this occasion.

The second field assessment took place between November 14-16 2006 and DLALC was represented by Sharon Hodgetts and Jason Taylor. GTLAC was represented by Tracey-Lee Howie and Kevin Robinson. The OzArk EHM archaeologists on this second

survey were Dr Jodie Benton and Ben Churcher. A detailed community consultation log can be found in **Appendix 2** of this report and community correspondence and reports relating to these assessments in **Appendix 3**.

3. STUDY AREA

3.1 Environmental settings (topography, hydrology, climate, geology and soils)

The study areas lie within the Sydney Basin Bioregion (SBBR, also known as the Sydney–Bowen Basin) which is on the east coast of NSW and includes a significant proportion of the catchments of the Hawkesbury- Nepean, Hunter and Shoalhaven river systems, all of the smaller catchments of Lake Macquarie, Lake Illawarra, Hacking, Georges and Parramatta Rivers, and smaller portions of the headwaters of the Clyde and Macquarie rivers.

According to DECC (2002), the SBBR is a geological basin formed when the earth's crust expanded and then filled with sediment forming near horizontal sandstones and shales between the late Carboniferous and Triassic ages. These overlie older basement rocks of the Lachlan Fold Belt. These rocks have been subject to uplift with minor folding and faulting during the formation of the Great Dividing Range. Erosion by coastal streams in some areas of the bioregion (for example Illawarra) has created deep-cliffed gorges and remnant plateaus with an east-west rainfall gradient and differences in soils. Other atypical environs include coastal landscapes of cliffs, beaches and estuaries.

The stages of development saw the continental rift filled with sediments (marine volcanic). Subsequent deposition therefore shifted to rivers and swamps during the cold climates of the early Permian. Coal deposits accumulated in the upper parts of the basin that were then covered in quartz sands by extremely large, braided rivers whose headwaters lay hundreds or even thousands of kilometres away (when Antarctica was joined to the current Australian continent). These waterways flowed in from the south and the northwest to deposit the sands that later formed the Hawkesbury Sandstone. Shallow marine sediments and later more river sediments continued to accumulate in the basin during the Jurassic Period (all currently eroded). There is presently only a thin cap of these latter deposits (shale) over the resistant sandstones.

More specifically, the current study areas lie at the margins of the Clifton Subgroup of the Narrabeen Group and forms part of the Munmorah Conglomerate Formation (Sydney 1:25k Geological Series Sheet SI 56-5).

The considerable range of rock types, topography and climates in the Sydney Basin has resulted in a large variety of soils and vegetation communities. The coastal area of the bioregion consists of frontal dunes. Dunes behind this accumulate organic matter and begin to develop coloured subsoil. The oldest dunes on the inland side of the barrier and the parabolic dunes high in the landscape, even on headlands, have well-developed podsol profiles. Limited areas of rainforest can be found in the lower Hunter, Illawarra escarpment and on Robertson basalts, as well as in the protected gorges and on richer soil in most subregions. Species composition and structural form are similar on sandy soils of the sandstone plateaus and the sandy soils of the dunes. Better quality shale soils form caps on sandstone and on the coastal ramps.

Soils in the Munmorah Conglomerate Formation have moderately deep (50-150cm) yellow earths, yellow podsolic soils and soloths (Murphy 1993) with low usable nutrients.

The SBBR is dominated by a temperate climate characterised by warm summers with no dry season. A sub-humid climate occurs across significant areas in the northeast of the bioregion such as that experienced in the assessed areas. Rainfall can occur throughout the year, but varies across the bioregion in relation to altitude and distance from the coast, with wetter areas being closer to the coast or in higher altitudes. Temperature varies across the bioregion, with areas of higher temperature occurring along the coast and in the Hunter Valley and areas of lower temperature on the higher plateaux and western edge.

More specifically, climate data from the Bureau of Meteorology monitoring station located in Gosford shows that the area has an average annual temperature of 22.9°C (Maximum annual average of 27.5°C and minimum annual average of 4.5°C) with an annual average rainfall of 1,320.8 mm (most of the rainfall occurs in March with the least occurring in October).

3.1.1 Direct impact areas

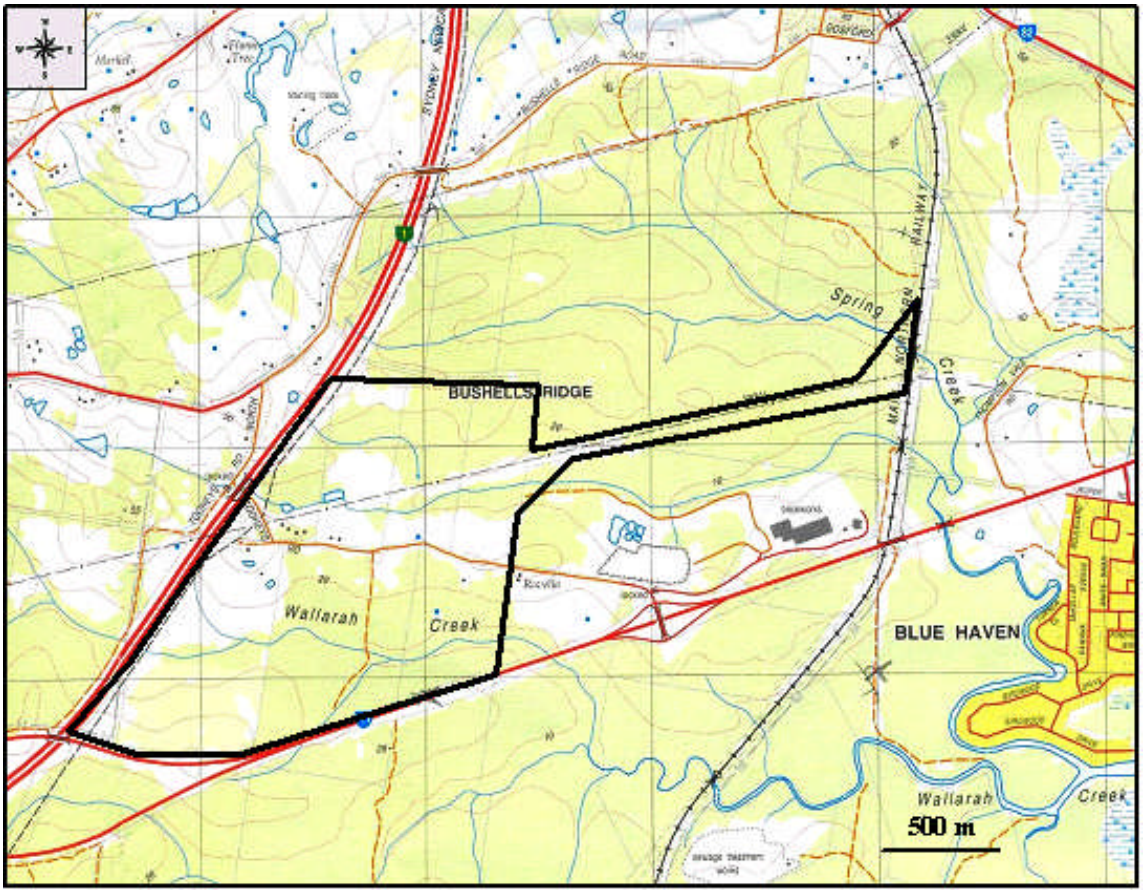
3.1.1a Tooheys Road study area

Topography within the study area is characterised by gentle rises ranging in elevation from c. 10m Australian Height Datum (AHD) surrounding Wallarah and Spring Creeks to c. 50m AHD at Bushells Ridge in the northern extent of the study area and in the south-western portion of the assessed area where the Pit Top Facility is to be located (Figures 6 and 11).

Hydrology within the Tooheys Road study area features Spring and Wallarah Creeks with associated tributaries and one unnamed drainage line and headwater. All water features drain east into Wallarah Creek then eventually into the Budgewoi Lake.

More specifically, Spring Creek, a permanent source of water, is on land owned by the DLALC, north of Tooheys Road in the north-eastern section of the study area. Only a very small portion of this creek (c. 200m) is within the assessed rail easement impact footprint and buffer zone. This creek is fed by two main unnamed drainage lines from northwest and due west of the existing rail bridge, south of Bushells Ridge Road. According to the 2002 Dooralong 9131-1S map, no agricultural dams alter the natural hydrology of this waterway.

Figure 11: Topography and hydrology Tooheys Road study area - black outline
(Source: Dooralong 9131-1S 1:25K).



South of Tooheys Road lies Wallarah Creek, a permanent source of water. The headwaters for this creek are c. 2 km west largely within the Hue Hue Road ecological offset investigation area, owned by the WACJV (**Figure 5**). Approximately 1.5km of this creek occurs within the study area, flowing east and dissecting the property into two equal portions of land. This creek has two main tributaries within the study area; one draining land to the north of the creek at the western boundary of the study area and which is barely recognisable as a headwater, occurring in cleared, ploughed land adjoining the Sydney–Newcastle Freeway. The second drains land south of the creek, is approximately 500m in length, of which 300m is within the study area, and has its origins on the southern side of the Pacific Highway (the southern border of the study area). One large agricultural dam on private property south of Bushells Ridge Road and upstream of the Tooheys Road site alters the natural hydrology of this waterway (Dooralong 9131-1S 1:25k).

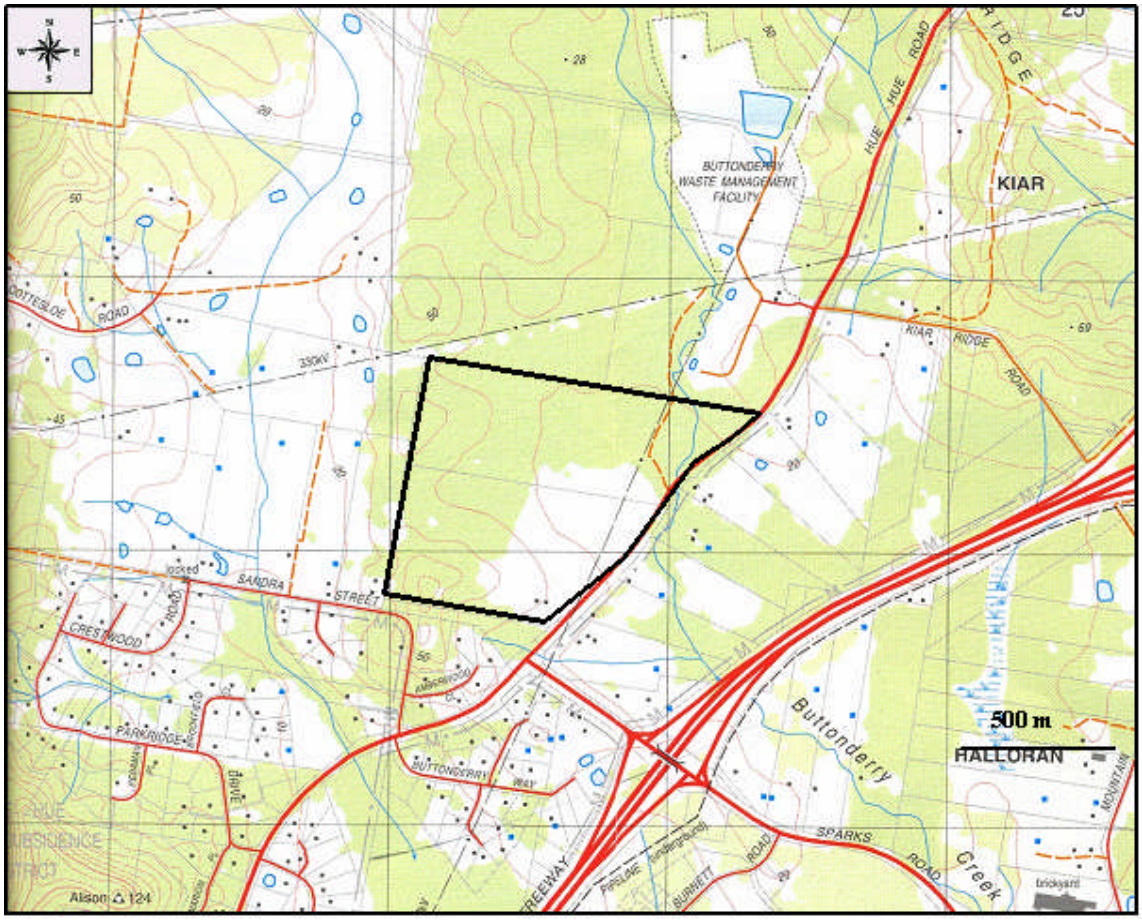
A smaller unnamed drainage feature is situated north of Tooheys Road, loosely paralleling it and then crossed by the TransGrid 330kV transmission line. Both headwaters for this feature are located on private property south of Bushells Ridge Road c. 1km west of the Sydney–Newcastle Freeway. Approximately 1.3km (or 1/3 of the entire length) of this feature is within the study area. This waterway is characterised by multi-channelled, shallow, separated, mostly permanent pools and waterlogged soils. Six agricultural dams located on private property south of Bushells Ridge Road alter the natural hydrology of this waterway.

According to the Sydney 1:25k Geological Series Sheet SI 56-5, the study area is within the Clifton Subgroup of the Narrabeen Group and forms part of the Tuggerah Formation. These areas have moderately deep (50-150cm) yellow earths, yellow podsolic soils and soloths (Murphy 1993) with low usable nutrients.

3.1.1b Buttonderry study area

Topography within this assessed area is characterised by a gentle rise ranging in elevation from c. 5m AHD next to Hue Hue Road and Buttonderry Creek to c. 60m AHD in the south-western and most elevated portion of the study area and to 40m AHD in the north-western corner.

Figure 12: Topography and hydrology of the Buttonderry study area - black outline (Source: Dooralong 9131-1S 1:25K).



Surface water within the Buttonderry study area moves from the higher ground in the west toward Hue Hue Road and Buttonderry Creek. Once in the creek the water flows southeast for c. 3km where it then peters out near the Warnervale aerodrome. Only c. 200m of this permanent waterway dissects the most north-eastern portion of the property (Figure 12). Only one agricultural dam, located on private property upstream of the site between Bloomfield and Kiar Ridge Roads alters the natural hydrology of this waterway.

Soils on this site are similar to those at Tooheys Road (forms part of the Formation and low nutrient yellow soils), but are formed from Patonga Claystone sediments near the boundary of the Tuggerah Formation.

3.1.1c Western shaft study area

Topography within this study area is generally hilly with steep slopes along an east-westerly oriented ridge. Areas to be upgraded on Brothers Road are 21m AHD and rise in elevation along the 700m long (impact footprint road and facilities) area to 45m AHD at the site proposed for the western shaft facility.

There are no drainage features within this impact footprint. Surface water from the ridgeline drains south, off the slope, into a small east-west oriented valley containing the northern tributary (draining south) of Armstrongs Creek. This creek drains southeast for c. 3km before joining Jilliby Jilliby Creek which then flows south into the Wyong River before eventually draining to Tuggerah Lake.

Geology in this area is underlain by rocks of the Triassic Clifton-Subgroup, mainly consisting of claystone and sandstone (Sydney 1:25K Geological Series Sheet SI 56-5). Soils are comprised of yellow podsolics and have low amounts of usable nutrients.

3.1.2 Potential conservation off-set areas

3.1.2a Buttonderry off-set study area

The environmental settings for this area are that same as those for the Buttonderry direct impact study area, described in **Section 3.1.1b**, and will not be repeated here.

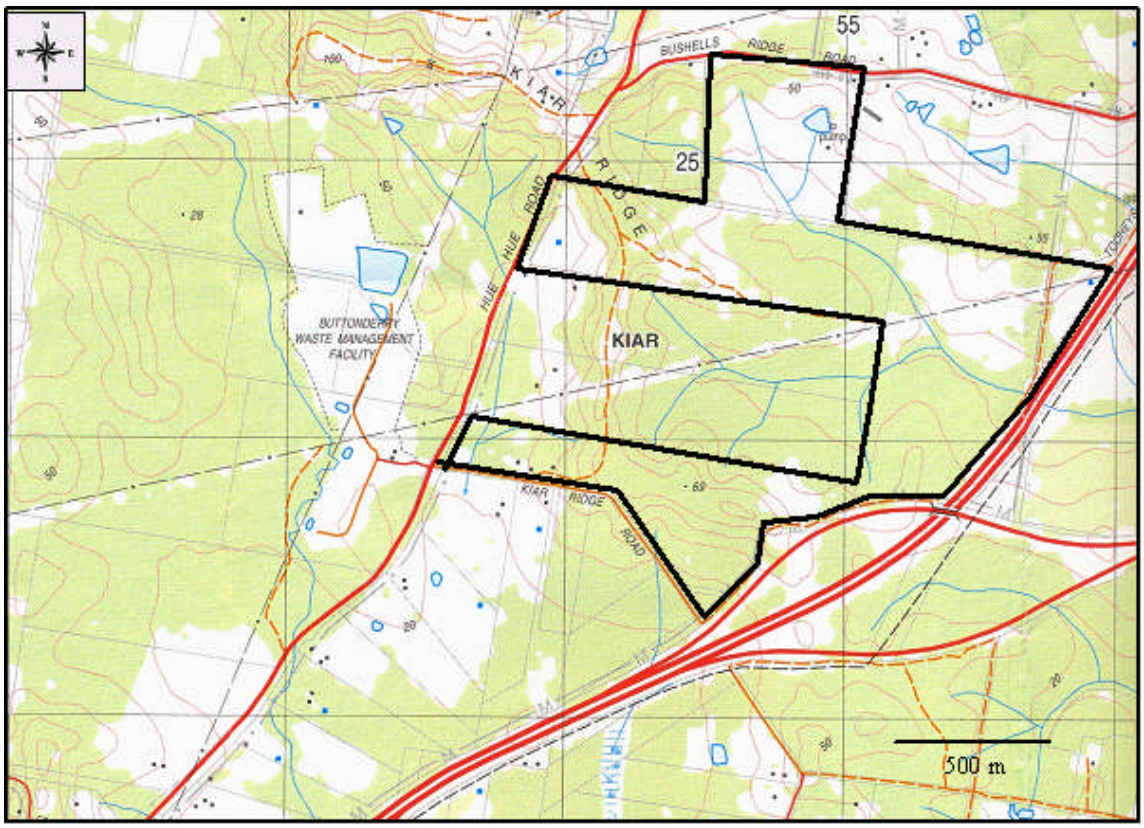
3.1.2b Hue Hue Road ecological offset investigation area

Topography within this assessed area is generally hilly with moderate to occasionally steep slopes. Two ridgelines influence the topography and hydrology within these parcels of land. Kiar Ridge (c. 70m AHD) is the major influence over the study area and comprises two spurs, one oriented north-south and the other east-west. Bushells Ridge (c. 60m AHD) is situated north of Kiar Ridge and is oriented east-west. Areas of lower elevation (5 to 10m AHD) within this study area occur toward Hue Hue Road in the west and in association with Wallarah Creek and its headwaters.

All drainage lines are associated with Wallarah Creek and are the result of surface runoff entering drainage depressions from the elevated areas of Kiar and Bushells Ridge (**Figure 13**). Wallarah Creek drains east, flowing under the Sydney Newcastle Freeway, through the Tooheys Road study area and eventually to Budgewoi Lake.

The northern tributary of Wallarah Creek is located within this study area and originates from the slopes of Bushells Ridge. This ephemeral tributary is fed by three unnamed headwaters, one of which has been modified by an agricultural dam, the others are all relatively intact. The southern main headwater is, for the most part, not within the Hue Hue Road study area and derives from the slopes of Kiar Ridge.

Figure 13: Topography and hydrology of the Hue Hue Road ecological offset investigation area - black outline (Source: Dooralong 9131-1S 1:25K).



In the south-western portion of these parcels of land is an additional ephemeral drainage feature not associated with Wallarah Creek. It is derived from the slopes of Kiar Ridge but in this case has its origin from slopes on the western side of Hue Hue Road. Prior to European impact this feature would have flowed south into Buttonderry Creek.

Geology and soils on this site are the same as Tooheys Road (forms part of the Tuggerah Formation and low nutrient yellow soils).

3.2 Current land uses and existing levels of disturbance

3.2.1 Direct impact areas

3.2.1a Tooheys Road study area

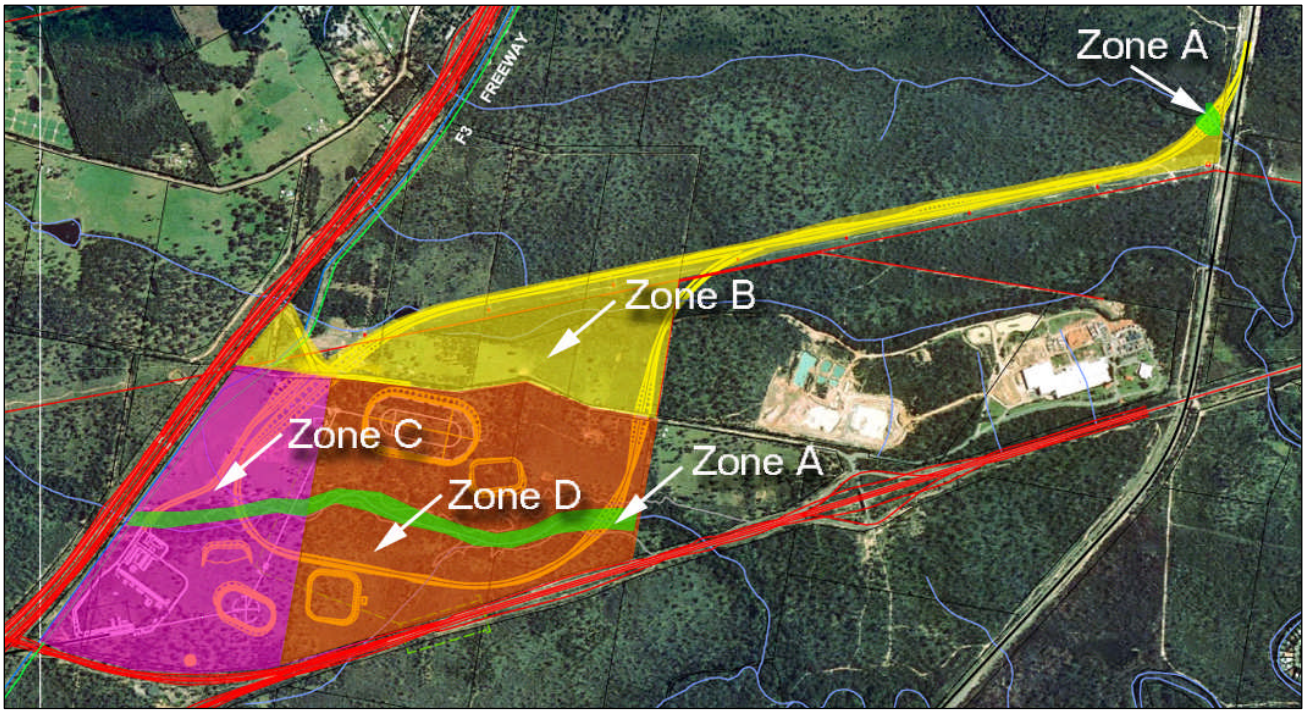
The Tooheys Road study area is the most easterly of the current study areas and will be the site of major development works including rail loops, conveyor lines, pit top infrastructure, stockpile areas and roads. **Figure 14** shows the Tooheys Road study area in its context.

The levels of existing disturbance across the Tooheys Road study area were assessed as moderate to high. This disturbance was primarily due to the clearing of vegetation, agricultural use and subsequent erosion. For the purposes of this disturbance assessment, the Tooheys Road study area can be divided in four major areas, namely:

the environs of Spring and Wallarah Creeks (**Figure 15 Zone A**), land to the north of Tooheys Road (**Figure 15 Zone B**), land to the southwest of Tooheys Road (**Figure 15 Zone C**) and land to the southeast of Tooheys Road (**Figure 15 Zone D**).

Figure 14: Proposed impact details at the Tooheys Road and Buttonderry study areas. Base map supplied by the Proponent.

Figure 15: Division of Tooheys Road study area into zones. Base map Figure 14.



Zone A: Environs of Spring and Wallarah Creeks. Spring Creek is located on DLALC property and appears to provide a permanent fresh water supply within the assessed area, despite becoming estuarine a few hundred meters downstream (**Plate 1**). The creek is largely unmodified and lined with large eucalyptus within the assessed area. The proposed impact footprint adjoins an existing area of very heavy disturbance and waterway modification where a rail bridge has been constructed for the Main Northern Railway. There is evidence of surface impacts from vehicle tracks and ruts to the banks of the creek in discrete places (**Plates 2 and 3**).

Wallarah Creek can also provide a fresh water supply, although at the time of the survey the creek was largely dry except for occasional standing pools. Portions of this creek have undergone heavy disturbance evidenced by highly modified open channels, such as at the western end of the study area in the location of recent works associated with the construction of the Morisset to Warnervale water trunk main (Hunter Water Pipeline) and numerous other services and pipelines. Areas of intensive erosion occur resulting from land clearing practices and prior agriculture (**Plate 4**). In the western portion of the Tooheys Road study area (adjoining the F3 freeway) vegetation has been largely cleared within the past 50-80 years. Although some remnant trees remain and varying levels of soil disturbance have occurred, there has been some regeneration of native vegetation, particularly associated with the creek. It is within this regenerated and remnant vegetation of Wallarah Creek that the western most portion of the rail loop will cross (**Plate 5**).

Although the tributary of Wallarah Creek originating on the southern side of Doyalson Link Road appears largely unmodified, the vegetation has in fact regenerated over the past 50 years, subsequent to clearing and grazing (**Plate 6**). The 4WD track shown on the topographic map crossing Wallarah Creek and running immediately west of the waterway is barely recognisable in the field and has been for the most part reclaimed by regrowth.

Within its central and eastern sections at the Tooheys Road site, native vegetation along Wallarah Creek is unmodified between 50 and 100m either side of its existing banks. The presence of old growth eucalypts behind former agricultural fences indicates the creek has been recently excluded from both direct and indirect impacts (excluding the former vehicle crossing).

Zone B: Area to the north of Tooheys Road. The study area within DLALC land is c. 1800 x 60m (10.8ha). This land is not managed for any specific purpose by the DLALC. The only infrastructure present on the property (apart from agricultural fencing) is associated with a TransGrid 330kV powerline which occurs within a dedicated easement (**Plate 7**). The assessed area for the current W2CP project included 10 to 15m of the northern portion of the TransGrid easement (in the event that TransGrid would allow the rail alignment to be moved closer to the existing towers to minimise impacts to vegetation and possible heritage) and extended for 50m beyond the existing easement's northern limit. The alignment of the electrical towers does not occur within the assessed area. Specific disturbance within the assessed corridor included:

- Manual vegetation thinning and removal of understorey layers for early grazing agricultural practices. Vegetation has been allowed to regrow in the past 40 years approximately (**Plate 8**);

- Vegetation clearing for the purpose of creating the 330 kV easement; and
- Impacts associated with former and current vehicle tracks (authorised and unauthorised use including very high level impacts associated with many unregulated motorcycle tracks, **Plate 9**).

As a rough indicator, this study area can be described as having:

- 15% heavy disturbance to all vegetation and soil structure in the eastern portion of the assessed area excluding the riparian zone (1.62ha);
- 17% moderate disturbance in areas cleared for the 330 kV easement that are not impacted by motorcycle tracks (1.3ha);
- 58% low disturbance in vegetated areas adjoining the easement impacted only by former agricultural practices (6.26ha); and
- 10% very low disturbance in the riparian corridor associated with Spring Creek (1.08ha).

The property north of Tooheys Road, owned by the WACJV consists of three c. 300 x 700m (63 ha) blocks and one c. 210m x 490m (10.3ha) block. These portions of land are currently used for grazing agriculture, domestic residence on two of the four properties and a continuation of the Transgrid 330 kV power line (**Plate 10**).

Common disturbance to all four blocks include:

- Manual vegetation thinning and removal of understorey layers for early grazing agricultural practices. Vegetation has been allowed to regrow in the past 20-60 years depending on block ownership;
- Vegetation clearing for the purpose of creating the 330 kV easement;
- Installation of 330kV electricity towers;
- Impacts associated with the instillation of the Munmorah gas pipeline within the southern side of the TransGrid 330kV easement; and
- Impacts associated with former and current authorised vehicle tracks.

Specifically DP 755245 Lot 103 and DP 755245 Lot 102 (the two easternmost blocks) have undergone similar management. Of the 42 ha (c. 21 ha each):

- 50% has moderate disturbance with discrete areas of high disturbance (21 ha). Disturbance activities include vegetation removal (including impacting a minor drainage line), stump pushing, agricultural fencing, creation of farm dams and other minor infrastructure, gas line installation, continuous grazing, clearing for the 330kV easement, creation of TransGrid and rural service tracks and installation of electricity towers;
- 40% low disturbance in vegetated areas north of the 330kV easement impacted only by former agricultural practices (16.8 ha); and

- 10% very low disturbance in the riparian corridor south of the easement (4.2 ha) (outside the area to be impacted directly by the proposed works).

DP 260217 Lot 1 and DP 260217 Lot 3 (the two westernmost blocks) have undergone similar management and both have been reduced in size to make way for the F3 freeway. Two domestic dwellings are situated on these properties, and disturbance can be summarised as follows:

- 80% has moderate disturbance with discrete areas of high disturbance (24 ha). This land has undergone vegetation removal within the past 20 years, stump pushing, agricultural fencing, creation of farm dams and other minor infrastructure, residential housing construction, continuous grazing, clearing for the 330kV easement (including through the riparian vegetation) and the Morisset to Warnervale water trunk main on the western boundary, creation of TransGrid and rural service tracks and installation of electricity towers; and

- 15% has low disturbance in vegetated areas north of the 330kV easement impacted only by former agricultural practices (4.5 ha).

Zone C: Area to the southwest of Tooheys Road. Principally the zone covered in this section is block DP 755245 Pt 124 which extends both to the north and the south of Wallarah Creek. This area has been heavily modified. Nearly all trees have been cleared, arable land ploughed and elevated lands suitable for Indigenous occupation have been impacted by a residential house and farming infrastructure (dairy shed). In 2006 large amounts of rubbish (car bodies, building materials and storage containers) were stacked in multiple piles toward and along the banks of Wallarah Creek. These materials, including potentially hazardous items (old pesticide containers and asbestos sheeting) have been subsequently removed by the Proponent. The western boundary of the property has been heavily impacted by the Morisset to Warnervale water trunk main. South of Wallarah Creek, until recently, was used for grazing agriculture (goats) and has no understorey layer and very few mature trees (**Plates 11 and 12**).

- 100% has moderate disturbance with discrete areas of high disturbance. This land has undergone vegetation removal within the past 20 years, stump pushing, agricultural fencing, creation of farm dams and other minor infrastructure, residential housing construction, continuous grazing and the Morisset to Warnervale water trunk main on the western boundary.

Zone D: Area to the southeast of Tooheys Road. The two blocks to the east adjoining DP 755245 PT 124 have had similar, although less severe impacts to that noted in DP 755245 Pt 124. North of Wallarah Creek these blocks have been cleared and, in the past, ploughed and grazed. Other impacts such as vehicle tracks and dams are also found in this area. To the south of Wallarah Creek, however, the land has been fallow for more than 30 years (estimation) as it has a mature understorey layer and moderate sized trees. It is likely that all blocks underwent tree clearing at some time in the past (**Plates 13 and 14**).

- 20% has moderate to high disturbance as it has undergone vegetation removal within the past 20 years and remains cleared and grazed. This area also includes the construction of farm dams, fences and farm access tracks.

- 80% has low-moderate disturbance due to vegetation clearing in the past although large areas have been allowed to revegetate during the past few decades.

3.2.1b Buttonderry study area

Buttonderry is currently and was formerly used for grazing agriculture. It comprises two blocks with separate DP's. DP 791157 Lot 2 (c. 35 ha) is the southern most and it is within this block that direct impacts will occur (**Figures 3 and 5**).

The area of proposed direct impact is primarily situated on lower, undifferentiated, north facing slopes which are currently predominantly treed, but have been subject to previous logging (only a few isolated trees are mature, **Plate 15**). The southeastern portion of the direct impact area, where the access track and dam is located, comprises slightly more elevated land with minimal slope gradient (**Plate 16**). This area has been completely cleared and shows evidence of having undergone ploughing or scarification for pasture improvement. A couple of stock dams have been excavated into deposits of the lower hillslope (**Plate 17**), which indicate that the remnant topsoil is very skeletal and directly overlies heavy clays of the 'B' horizon (**Plate 18**). Tracks that traverse the entire Buttonderry site (indicated on **Figure 13**) also provide limited disturbance.

3.2.1c Western shaft study area

The Western shaft site occurs on land within the Wyong State Forest. Disturbance in the immediate area is limited to the prior construction and ongoing maintenance of Brothers Road (**Plate 19**) and selective logging (**Plates 20-23**).

3.2.2 Proposed off-set areas

3.2.2a Buttonderry potential off-set

Levels of disturbance have been previously described in **Section 3.2.1b** and generally comprise logging and grazing. Overall the potential off-set area of the Buttonderry site (see **Figure 5**) has suffered generally lower levels of disturbance of the slopes that drain down to Buttonderry Creek and the surrounding lowland/wetland than those of the direct impact zone (**Plates 24 -26**).

3.2.2b Hue Hue Road ecological offset investigation area

Previous impacts to these parcels of land are varied and are as follows:

DP 755245 Lot 118 (c. 25 ha)

This is the most northern block in the potential off-set group and fronts Bushells Ridge Road (**Figures 5 and 13**). It is currently used for grazing agriculture and has been throughout the past century. All drainage lines have been impacted by vegetation removal with one large dam having been constructed in one of the headwaters to Wallarah Creek. The vast majority of vegetation on the block has been removed except on areas where there is steep topography (**Figure 13, Plate 28**).

DP 719762 Lot 1(c. 36 ha)

This portion of land fronts Hue Hue Road along its western boundary. It has apparently suffered low levels of prior disturbance with only selective tree clearing having been undertaken (**Figure 13, Plate 27**).

DP 258692 Lot 31 (c. 48 ha)

This portion of land abuts the F3 freeway (**Figure 13**). The flat land areas have been cleared for grazing agriculture whilst the steeper slopes remain timbered only having undergone selective logging. In this block generally all land north of the tributary to Wallarah Creek has been cleared however the only clearing on the slopes is associated with the TransGrid 330kV electricity easement. There are several vehicle tracks that traverse this parcel of land.

DP 791157 Lot 2 (c. 36 ha)

This is the southern-most of the potential off-set group and is bounded to the south by Kiar Ridge Road and the west by Hue Hue Road (**Figures 5 and 13**). The western c. 5ha contains a residence and has been heavily impacted by residential infrastructure which has caused modification of the drainage line that runs parallel to Hue Hue Road. Similarly, as with all land in the vicinity, the flat areas have been were cleared for agricultural purposes and the steeper slopes have been selectively logged. One moderately sized farm dam is present on elevated land in the east of the property and several vehicle tracks exist (**Plate 29**).

4. INDIGENOUS HERITAGE

4.1 Aboriginal Historical Background

Although the exact position of pre-European tribal boundaries is not clear, most of the Central Coast in the Gosford and Wyong area was the country of the Darkinjung tribe; an area today covered by the two local government areas. Their neighbours were the Daruk people, whose country included the shores of Broken Bay and extended south to Sydney Harbour, the Awabakal tribe, who lived around Lake Macquarie in the north, the Wiradjuri tribe to the west, and the Wonnarua tribe to the inland north (www.samuseum.sa.gov.au).

The Darkinjung lived by fishing, gathering bush foods and hunting. The region was part of an extensive trade network and large ceremonies were held at times of the year when fish were plentiful. Ourimbah, in the middle of the Central Coast region, was a ceremonial ground in which boys were initiated (Vinnicombe 1980).

The European occupation of Australia started at Sydney in 1788 and its effects were soon felt in Darkinjung country. Smallpox, measles and other exotic diseases quickly reduced the population (Stinson 1979: 11). It is also recorded that the Darkinjung men did not take too kindly to the invasion of white settlers to the area. According to the Town and Country Journal, 6th March 1875 Aboriginal men were "ruthlessly slaughtered" when reacting to the provocation of the stealing of land or women.

Before the invasion there may have been 1,500 Aborigines in 12 family groups living between the Hawkesbury River and Lake Macquarie. In six years, between 1821 and 1827, the Darkinjung population was reduced from 200 to 65. A second smallpox epidemic in about 1828 almost completely destroyed the local population. In 1874 Billy Fawkner, said to be the last remaining Darkinjung, drowned in Tuggerah Lake, which had been the source of life for his people (Stinson 1979).

After the dispossession of Aboriginal people from their land, Aborigines and White Australians tended to live separately in space (Coombs 1994: 70). Though there were a few people who may have been descendants of the original inhabitants living near Mangrove Mountain (Vinnicombe 1980). The Central Coast region grew rapidly as a centre of European population. By 1968 a local historian could comment that 'these friendly and worthy people... are no longer with us' (Bennett 1968: 3)

4.2 Regional Context and Previous Archaeological Studies

Although there is quite a long history of archaeological investigations in the Central Coast region, much of this research has been somewhat limited, with areas selected on the basis of development or specific site types. Studies have generally been based on coastal areas, with little work carried out to the west of the lakes. As a result, there is not enough information available for a regional model of Aboriginal settlement and population movements to be developed (Dallas 1986:4, 1987). However, results of previous work indicate that all of the available environments (rocky shore, estuarine, beach and swamp) were exploited by Aboriginal populations. Known sites in this area include open camp sites, axe grinding grooves, middens, scarred / modified trees, shelters with art / deposits, burials and quarries. Approximately 270 Aboriginal sites within the Wyong area are listed on the NSW DECCW AHIMS database. More sites are added to the list as further specific studies are completed (Wyong Shire Council 2004). The oldest date for the region (11,050 years BP) is based on evidence from Logger's Shelter at Mangrove Creek, located by Attenbrow (1980, as cited in Vinnicombe, 1990).

Lake Macquarie to Broken Bay

In 1975-1976 a survey was undertaken to locate shell middens between Lake Macquarie and Broken Bay (Stockton 1977). This 79km coastline has at least 40 sites resulting in a density of 0.51 sites/km. A cluster of 7 sites were recorded at Norah Heads at the southern end of Budgewoi Beach, approximately 15km southeast from the current study. The middens recorded were beach, dune and cliff-top middens and while the middens in general lacked large numbers of stone tools, one midden at Norah Head (midden #17) contained a good assemblage including artefacts of the small tool tradition including Bondi Points.

Mangrove Creek Dam

The largest systematic and best-published survey in the region took place in the 1970s and the 1980s in the Mangrove Creek dam catchment area located in the sandstone hinterland of the central coast and approximately 30km southwest of the study area. During the salvage program, Pat Vinnicombe introduced the concept of potential habitation (PH) shelters as it was realised that many rockshelters without any visible sign of Aboriginal use had deposits that looked as if they would contain archaeological

materials. Important to future archaeological investigations, this work introduced the concept of potential archaeological deposits (PADs) to Australia (Attenbrow 2004a). 28 rockshelters with deposit were excavated during this salvage program, along with many open artefact scatter sites. Of the 28 rockshelters, only 16 had been recorded as having archaeological deposit from the presence of surface artefacts sighted during the site survey. Of the twelve potential archaeological deposits in rockshelters that were test excavated, eight (67%) proved to contain sub-surface cultural materials. Additionally, this salvage program was among the first pieces of research aimed at the scientifically rigorous understanding of an environmentally defined area that was able to shed light on the processes of 'intensification' of Aboriginal occupation during the late Holocene around 4000 BP (Attenbrow 2004b).

Wyong Shire

Patricia Vinnicombe (1980) undertook a major survey that sought to categorise and define Aboriginal heritage resources in the Gosford/Wyong area (further to the south of the W2CP area) as a means to integrate cultural heritage into the early stages of development planning. The project comprised a thorough background research, detailed survey and analysis of results to produce a predictive model for the region. Vinnicombe identified various ecological zones within the study area and sought to determine the differences within and between these areas that might make Aboriginal site prediction more accurate. Three different environments were investigated, including open coastline and coastal estuary, riverine estuary and inland sclerophyll forest.

Vinnicombe conducted intensive 10km^2 surveys within each of these three zones, identifying an average of 11 sites/km^2 in coastal estuary areas, 8 sites/km^2 in riverine estuary areas and 6 sites/km^2 in inland sclerophyll zones. Given the (then) current levels of development and the ecological make up of the Gosford/Wyong area, Vinnicombe predicted that there could be an overall total of 13,000 sites within the locality. Vinnicombe was also able to postulate that decreasing site densities are directly related to the distance from marine resources.

A total of 243 sites were recorded during intensive survey, as well as additional sites recorded in spot surveys and ad hoc inspection[1]. A total of 127 rock shelters with occupation evidence were located, along with another 469 shelters considered to be potentially habitable. These were mainly associated with Hawkesbury sandstone rather than the type of geology found in the W2CP area.

Vinnicombe concluded, on the basis of recorded rock shelters with evidence of human occupation, that proximity to permanent water sources was not a factor in site selection, as habituated shelters were most commonly found on high ridge tops, far from drainage lines; although water was still available, either from rock pools, seepage or aquifers.

Art sites within shelters (67) occurred in both high ridge tops and on lower valley slopes. The size and aspect of the shelter did not seem to be a key factor in the location of art sites. Art included figurative and non-figurative work in wet pigment paintings (mostly red with some white and black), stencils (predominantly white, red, yellow and

[1] The results of Vinnicombe's 1980 survey have been cited from ERM 2001a.

pink) and dry pigment drawings (most commonly black). Images were found on both ceilings and walls. Engravings within shelters were rare.

A total of 49 middens were recorded in sandy, alluvium and Narrabeen Formation landscapes, and these were most often observed near freshwater creeks/aquifers at the bottom of slopes towards the valley floor.

Artefact scatters were not commonly observed during survey. Five were located (only one is recorded as a separate site, the others as middens or shelter with deposit), all of which were either associated with middens or found on creek banks or a high plateau.

A total of 54 grinding grooves were found, mostly in and along creek beds at the heads of valleys on Hawkesbury Sandstone. These were also found on Narrabeen Group sandstone(s) although not as often as in Hawkesbury Sandstone.

Engravings usually consisted of pecking, abrasion or both. Most motifs were human, fish or macropods, with birds and other animals, weapons and animal/human tracks also being observed. Of the 12 engravings recorded, they were usually found in Hawkesbury Sandstone on ridge tops and plateaus. Others were found on Narrabeen Group sandstone(s) at sea level;

As the Gosford-Wyong area has been heavily logged in the past, scarred trees were considered rare in the region.

The majority of the 1000 registered sites listed on NPWS records for the Gosford-Wyong area at the time of the Vinnicombe study were engravings, axe grinding grooves, rock shelters containing art and shelters with deposit. Shell middens, stone arrangements, open camp sites, burials and quarries were also recorded but in far fewer numbers. Vinnicombe argued that the bias in favour of engravings in the NPWS register largely reflected past survey strategies. In addition, the greater Gosford-Wyong area was dominated by Hawkesbury Sandstone ridges and as a result, the predominance of sandstone-derived sites recorded may have contributed to this trend.

Tuggerah-Sterland 330 kV Transmission Line

Dyall (1981) conducted a survey for the then Electricity Commission of NSW on the route of the Tuggerah-Sterland 330 kV transmission line located 10km south of the study area. A total area of 120 square kilometres was covered by this survey, encompassing a variety of landforms, including steep Narrabeen sandstone ridges and Gosford sandstone (Terrigal Formation) outcrops. Particularly the eastern portion of the survey covered similar landforms to those found in the current study area.

Thirteen Aboriginal occupation sites were recorded during the survey. An ‘art gallery’ was identified at the head of Moran’s Creek. Six rock shelters were located, one with a single drawing. Six sets of grinding grooves were also identified, ranging from a single groove to a set of seventeen, all located in minor creeks, at locations where the creeks flow over sandstone shelves, high on the ridges. Two isolated finds of stone flakes were also recorded.

Based on the results of the preliminary survey, Dyall hypothesised that while it was unlikely that more art would be found within the study area, a more detailed survey should reveal more Aboriginal material, especially around the swamp areas.

Hue Hue Road

In 1986 the Wyong Shire Council commissioned an archaeological survey along Hue Hue Road as part of their Draft LEP (Dallas 1986). The study area consisted of land abutting Hue Hue Road, to the west of the Sydney-Newcastle Freeway.

Based on the limited previous archaeological work in the area and the environmental setting of the site, Dallas limited site prediction to open camp sites and scarred trees.

A surface scatter of three artefacts was identified, on compact exposed clays and gravels, located on a slope overlooking a creek. The artefacts consisted of a yellow mudstone flake, a grey silcrete flake and a yellow chert flake. It was assessed as unlikely that any undisturbed subsurface deposits remain in the area.

The scatter was interpreted to represent sporadic use of the area. Its location may indicate use of the area by small foraging groups who would have exploited the resources of the nearby swamp. However, European land use practices are likely to have obliterated any traces of substantial significant occupation sites within Dallas' study area.

Morisset Forestry District

An archaeological assessment in the Morisset Forestry District (MFD), north of the study area, was undertaken by Kinhill Engineers (1995) as part of an EIS for proposed forestry operations. The study aimed to describe the Aboriginal heritage and cultural values of the area and considered the likely environmental impact of forestry operations on Aboriginal heritage sites. The study also endeavoured to establish the nature and distribution of stone artefact scatters across the landscape, as it appeared that the database for sandstone sites was sufficiently large enough for predictive purposes.

The study area was approximately 1,160 square kilometres in area, and was divided into 10 environmental zones based on geology and topography. The geographical nature of these zones was used to predict the frequency and distribution of different site types.

A total of 41 Aboriginal sites were recorded during survey, including open artefact scatters, axe-grinding grooves and rock shelters. Of the 22 open artefact scatters, the majority were low density sites with an average of six artefacts per site. The largest artefact scatter contained 34 pieces. Most scatters were located on ridge tops or valley floors (ERM 2001a).

The Kinhill study concluded that the area's long logging tradition explained the low numbers of open artefact scatters. Years of logging had disturbed those areas where artefact scatters usually occur (ridge tops and valley floors), while the higher number of sandstone sites (rock shelters and engravings) was probably due to the fact that logging activities were concentrated away from sandstone outcrops.

Ourimbah State Forest

An archaeological investigation in the Ourimbah State Forest, Mangrove Mountain near Gosford, NSW, (approximately 5 kilometres southwest of the study area) was conducted by Silcox (1996) in preparation for further forestry activities.

Silcox recorded a total of 59 new sites during survey, including 40 axe grinding groove sites, 18 shelter sites and one boulder with art. Of the axe grinding sites, 50 percent were found on creek beds of major tributaries on valley floors, 32.5 percent on top of or on the side of ridge tops, 12.5 percent on the plateau surface, and 5 percent were found on the sloping sides of plateau. The number of grooves in each site ranged from two to 131.

Of the shelters, 72 percent were found along the ridge sides and ridge tops/cliff lines, 17 percent were found on the plateau surface, 5.5 percent were found on the side of the plateau, and 5.5 percent were found on the lower side of a valley.

Hue Hue Road

Nexus Environmental Planning (1998) undertook an archaeological survey at the proposed Green Waste Processing Facility on Hue Hue Road, Warnervale, adjacent to the Buttonderry study area, as part of an EIS in preparation for a development application.

The site had previously been used as a waste disposal area and therefore it had already been highly disturbed and striped of vegetation due to previous land use. Further, the new facility was to be built on land fill. No items of archaeological or heritage significance were found on the site. It was also concluded that any items which may have previously existed, were probably removed during the previous stage of site development.

4.2.1 Local Context

In 2000 a preliminary Indigenous cultural heritage assessment of the proposed surface infrastructure at the Bushells Ridge (Tooheys Road) site was carried out by Environmental Resources Management Australia Pty Ltd (ERM) on behalf of Coal Operations Australia Limited. The assessment was undertaken to establish the likely possibilities and constraints to the development of the site in terms of Indigenous archaeological potential.

This survey covered the same land area as the current survey in the Tooheys Road study area.

The study consisted of a survey methodology (ERM 2001a) and a heritage survey (ERM 2001b).

Survey Methodology. The survey methodology was designed to ensure technical robustness and project relevance as well as to:

- characterise and assess the archaeology of the study area;

- estimate what potential impacts underground mining will have on the archaeology; and
- formulate appropriate strategies to minimise development impacts in archaeologically sensitive areas within the study area.

To achieve these objectives a desktop study was undertaken to review the existing environmental and archaeological landscapes in and around the study area. From this review a predictive archaeological model for likely site types and their distribution across the landscape was developed. The predictive model was then used to design a two-staged survey that targets sampling within the main geological and topographic zones considered having archaeological sensitivity and value.

The survey methodology predicted site types at the Tooheys Road study area to include:

- open artefact scatters;
- camp sites;
- isolated finds; and
- axe grinding grooves.

Heritage Survey. During the survey that followed (ERM 2001b), no visible evidence of Indigenous cultural material was recorded. Despite the lack of observed archaeology, other environmental indicators were used to identify areas of archaeological potential. The landforms with greatest archaeological potential were identified at two places along Wallarah Creek in areas named Units A and C in this survey. Unit A was the cleared paddock on each side of Wallarah Creek immediately adjacent east of the Sydney-Newcastle freeway (equating to the current survey Zone C. See **Figure 15**). Here the land is gradually sloping with elevated ridges on both the northern and southern sides of the creek. The second area of archaeological sensitivity was deemed to be in Unit C, the land immediately adjacent to the east of Unit A (this area corresponds to the current survey Zone D. **Figure 15**). As such, this survey concluded that the entire length of Wallarah Creek within the current study area was a zone of archaeological sensitivity.

This survey did not record any scarred trees and concluded that rock shelters are unlikely to occur within the study area as no significant sandstone outcropping was apparent within the Tooheys Road site.

The ERM (2001b) report concluded:

> "Despite the apparent lack of surface archaeological material located during inspection, there remains the potential for archaeological and cultural sites to exist within the area. The southern half of the Bushells Ridge site (units A and C) is on moderate or gentle low slopes in the vicinity of Wallarah Creek and its tributaries. This environment, with its proximity to water and associated resources, is the most likely area of consistent Aboriginal land use and resource exploitation. The presence of archaeological sites in similar soil landscapes nearby adds weight to this predictive statement. The relatively minor land disturbance to the area increases the potential for archaeological evidence to remain. Such evidence may include artefact scatters/campsites and isolated finds. It is possible, though less likely that grinding grooves and scarred trees may occur.

> The land north of Tooheys Road (survey units B, D and E) incorporates the more elevated portions of the ridge and represents a more disrupted landscape. There is some potential for archaeological material, such as isolated artefacts, to exist. However, the area is less likely to be of archaeological significance due to the range and extent of land disturbance."

In 2005 three isolated artefacts and two artefact scatters were found as a result of a survey for a proposed Gas Turbine Facility associated with Munmorah Power Station (Heritage Concepts 2005). Part of this survey traversed very close to the Tooheys Road study area, particularly in the north where the Munmorah Power Station survey ran down the TransGrid easement. As a result of this survey, two sites were recorded very close to the current study area. Site AS1, a scatter of seven artefacts, was located on Spring Creek within a kilometre southeast of the Tooheys Road study area. The consultant believed this site to be the same site as DECCW # 45-3-3187 (BR13), previously recorded by Therin. Site AS2, a scatter of at least 27 stone artefacts, was also recorded during this survey and was thought to equate to site DECCW # 45-3-3180, previously recorded as site B14 by Michael Therin. Both these sites are outside the current study area, but are in close proximity being within 1km downstream from the portion of Spring Creek within the current Tooheys Rd study.

Of the three isolated finds recorded, two are located along the TransGrid easement within the Tooheys rd study area generally, but outside the direct impact corridor surveyed for the rail loop as part of the current W2CP study. Underneath TransGrid pylon 21TL16, the pylon closest to Spring Creek on its western bank, isolated artefact (IA2) was recorded. It consisted of a large flake of mudstone. This location is 50m south of the southern edge of the direct impact corridor in this area. The ground surface in this area also has been heavily disturbed from vehicle (mostly motocross) traffic.

The other isolated artefact (IA3) was located in a section of the TransGrid easement towards the western boundary of the Darkinjung LALC's property. It was a single flake of indurated mudstone found sitting on the hard, eroded track surface. This track runs beneath the TransGrid powerlines and is 50m south of the southern edge of the direct impact corridor for the current project.

AHIMS Database

A search of the DECCW AHIMS register revealed sixty six (66) previously recorded Aboriginal sites in a 25km (E-W) x 15km (N-S) area centred on the current study area. (between 340000-365000E and 6316000-6331000N: Search date: 28.9.06). **Table 4** displays the site information of these sites.

Table 4: Previously recorded sites in proximity to the study area. Between 340000-365000E and 6316000-6331000N: Search date: 28.9.06

Site ID	Site Name	Easting	Northing	Site Types	Recording
45-3-0559	Gosford	340500	6319400	Axe Grinding Groove, Shelter with Midden	Dyall
45-3-0815	Hue Hue Road	351420	6320460	Open Camp Site	Mary Dallas Consulting Archaeologists
45-3-1223	Morans Creek	351900	6329000	Open Camp Site	ASRSYS
45-3-1220	Wyee Creek	353600	6328900	Axe Grinding Groove	ASRSYS

Site ID	Site Name	Easting	Northing	Site Types	Recording
45-3-1225	Wyee Creek	353500	6329600	Axe Grinding Groove	ASRSYS
45-3-1226	Buttonderry Creek	350900	6327700	Axe Grinding Groove	ASRSYS
45-3-1227	Morans Creek	352200	6328800	Axe Grinding Groove	ASRSYS
45-3-1228	Morans Creak	351800	6328100	Shelter with Art	ASRSYS
45-3-1229	Olney	351600	6326900	Shelter with Art	ASRSYS
45-3-1230	Morans Creek	351900	6327700	Shelter with Art	ASRSYS
45-3-1231	Digary Creek	352200	6327300	Shelter with Deposit	ASRSYS
45-3-1232	Wyee Creek	352800	6329300	Shelter with Art, Shelter with Deposit	ASRSYS
45-3-1233	Olney	350200	6328100	Shelter with Art	ASRSYS
45-3-1234	Morans Creek	350600	6330900	Axe Grinding Groove	ASRSYS
45-3-1276	Wyong Creek	349771	6316077	Shelter with Art	ASRSYS
45-3-1309	Pourmalong Creek	357361	6330396	Open Camp Site	ASRSYS
45-3-1310	Pourmalong Creek	357823	6330130	Open Camp Site	ASRSYS
45-3-1311	Pasadena	356972	6326822	Open Camp Site	ASRSYS
45-3-1312	Hue Hue Road	353671	6322552	Open Camp Site	ASRSYS
45-3-1553	Wyee Bay; Ruttleys Road	362540	6330400	Midden	Attenbrow, Morris
45-3-2469	SRG	341300	6325800	Isolated Find	Heritage Solutions-Alistair Grinbergs, Knight
45-3-2470	SR4	341590	6325200	Isolated Find	Heritage Solutions-Alistair Grinbergs, Knight
45-3-2471	SR3	342390	6325440	Isolated Find	Heritage Solutions-Alistair Grinbergs, Knight
45-3-2472	WR9	344850	6325470	Isolated Find	Heritage Solutions-Alistair Grinbergs, Knight
45-3-2473	WR9	344520	6325570	Isolated Find	Heritage Solutions-Alistair Grinherge, Knight
46-3-2474	WR6	343030	6326650	Isolated Find	Heritage Solutions-Alistair Grinbergs, Knight
45-3-2475	WR5	343900	6326530	Isolated Find	Heritage Solutions-Alistair Grinbergs, Knight
45-3-2476	WR3	343670	6326340	Isolated Find	Heritage Solutions-Alistair Grinbergs, Knight
45-3-2857	SR5	341450	6325150	Open Camp Site	Heritage Solutions-Alistair Grinbergs
45-3-2868	SR2	342180	6326390	Open Camp Site	Heritage Solutions-Alistair Grinbergs
45-3-2869	SR1	342840	6325280	Open Camp Site	Heritage Solutions-Alistair Grinbergs
45-3-2870	WR7	343920	5326250	Open Camp Site	Heritage Solutions-Alistair Grinhergs, Knight
45-3-2871	WR2	343590	6326350	Open Camp Site	Heritage Solutions-Alistair Ginsbergs, Knight
45-3-2872	WR1	343410	6326390	Open Camp Site	Heritage Solutions-Alistair Grinbergs, Knight
45-3-2813	WR4	343720	6326410	Open Camp Site	Heritage Solutions-Alistair Grinbergs Knight
45-3-2880	Toepfers Road	351940	6327730	Shelter with Art	Bluff
45-3-2881	Toepfers Road	351950	6327740	Shelter with Art	Bluff
45-3-2889	Toepfers Road	351030	6327720	Shelter with Art	Bluff
45-3-2968	Strickland Airstrip	345100	6319500	Axe Grinding Groove	Welsh

Site ID	Site Name	Easting	Northing	Site Types	Recording
45-3-2970	Olney	352190	7326220	Axe Grinding Groove	Welsh
45-3-3040	Myrtle Creek/Maculata Road #3; Wyong State	345850	6322700	Axe Grinding Groove	Donovan, Welsh
45-3-3041	Myrtle Creek/Maculata Road #1;Wyong State	346600	6323180	Axe Grinding Groove	Donovan, Welsh
45-3-3042	Myrtle Creek/Maculata Road #2; Wyong State	346750	6322930	Axe Grinding Groove	Donovan, Welsh
45-3-3089	Dog Trap/Strickland SF	344890	6320130	Open Camp Site	Welsh
45-3-3169	J1	356049	6317397	None	Therin
45-3-3176	B1	359750	6324715	None	Therin
45-3-3179	B11	359563	0325450	None	Therin Archaeological Consulting
45-3-3180	B14	359150	6325075	None	Therin
45-3-3186	BR10	359612	6325462	None	Therin
45-3-3187	BR13	359375	6325050	None	Therin
45-3-3188	BR12	359427	6325219	None	Therin
45-3-3228	Wyong Creek 1 PAD	347051	6317335	None	McGardle
45-3-3259	B7	360227	6325388	None	Therin
45-3-3260	B3 BushelIs Ridge	360167	6325275	None	Therin
45-3-3261	B9 BushelIs Ridge	359601	6326537	None	Therin
45-3-3262	B4 BushelIs Ridge	360008	6325262	None	Therin
45-3-3263	B8 BushelIs Ridge	359931	6325504	None	Therin
45-3-3276	IF1 Wyong	354770	6319410	None	Silcox
45-3-3277	WS20/A	354320	6318700	None	South East Archaeology
45-3-3278	WS20/B	354400	6319010	None	South East Archaeology
45-3-3304	Halloran ISO 1	355000	6322650	None	Appleton
45-7-0080	Mannering Park	364780	6328890	Scarred Tree	ASRSYS
45-7-0121	Toukley	363300	6318200	Ochre Quarry	ASRSYS
45-7-0207	The Hole 1 TH1	361820	6329800	Open Camp Site	Navin, Officer, Saunders
45-7-0231	B2	360937	6325205	None	Therin
45-7-0245	B5 BushelIs Ridge	360800	6325350	None	Therin

Of these 66 sites, none have been recorded in the current study area. Table 5 is a breakdown of these previously recorded sites by site type. 29% of the sample is recorded without a site type description. Of those sites with site type descriptions, the largest class is open camp site (23%) followed by, Axe Grinding Groove sites (15%), Shelter sites with Art (12%), Isolated Finds (12%). Axe Grinding Groove/Shelter with Midden, Shelter with Deposit, Shelter with Art/Shelter with Deposit, Midden, Scarred Tree and Ochre Quarry are represented by one site each (1.5%).

Table 5: Sites recorded on the AIHMS Database by Site Type. Between 340000-365000E **and 6316000-6331000N: Search date: 28.9.06**

Site Type	Number of Sites in Sample	Percentage of Total Site Types
Axe Grinding Groove/Shelter with Midden	1	1.52%
Shelter with Deposit	1	1.52%
Shelter with Art/Shelter with Deposit	1	1.52%
Midden	1	1.52%
Scarred Tree	1	1.52%
Ochre Quarry	1	1.52%
Shelter with Art	8	12.12%
Isolated Find	8	12.12%
Axe Grinding Groove	10	15.15%
Open Camp Site	15	22.73%
No Site Type Listed	19	28.79%
Total	**66**	**1%**

Of the sites listed in **Table 5** of known site type (n=47), 22 or 47% are sites are likely to occur where there is substantial sandstone outcropping (Axe Grinding Grooves, Shelters etc). Surprisingly few Scarred Trees have been recorded in the vicinity (n =1); probably reflective of the early and complete logging of the region.

Figure 16 maps previously recorded sites from the AIHMS database that are located in close proximity to the current study area. As **Figure 16** clearly displays, there are several clusters of previously recorded sites that probably coincide with previous development in the area, rather than actual distributions of Indigenous sites. Of the regions where these clusters occur, two are in mountainous country west of the current study area, while one is to the east of the current study area in a region where the landscape becomes swampy and estuarine.

All these clusters of previously recorded sites are in landforms that are not found in the current study area.

It is important to re-emphasise that the distribution of recorded sites across this landscape reflects more the pattern of development, the ad-hoc nature of incidental recordings and factors of visibility, rather than providing a true picture of Aboriginal site distribution.

4.3 Predictive Model for Site Location

The current study area covers a variety of landform features.

Tooheys Road study area. This study area can be characterised as lower land around Wallarah and Spring Creeks with higher land away from the creeks, particularly in the north. Rock outcropping is not present and the majority of the study area is flat to sloping land over 200m from permanent water. The entire study area has been cleared at some point in the past and there are few trees of sufficient age to have been growing when the area was occupied or used by Indigenous peoples.

Buttonderry study area. This study area can be characterised as a north facing, sloping hill overlooking an area that would have once been a swamp environment. Rock outcropping is not present and the majority of the study area is sloping land over 200m from permanent water. The entire study area has been cleared at some point in the past and there are few trees of sufficient age to have been growing when the area was occupied or used by Indigenous peoples.

Western shaft study area. This study area can be characterised as being below the ridge line overlooking Little Jilliby Creek to the north. Rock outcropping is not present and the majority of the study area is flat to sloping land over 200m from permanent water. The entire study area has been cleared at some point in the past and there are few trees of sufficient age to have been growing when the area was occupied or used by Indigenous peoples.

Buttonderry off-set study area. This study area can be characterised as lower land fronting Buttonderry Creek. Rock outcropping is not present and the majority of the study area is flat, former swampland over 100m from permanent water. The entire study area has been cleared at some point in the past and there are few trees of sufficient age to have been growing when the area was occupied or used by Indigenous peoples.

Hue Hue Road ecological offset investigation area. This study area can be characterised as lower land around Wallarah Creek with higher land away from the creeks, particularly in the west. Rock outcropping is low and the majority of the study area is flat to sloping land and ridge lines over 200m from permanent water. The entire study area has been cleared at some point in the past and there are few trees of sufficient age to have been growing when the area was occupied or used by Indigenous peoples.

Regarding the landforms of the study area, it could be summarised that:

- There are few areas of substantial rock outcropping;
- That there are two drainage lines providing potentially permanent water: Wallarah and Spring Creeks;
- The majority of the land is over 200m away from permanent water; and,
- The majority of the land is flat to gently sloping.

An Aboriginal Resources Planning Study for the Wyong Shire Council by Dallas *et al* (1987) attempted to develop predictive models of Aboriginal settlement but was limited by a lack of data. Most of the sites recorded were rock shelters and art sites, which were located in the sandstone outcrops west of the study area and shell middens along the coast. These would be the most obvious and easily detected sites. Sites were rare in alluvial deposits in landscape contexts similar to the current study area. This was thought to reflect the level of development and disturbance of these areas, lack of visibility and lack of archaeological survey work. Their predictive model is heavily influenced by Vinnecombe's earlier work in the region and is based on dividing the region into ecological zones (coastal, riverine, escarpment etc.) and modelling Aboriginal settlement for each of these zones. As was seen from Vinnecombe's survey (Section 4.2) sites are more numerous near the coast and near permanent waterways and swamps.

On the basis of the geology, topography and soils, the study area has moderate archaeological potential.

In terms of rock shelters, there appears to be low potential of finding such sites in the area covered by the current study as substantial sandstone outcropping is rare. The only potential location is outside the Western shaft study area to the north.

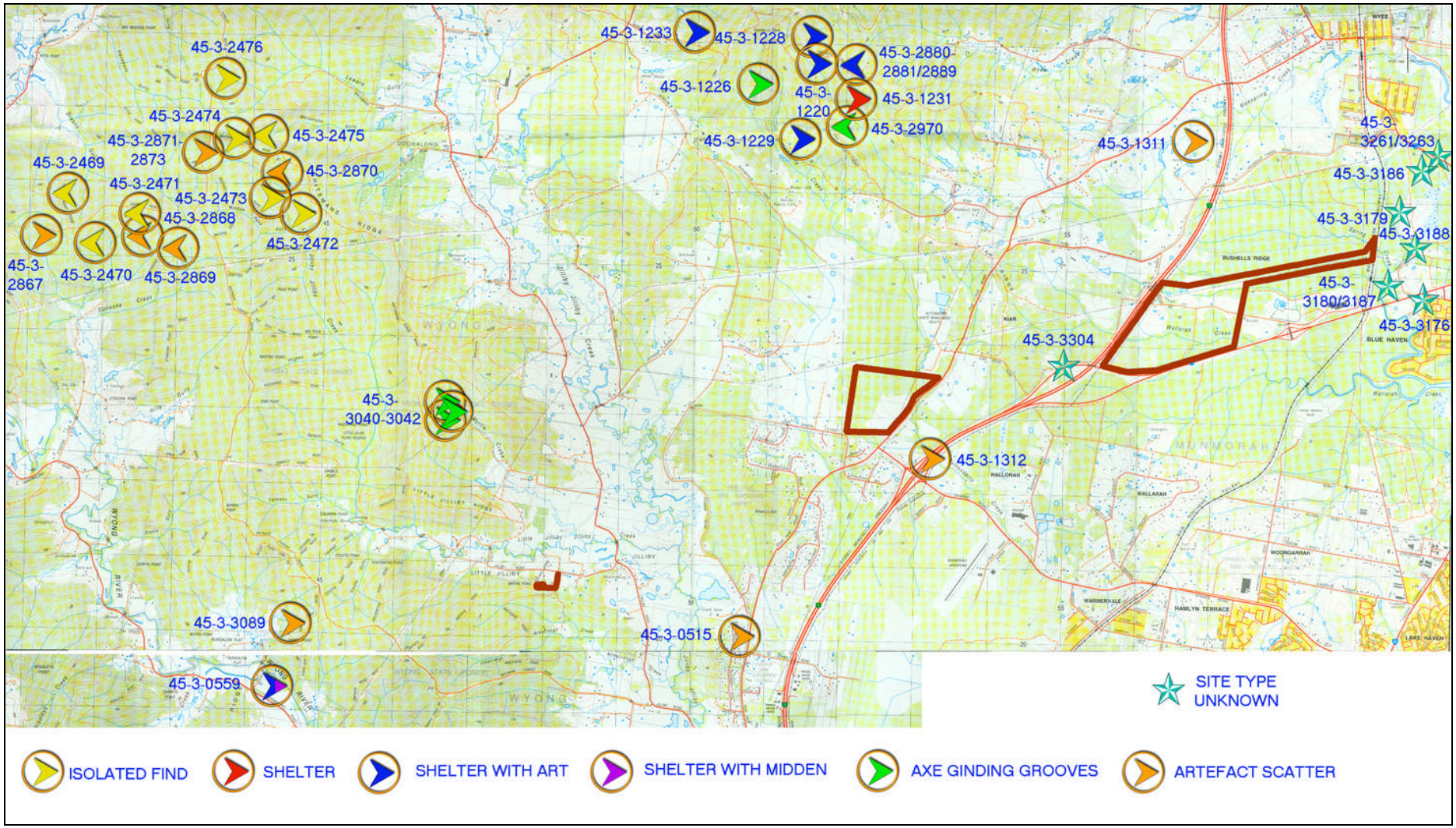
Open sandstone art sites and grinding grooves may also be evident in any landscape where rock outcropping is present. As the current study area contains little sandstone outcropping, the potential for recording such site types would also be low.

Open artefact scatters and/or Isolated Finds are likely to exist on ridge tops and associated high slopes (approximately 10m down slope from the ridge top/ slope break), as well as on low gentle slopes and terraces surrounding creek lines. On the basis of topography, the potential of recording artefact scatters would be moderate across the study area. However, as much of the study area is prone to erosion and soil movement, there is also the possibility that scatters have been locally redistributed or buried and may be therefore not as evident in the landscape. Furthermore, freshwater middens, which commonly occur along creek lines may be equally affected by both flooding, erosion and soil movement.

There also remains the possibility of subsurface archaeological deposits (including burials) in the study area. Soils in the district are described as moderately deep to deep, particularly along the valley floors of Quaternary alluvium. While erosion should be considered, there remains some potential for sub-surface archaeological deposits in valley floors and on low slopes on Quaternary alluvium. The deep alluvial soils and siliceous sands present along the valley floors are also the most likely environment to yield burials.

The possibility of recording Scarred Trees within the study area is low as most mature timber has been logged at some time in the past. It should also be noticed that there are very few Scarred Trees recorded in the general vicinity of the study area, probably for the same reason. (see **Section 4.2** – one scarred tree is recorded from 66 entries on the AHIMS Database).

Figure 16: Previously recorded sites in proximity to the study area (delineated in brown). Base maps Dooralong 1:25000 and Wyong 1:25000.



Other site types such as quarries, ceremonial places and middens can exist in any landscape although it is assessed that the probability of locating such site types in the current study area would be low. This assessment was reached as there is a lack of suitable stone outcrops for quarrying activities and although middens have been located in the region, they are predominantly coastal or associated with larger drainage lines than that afforded by Wallarah Creek. The high degree of disturbance across the study area suggests that ceremonial places would have a low probability of survival.

4.4 Survey Methodology

The entire study area was divided into those areas where there will be direct impacts (Tooheys Road study area, Buttonderry study area and Western shaft study area) and those where there will be no impacts (Buttonderry off-set study area, Hue Hue Road ecological offset investigation area).

Direct Impact Areas: The study areas within direct impact areas were traversed using pedestrian transects by three or more surveyors. The surveyors assessed all regions within the direct impact zones, as well as a buffer surrounding the impact zones. Thus in these study areas, the proposed development was the primary determiner of what land was surveyed.

Off-set Areas: The study areas outside direct impact zones were traversed using pedestrian and vehicle transects by a survey team. The surveyors assessed all regions within the off-set zones where the proximity to water and/or suitable landform appeared to suggest that heritage items might be retained.

4.5 Results

4.5.1 Direct impact areas

4.5.1a Tooheys Road study area

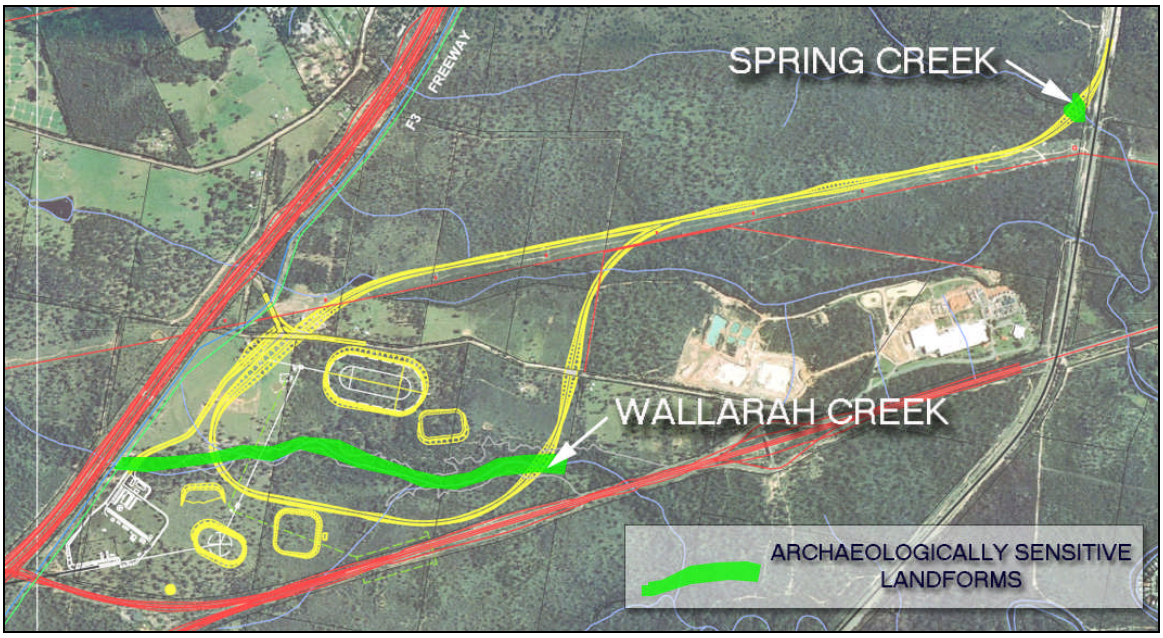
The current survey did not record any Indigenous sites or heritage items within the Tooheys Road study area.

Although no sites were recorded, it was assessed that two areas within the Tooheys Road study area had archaeologically sensitive landforms. **Figure 17** shows the two areas.

The largest area is 75m north and south from the centre line of Wallarah Creek. This archaeologically sensitive area stretches along the whole length of Wallarah Creek within the Tooheys Road study area. This area of archaeological sensitivity is approximately 1.4km long (east–west) which gives it a total area of around 210,000m^2.

The second area of archaeological sensitivity is for 50m on both banks of Spring Creek. This area of archaeological sensitivity is approximately 200m long (northwest–southeast) which gives it a total area of around 20,000m^2.

Figure 17: Archaeologically sensitive landforms in the Tooheys Road study area.
Base map supplied by WACJV.



These two locations were assessed as archaeologically sensitive due to their proximity to permanent water and the nature of their landforms. Although erosion and other disturbances have lessened, in places, the potential for these areas to yield intact subsurface deposits, there remains large areas of land that are suitable for the retention of intact subsurface deposits, especially along Wallarah Creek. It is noteworthy that the portion of Spring Creek to be intersected by the rail loop is extensively eroded and damaged by vehicle 4WD and motorbike use.

These areas of archaeological sensitivity are recommended for the following reasons:

- ERM 2001b assessed that the area along the north and south bank of Wallarah Creek was archaeologically sensitive,
- A site complex was recorded by the present survey on the bank of Wallarah Creek a few kilometres west of the Tooheys Road study area,
- The landform in the Tooheys Road study area is similar to the landform where the present survey recorded a site complex,
- The landform and soil depth in the Tooheys Road study area suggest that intact subsurface deposits could be present.
- There was low ground surface visibility at the time of survey that hindered the detection of sites.

These areas are being termed areas of archaeological sensitivity rather than Potential Archaeological Deposits (PADs) as there is nothing distinctive in the landscape that would aid the determination of a particular PAD to a discreet area. The areas are rather seen as worthy of further investigation that will assess the nature and extent of any subsurface deposits that may be present.

Within this zone of archaeological sensitivity are several locations where there will be direct impact from the proposed works. To illustrate the nature of each of these locations are the following plates:

- Rail Loop;
    - East Arm (Plate 30)
    - West Arm (Plates 31 and 32)
- Conveyor (Plate 33);
- Access road to Pit Top Facility (Plate 34).

4.5.1b Buttonderry study area

No Indigenous sites were located within the area of direct impact at the Buttonderry study area. It is possible that factors of visibility influenced this outcome, however the general sloping nature of the majority of the landform and the agricultural disturbance to the flatter lands closer to Buttonderry Creek combine to make the detection of *in situ* Indigenous sites unlikely. These factors will be discussed in greater detail in the Discussion (**Section 4.6**).

It was deemed that no specific zones of archaeological sensitivity could be delineated within this area.

4.5.1c Western shaft study area

No Indigenous sites were recorded within the area of the direct impact at the Western Shaft study area. The study area here is small, fairly extensively disturbed and provided limited visibility, hence making site presence and detection unlikely. This will be discussed further in **Section 4.6**.

Immediately outside the proposed impact area to the north is a steep, sandstone escarpment that was also assessed during the fieldwork component. Although no rock shelter sites were recorded in the local vicinity of the proposed Western shaft study area, potential was noted for the presence of caves within the escarpment (**Plates 21-23**).

4.5.2 Off-set areas

4.5.2a Buttonderry off-set study area

No Indigenous sites were located within the Buttonderry off-set study area. A scar on a mature spotted gum (*C. maculata)* was documented (**Plate 26**) in this area, however, the scar was assessed as being of natural, not anthropomorphic origin. As noted above (**Section 4.5.1b**), no zones of archaeological sensitivity were delineated in this area, an issue that will be discussed in greater detail below.

4.5.2a Hue Hue Road ecological offset investigation area

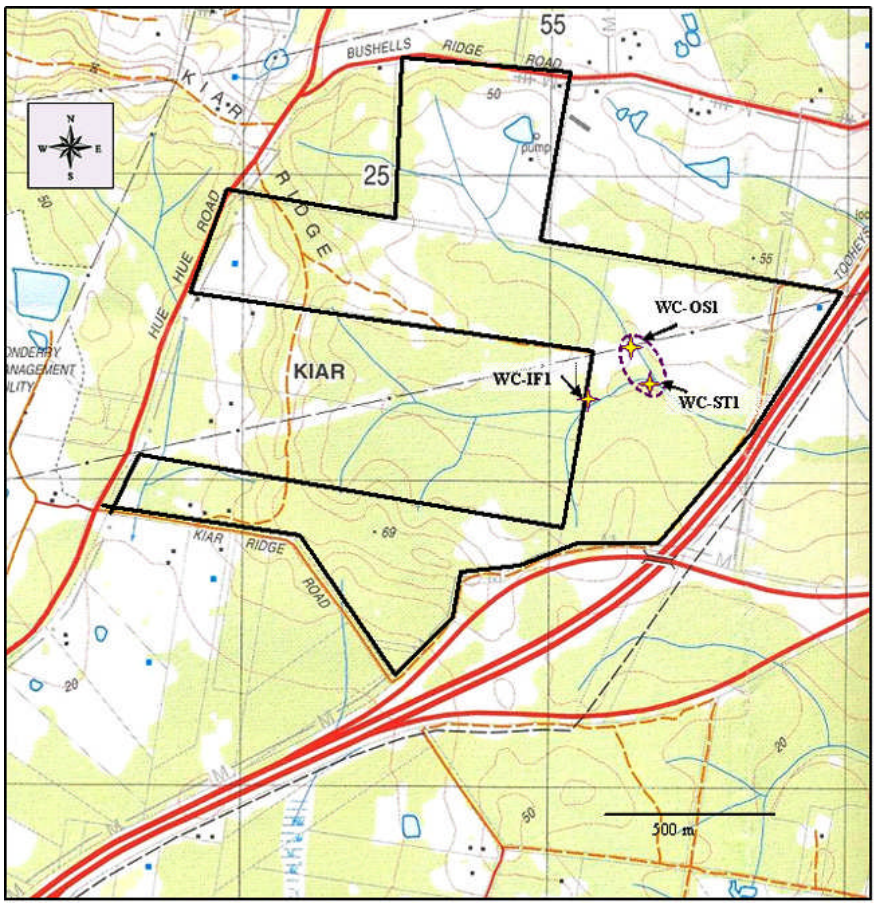
Three Indigenous sites, an open artefact scatter (WC-OS1), a scarred tree (WC-ST1) and an isolated find (WC-IF1) were recorded along Wallarah Creek or its tributaries in the Hue Hue Road ecological investigation area. The location of these sites is shown on Figure 18 and details are presented below.

WC-OS1 Dooralong 1: 25K GDA 355307-355237E 6324431-6324471 N

This open artefact scatter site is situated on the banks of Wallarah Creek at an elevation of c. 20m AHD. The site is located within an alluvial landform, at the base of long, low gradient slopes stretching back from the drainage line (**Plate 35**). The dotted line seen on Figure 18 is indicative of the extent of stone artefact material present on the surface, but it is noteworthy that in general visibility was low and in areas of better visibility, surface erosion was active, potentially removing evidence from the skeletal soils that characterise the lower slopes. The site is considered to extend at minimum c. 150m along the bank of Wallarah Creek on the west (**Plates 35 and 36**) and extends to the east bank, at minimum beneath the electricity transmission line, although it is likely to extend further.

The artefacts were recorded in several exposures along a sandy vehicle track, illustrated on a site sketch (**Appendix 5**), and shown in **Plate 37**. The track is better established in the vicinity of the transmission line, allowing significantly better exposures in this location, coinciding with higher surface artefact visibility.

Figure 18: Map showing the location of the Hue Hue Road ecological investigation area Indigenous sites (Source: Dooralong 9131-1S 1:25K).



Artefacts included flakes and cores of a creamy, fine grained material, possibly an indurated mudstone / chert. Also present were artefacts of good quality silcrete (**Table 6, Plate 38**).

It is considered that the nature of the landform combined with the lack of visibility, makes it very likely that artefact material will be found beyond the locations at which surface manifestations exist. The confluence of a tributary into Wallarah Creek at this point is by no means an accident, as this particular environmental setting is a proven popular location for Aboriginal occupation during prehistory. Given its proximity to other sites and the suitable landform, there is potential for sub-surface deposits in this area, although their condition may be questionable due to the affects of erosion.

Table 6: Details of artefacts recorded at site WC-OS1

Artefact dimensions	Raw material	Comment
Exposure 1 - west side of creek.		
17 x 4.5 x 2.1mm	Cream (indurated mudstone, chert?)	Complete flake, feather termination and 3 negative scars on dorsal surface
7.9 x 3.5 x 1.7mm	Reddish green chert	Broken flake
19.79 x 10.4 x 23mm	Cream (indurated mudstone, chert?)	Core, bipolar
Exposure 2 – east side of creek		
41 x 29.2 x 12.6mm	Yellow-red silcrete	Broken flake – transverse snap, distal portion missing. Evidence of core rotation and platform preparation (crushed)
16.8 x 12 x 2.7mm	Silcrete	Broken flake, proximal end missing, no cortex
30.7 x 20.2 x 8.4mm	Cream (indurated mudstone, chert?)	Broken flake, 2 negative flake scars, small platform
Southern exposure, west side of creek (adjacent to confluence)		
35.7 x 28.4 x 7mm	Cream siltstone	Flake (-ve flake scars),
8.2 x 4 x 0.2mm	As above	Broken flake.

WC-ST1 *Dooralong 1: 25K* *GDA* *355284 E* *6324324 N*

This scarred tree is a Blackbutt (*E. pilularis*) located on the southern bank of a tributary flowing into Wallarah Creek and within c. 50 m of this confluence, at an elevation of AHD c. 25m (**Figure 18**). The tree is situated on a sandy, creek bank landform on DP 258692.

The scarred tree is alive, c. 25m in height, and 2.73m in circumference. The elongated, south-southeast facing scar has dimensions of 104 x 13cm, with a depth of c. 15cm. The original dimensions, based on regrowth, may have been c.132 x 43cm (**Plates 37 and 39**).

The scar on this tree is assessed as being of **possible** Indigenous cultural origin, but it must be noted that the tree is adjacent to a vehicle track and could be the result of damage from a vehicle, or from previous natural processes that have affected the tree. Morphological characteristics of the scar, however, such as its alignment with the trunk, its elongate nature and more specifically the tapered appearance of both ends, lend themselves to an interpretation of the scar as anthropomorphic in origin. Further support for this contention comes from the presence of artefacts in direct association with the scarred tree (those noted in **Table 6** as being from the southern exposure (**Appendix 5**) as there is positive evidence for the Indigenous use of the area in prehistory.

WC-IF1 *Dooralong 1: 25K* *GDA* *355124 E 6324266 N*

Isolated find WC-IF1 is located on the northern bank of a tributary into Wallarah Creek (**Figure 18**). The site was recorded on a dirt track that is actively eroding. Surrounding areas are unlikely to have been ploughed but may have been grazed, and have been selectively cleared. Visibility was good on the track, but poor off it (**Plate 40**).

This is the same tributary that provides evidence of occupation at its confluence with Wallarah Creek, several hundred metres to the east (WC-IF1 and the southern portion of WC-OS1). Although this isolated find has been presented as a separate site from WC-OS1, it is in essence considered to be part of the same site complex. It is likely that visibility and erosion have influenced the appearance of the archaeological record in this area, although it is also plausible that temporal variation may also be a factor.

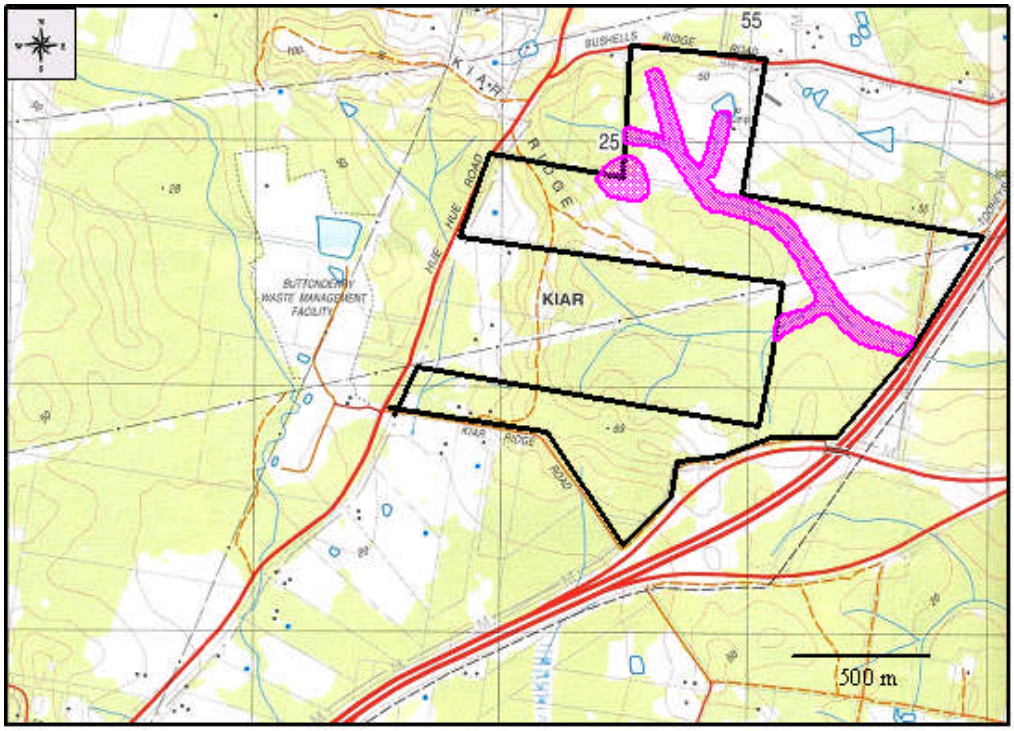
The artefact comprising WC-IF1 is a cream flake possibly of indurated mudstone (**Table 7**). Given its proximity to other sites and suitable landform, it is likely to have at some point been associated with other artefacts, and there is potential for sub-surface deposits in this area, although their condition may be questionable due to the affects of erosion.

Table 7: Artefact from site WC-IF1.

Artefact dimensions	Raw material	Comment
14.5 x 12.9 x 4.1	Cream (indurated mudstone, chert?)	Flake (complete) with hinge termination, percussion point present.

In keeping with the results of the assessment of the Tooheys Road study area, and based on the results of survey within the Hue Hue Road ecological offset investigation area, a zone of archaeological sensitivity can be delineated along Wallarah Creek and its more major tributaries, see **Figure 19**.

Figure 19: Map showing archaeologically sensitive landforms in the Hue Hue Road ecological offset investigation area.



4.6 Discussion

4.6.1 Indigenous Site Distribution

The predictive model set out in **Section 4.3** established that certain site types would probably be absent from the current study area. These included shelter sites and axe grinding grooves as there were no areas of substantial rock outcrops in the study area, and site types such as scarred trees were deemed to be rare as so few are recorded in the vicinity due to the extensive nature of land clearing. Other site types such as artefact scatters and isolated finds were assessed as being able to potentially exist within the study area, as were site types such as burials. Site types such as quarries, ceremonial places and middens may also exist within the landforms of the study area, but the likelihood of them being present was assessed as low.

Further, the predictive model suggested that sites would be recorded close to permanent water on flat to gently sloping sandy soil.

The sites recorded by the current survey therefore perfectly match the predictive model. These comprise an open artefact scatter (WC-OS1 and IF1) found near permanent water on flat to gently sloping, sandy soils. The associated possible scarred tree (WC-ST1) in an area that has undergone less clearing than most of the assessed areas is also not unexpected. The lack of recordings of any other site types across the study area also supports the predictive model.

Given the high levels of disturbance to the ground surface throughout the study area (either from clearing and ploughing/grazing, or from erosion by water or human agency), it is not surprising that more sites were not recorded. Landscapes such as that around Wallarah Creek would not have supported large, permanent populations and so the sites remaining tend to be of transit camps, rather than large base camps. Transit camps have lower densities of lithic discard and their more ephemeral nature can be removed from the landscape altogether if disturbed by ground surface alteration and/or erosion.

Ground surface visibility was also low (around 8%) and this would have also hampered the detection of sites across the study area.

Although recorded sites were few, the landform along both the north and south bank of Wallarah Creek within the Tooheys Road study area was assessed as being archaeologically sensitive. No relics were located in this 150m wide band along the creek, even where sheet erosion gave reasonable ground surface exposure. While not assessed as a Potential Archaeological Deposit (PAD, because this zone of sensitivity has no easily discernible boundaries, this archaeologically sensitive zone has been declared as the one landform within the study area that requires further investigation before full management recommendations can be advanced. Options for this management of this area will be presented in **Sections 4.8 and 4.9**.

The landform along Spring Creek within the Tooheys Road study area was also assessed as being archaeologically sensitive. No relics were located in this 100m wide band along the creek, even where sheet and vehicle erosion gave reasonable ground surface exposure. Again this zone is not assessed as a Potential Archaeological Deposit (PAD), and it is

noteworthy that at the location where the Rail Loop is to intersect this zone, there has been considerable disturbance and archaeological deposits, if present at all, are considered unlikely to be intact. Options for the management of this area will be presented in **Sections 4.8 and 4.9**.

4.6.2 Indigenous Site Assessment

The appropriate management of cultural heritage items is usually determined on the basis of their assessed significance as well as the likely impacts of any proposed developments. Scientific, cultural and public significance are currently identified as baseline elements of this assessment, and it is through the combination of these elements that the overall cultural heritage values of a site, place or area are resolved.

Cultural significance

This area of assessment concerns the importance of a site or features to the relevant cultural group - in this case the Aboriginal community. Aspects of cultural significance include assessment of sites, items, and landscapes that are traditionally significant or that have contemporary importance to the Aboriginal community. This importance involves both traditional links with specific areas as well as an overall concern by Aboriginal people for their sites generally and the continued protection of these. This type of significance may not be in accord with interpretations made by the archaeologist - a site may have low scientific significance but high Aboriginal significance (or *vice versa*).

The significance of the archaeological site located within the study area was addressed during an on-site meeting attended by community representatives.

Scientific significance

Assessing a site in this context involves placing it into a broader regional framework, as well as assessing the site's individual merits in view of current archaeological discourse. This type of significance relates to the ability of a site to answer current research questions and is also based on a site's condition (integrity), content and representativeness.

The overriding aim of cultural heritage management is to preserve a representative sample of the archaeological resource. This will ensure that future research within the discipline can be based on a valid sample of the past. Establishing whether or not a site can contribute to current research also involves defining 'research potential' and 'representativeness'. Questions regularly asked when determining significance are: can this site contribute information that no other site can? Is this site representative of other sites in the region?

Open Artefact Scatters and Scarred Trees (being the only site types identified during the current study) are assessed on the basis of the known local context of this site type (i.e. are there many, some or no such features known locally). In general terms, artefact scatters have the ability to either add to our knowledge about an area’s Indigenous history, comment on the technological developments of a people and to act as a marker for further intact subsurface deposits.). Scarred Trees do not tend to increase our understanding of

the area's prehistory, except in situations where past land-use practices have resulted in the total clearance of trees. In these circumstances, scarred trees become more significant due to the overall degradation of this resource (Jo McDonald CHM 1998: 50).

Public significance

Sites that have public significance do so because they can educate people about the past. By reducing ignorance about why sites are important to the Aboriginal and scientific community, important sites can be protected from ignorant or inadvertent destruction. Educating the public to understand the need for site preservation should increase the likelihood of maintaining an archaeological resource into the future. For a site to have high public significance it should contain easily identifiable and interpretable elements, and be relatively easily accessed.

Although artefact scatters could be appreciated due to their obvious visual manifestation, their general significance is reduced by their small size and unremarkable characteristics (making lithic artefacts difficult to distinguish from natural rock). Unless an artefact scatter is in some way outstanding (either in terms of spatial size or artefact density) this site type is usually assessed as having low public significance. Scarred trees, on the other hand, are easily appreciated due to their obvious visual manifestation, but unless a scarred tree is in some way outstanding (i.e. located in an area where such site types are rare, a canoe or toe hold tree or an unusual species to carry scarring), and depending on the condition of the tree, this site type is usually assessed as having moderate-low public significance.

4.6.3 Assessed significance of the recorded Indigenous sites

4.6.3a Cultural significance

Conversations regarding the significance of the artefact scatter sites WC-OS1 and WC-IF1 were held with the community representatives on site and were assessed as being of **high cultural significance.** The cultural significance of the scarred tree WC-ST1 is more challenging for the community due to it being deemed a "possible" scarred tree, although this site type is general as having **moderate-high cultural significance.**

4.6.3b Scientific significance

The scientific assessment of artefact scatter sites, as described above, revolves around the known local context of this site type (i.e. are there many, some or no such features known locally). Looking within a 25 x 15km zone surrounding the study area, there are 15 artefact scatters (or 22.7% of total recorded sites) recorded on the DECCW AHIMS database. This makes artefact scatters the most common site type in the vicinity of the study area.

Sites WC-OS1 and IF1 are both assessed as comprising stone artefacts that are of Aboriginal origin. One is located on the flat and gently sloping banks of Wallarah Creek, while the other on the nearby banks of a tributary flowing into Wallarah Creek. The raw material, artefact density, site size and artefact type are all typical of previously recorded sites in the vicinity. The likelihood of there being associated, intact sub-surface deposits is

considered moderate-low. As such the artefact scatter is assessed as having **low-moderate scientific significance**.

Scarred tree WC-ST1 is assessed as being of probable Aboriginal origin. It is located on the gently sloping bank of the Wallarah Creek and the likelihood of there being associated, intact sub-surface deposits is considered moderate, as this tree is in association with recorded artefacts. Although scarred trees are a relatively rare site type in the region (see **Section 4.1.2**), there is only a probable chance that the scar was created by human agency, as such this site is assessed as being of **low-moderate scientific significance.**

4.6.3c Public significance

Artefact scatter sites WC-OS1 and IF1 are assessed as being of **low public significance** as the sites are hard to locate, on private land and comprise artefacts that would challenging for the lay person to identify.

Scarred tree WC-ST1 is also assessed as being of **low public significance** as the tree is on private land, the scar itself is not of a rare or unusual type and is in fact only identified as a possible scarred tree.

4.6.4 Likely impacts of the proposed W2CP to recorded sites / sensitive areas

The overall nature of the proposed works has been described in detail in **Section 1.3** of this report, while the project scope (**Sections 1.1.2 and 1.2**) outlined the focus and structure of the current assessment. In terms of impacts, the assessment divided the study area into locations of direct impact and potential conservation (off-set) areas. While the results of the assessment in the conservation areas is important for the overall interpretation of the landscape in terms of Aboriginal site distribution and as a cross-check for the predictive model, no impacts are proposed for these areas and an indication of heritage values of these areas is sufficient information within the current project parameters. With reference to the direct impact areas, however, it is necessary to look closely at the recorded sites and sensitive areas delineated as a result of the current study and how these are directly affected by the proposed works.

Although no sites were recorded in the Tooheys Road study area, two primary zones of archaeological sensitivity were delineated (**Figure 17**). There are several points at which the proposed impacts of the project (**Figures 2 and 6-8**) intersect with areas assessed as archaeologically sensitive. Management options for these areas will be presented in **Section 4.9**.

As no sites or areas of archaeological sensitivity were identified in either the Buttonderry or Western shaft study areas, there will be no direct impacts to Indigenous heritage and consequently there are no constraints to the proposed impacts in the assessed locations on the grounds of cultural heritage. If the location and extent of impacts alters significantly, some limited re-examination of the area may be required

4.7 Relevant Legislation

4.7.1 Introduction

Base line principles for the conservation of heritage places and relics can be found in the Burra Charter[2], which recognizes that there are places worth keeping because they can enrich our lives on many levels. The significance of such places may be embodied in fabric (physical material), environmental setting, contents, use or its meaning to people, and should be assessed through methodical data collection. Since its adoption in 1979, The Burra Charter has become the standard of best practice in the conservation of heritage places in Australia, and heritage organisations and local government authorities have incorporated the inherent principles and logic into guidelines and other conservation planning documents. The Burra Charter generally advocates a cautious approach to changing places of heritage significance. This conservative notion embodies the basic premise behind legislation designed to protect our heritage, which operates primarily at a State level.

4.7.2 Commonwealth Legislation

Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act)

The Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) provides a national framework for the protection of matters of national environmental significance and the conservation of Australia's biodiversity. Under the EPBC Act, "environment" includes

- ecosystems and their constituent parts, including people and communities;
- natural and physical resources;
- the qualities and characteristics of locations, places and areas;
- heritage values of places; and
- the social, economic and cultural aspects of a thing mentioned in paragraph (a), (b) or (c).

Recently, Australia has changed the legislation that protects its national heritage places. Three new laws came into effect on January 2004, which provide changes that offer greater legal protection under the existing Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and repeal the Australian Heritage Commission Act 1975 .

[2] The Burra Charter defines the basic principles and procedures to be followed in the conservation of all kinds of places such as monuments, buildings, Aboriginal sites, roads, archaeological sites, whole districts or even regions. It was first adopted in 1979, based on the Australian ICOMOS (International Council on Monuments and Sites) review (1977) of the 1966 Venice Charter (Australian ICOMOS Inc. 1998).

The three new Acts are;

The Environment and Heritage Legislation Amendment Act (no.1) 2003

This Act amended the EPBC Act to include 'national heritage' and protect listed places to the fullest extent under the Australian Constitution. Under the new system, National Heritage joins six other important 'matters of national environmental significance' (NES matters) already protected by the EPBC Act. The Environment and Heritage Legislation Amendment Act (no.1) 2003 also establishes the National Heritage List which records places with outstanding natural and cultural heritage values that contribute to Australia's National identity; and the

Commonwealth Heritage List which comprises the natural, Aboriginal and historic places owned or managed by the Commonwealth.

The Australian Heritage Council Act 2003

This Act establishes a new independent heritage advisory body to the Minister for the Environment and Heritage, the Australian Heritage Council (replacing the Australian Heritage Commission established under the Australian Heritage Commission Act 1975) and retains the Register of the National Estate (RNE). The RNE was also established under the Australian Heritage Commission Act 1975 which defined it as a register of those places being components of the natural environment of Australia, or the cultural environment of Australia, that have aesthetic, historic, scientific or social significance or other special value for future generations, as well as for the present community. Listings on the RNE are not legally binding but provide widely acknowledged recognition of the cultural value of the listed place or item.

Listing of an item or place on the RNE has certain implications for how Commonwealth agencies may deal with an item.

The Australian Heritage Council (Consequential and Transitional Provisions) Act 2003

This Act repeals the Australian Heritage Commission Act, amends various Acts as a consequence of this repeal and allows for the transition period whilst the National and Commonwealth Heritage Lists are finalised. During this transition period the Register of the National Estate will act in conjunction with the formative National and Commonwealth lists to provide full coverage for items already identified as having cultural heritage significance.

Approval under the EPBC Act is required if an action is proposed that will have, or is likely to have, a significant impact on the National Heritage values of a National Heritage place and/or any other NES matter. This action must be referred to the Australian Government Minister for the Environment and Heritage. The Minister will decide whether an action will, or is likely to, have a significant impact on a matter of national environmental significance.

The heritage provisions of the EPBC Act allow for a transition period whilst the National and Commonwealth Heritage Lists are finalised. During this transition period the Register

of the National Estate acts in conjunction with the formative National and Commonwealth lists to provide full coverage for items already identified as having cultural heritage significance.

Application to the study area – Commonwealth Listings

- No items within the study area are listed on the Register of the National Estate, the National Heritage List or the Commonwealth Heritage List

Aboriginal and Torres Strait Islander Heritage Protection Amendment Act 1987

The Aboriginal and Torres Strait Islander Heritage Protection Amendment Act of 1987 is a Federal act administered by the Aboriginal and Torres Strait Islander Commission and provides protection for Aboriginal heritage in circumstances where such protection is not available at a state level. This Act comes under Commonwealth jurisdiction which means that it can override state and territory provisions.

4.7.3 State Legislation

Environmental Planning and Assessment Act 2005

Amendments were made to the *Environmental Planning and Assessment Act 1979* by the Planning Reform Bill of 2005. Essentially this provides a new method for project assessment that places major infrastructure projects, or those deemed to be of state significance as defined in Schedule 1 of the *State Environmental Planning Policy (Major Projects) 2005*, under Part 3A of the Act.

Under Section 75U of *The Environmental Planning and Assessment Act 2005* (EP&A Act), if the current project is granted project approval under Part 3A of the EP&A Act, the following approvals, which may have otherwise been relevant, will not be required to carry out the Project:

- *Heritage Act 1977*: Disturbance to an item listed on the State Heritage Register or Interim Heritage Order – Excavation Permit; and

- *National Parks and Wildlife Act 1974*: A section 87 preliminary research / collection permit; or section 90 consent to destroy relics.

Although the provisions of other relevant Acts, including the *National Parkes and Wildlife Act 1974*, do not apply for developments assessed under Part 3A of the EP&A Act, their intent has been considered and remains part of the assessment requirements, with independent expert panels being utilised to assess the veracity of environmental assessment reports. Under Part 3A, the Section 87 and 90 permits that are required for impacts to Indigenous heritage under the NP&W Act, are not required for projects assessed under Part 3A. Instead, a Statement of Commitments in terms of heritage is presented within 3A applications, which then form the basis for the Minister's approval which will usually contain a series of Conditions, including a requirement for the preparation of an Indigenous Heritage Management Sub Plan as part of the Construction Environment Management Plan for the Project. These conditions include similar checks

and balances as required by the NP&W Act, such as test excavation programmes or site destruction mitigation development etc. as is currently required under the permitting process, however, without the need to obtain permits.

Application to the study area

As the current W2CP is a mining project and falls into the criteria defined in Schedule 1 *State Environmental Planning Policy (Major Projects) 2005*, it will be assessed under Part 3A of the EP&A Act and will be determined by the Minster for Planning.

- With respect of Indigenous sites / relics: There are sixty six (66) Aboriginal objects and places registered with the NSW (DECCW) AHIMS within a 25 x 15km radius of the study area. None are within the study area and no sites recorded as a result of this assessment will be impacted. Impacts to areas of archaeological sensitivity will however occur and management in respect of these impacts must be devised for the proposed works, to be presented in **Section 4.8**.

- With respect of non-Indigenous sites/ places: The Wyong Local Environmental Plan 1991 lists no items that are located within the current study area.

4.8 Management Options

Appropriate management of cultural heritage items is primarily determined on the basis of their assessed significance, the likely impacts of the proposed development and the application of the relevant legislation. **Sections 4.6.3 and 4.6.4** described respectively the significance/potential of the recorded sites / sensitive areas and the likely impacts of the proposed works. The following management options are general principles, in terms of best practice and desired outcomes, rather than mitigative measures against individual site disturbance.

As formalised applications for permits, as previously required under the NP&W Act, are no longer required under the new Part 3A assessment process (as presented in **Section 4.7.3**), this section consolidates the appropriate responsibilities and actions that the Proponent should undertake in terms of assessed impacts to the identified heritage resource within the assessed study areas, specifically at the Tooheys Road study area.

1. Avoid impact by altering the development proposal, in this case by redesigning the pit top facilities and infrastructure at Tooheys Road, to avoid crossing Wallarah Creek and to also prevent further agricultural activity within the immediate vicinity;

2. If impact is unavoidable then further investigation may required (previously under a Section 87 permit under the NP&W Act) or site destruction from the construction of project infrastructure may occur (previously under a Section 90 permit under the NP&W Act) and will need to be documented in a Statement of Commitments for the project. These then form the basis of the Conditions that the Minister for Planning may place within the Project Approval for the project, which often take the form of a requirement for a Aboriginal Heritage Management Plan (AHMP).

> The way sites are managed within the Statement of Commitments approval will depend on many factors including the site's assessed significance. Sites of moderate to high significance and/or potential may require either test or salvage excavation, or more detailed recording, as part of approval conditions. Sites of low significance may be impacted with no further archaeological assessment being required, or with an approved monitoring programme. Once granted, the local Aboriginal communities may wish to collect or relocate artefacts, whether temporarily or permanently, if necessary[3].

With direct reference to the proposed works and the assessed archaeologically sensitive zone along Wallarah Creek in the Tooheys Road study area:

1. The possible presence of Indigenous sites requires further investigation in face of the proposed impacts to this creek line. This investigation should take the form of a purpose designed test excavation programme focused on locations that will be directly impacted by infrastructure. This programme of subsurface testing will allow determination of the presence of Indigenous site material and if present, will enable assessment of the nature, extent and integrity of the subsurface deposits. Such information will subsequently allow a determination of the significance of the zone and may feed into the design of further management recommendations.

2. Results of the test excavation programme over the assessed archaeologically sensitive zone will reveal one of the following:

    a. That archaeological material is not present within the impact areas at the Tooheys Road study area, and hence no further archaeological assessment will be required;

    b. If archaeological material is detected in subsurface deposits, an assessment will be made of the extent, nature and integrity of the deposits. Once this information is known, there are several possibilities:

        i. Some assessed areas may provide little archaeological material or disturbed deposits and no further archaeological investigation may be required prior to their destruction;

        ii. Some areas may provide rare material or good site integrity and may warrant salvage excavation in the face of impending destruction;

        iii. Some locations may provide archaeological evidence that is rare or of high cultural and scientific significance such that an attempt may be made to conserve the area through limited redesign of the proposed works.

[3] The fate of all artefacts remains within the statutory control of the NSW DEC. A care and control permit may be issued to local Aboriginal groups or, with Aboriginal community consent, to other parties, for educational or display purposes.

3. With direct reference to the proposed works and the assessed archaeologically sensitive zone along Spring Creek in the Tooheys Road study area:

    i. As any 'A' deposits of this zone within the impact footprint are unlikely to possess intact deposits, it is considered most appropriate for the Aboriginal community to monitor ground surface disturbing impacts of the construction in this area and collect / salvage artefacts, if indeed any are present.

4.9 Proposed management of Indigenous heritage within the study areas

4.9.1 Direct impact areas

4.9.1a Tooheys Road study area

The preferred management recommendation for the Tooheys Road study area is to conduct test excavations at a number of locations along Wallarah Creek. These locations are either in areas that will be directly impacted by the proposed works or nearby. The aims of the test excavation programme are to determine the presence, nature, extent and integrity of subsurface deposits such that appropriate management recommendations may be formulated.

The test excavation programme is recommended for the following reasons:

- Both ERM 2001b and the current report have assessed the area along the north and south bank of Wallarah Creek as being archaeologically sensitive;
- The level of the proposed impacts will be high on any potential heritage item;
- A site complex (WC IF1, WC OS1, WC ST1) was recorded by during the current assessment on the banks of Wallarah Creek a few kilometres west of the Tooheys Road study area (within the Hue Hue Road ecological offset investigation area), confirming the sensitivity of this landform;
- The landform and soil depth in the Tooheys Road study area suggest that intact subsurface deposits could be present;
- There was low ground surface visibility at the time of survey that hindered the detection of sites.

The test excavation programme will allow the appropriate characterisation of any site material in order to develop full management recommendations for the heritage values in the areas to be impacted.

It was determined that a test excavation programme was not recommended for the other area of archaeological sensitivity at Spring Creek. This was due to the high degree of disturbance the north-eastern bank of the creek has suffered, where the landform was most conducive to retaining intact subsurface deposits. This disturbance is either from the previous construction of the rail line and bridge, or from the numerous vehicle tracks in the area. In particular, the track along the side of the north-eastern bank is heavily rutted from bogged vehicles. The south-western bank of Spring Creek is heavily eroded, in places quite steep and also criss-crossed with vehicle tracks, mostly from motocross bikes.

As such it was assessed that there would be few places on the south-western bank that would have soil depth to preserve intact subsurface deposits.

Another area that was noticed during the survey, but has not been included in the test excavation programme, was the junction between Wallarah Creek and the un-named tributary from the south. Creek junctions such as this were often the focus of Indigenous activity and it is common to locate sites in such landforms. However, as this creek junction is outside any proposed impact, it was assessed that this portion of the archaeologically sensitive area should not be part of the test programme. As conservation is always the desired management outcome, we would avoid excavation while this creek junction remains outside any areas of proposed impact[4].

Figure 20: Proposed Impacts in the vicinity of Wallarah Creek. Base map supplied by WACJV.

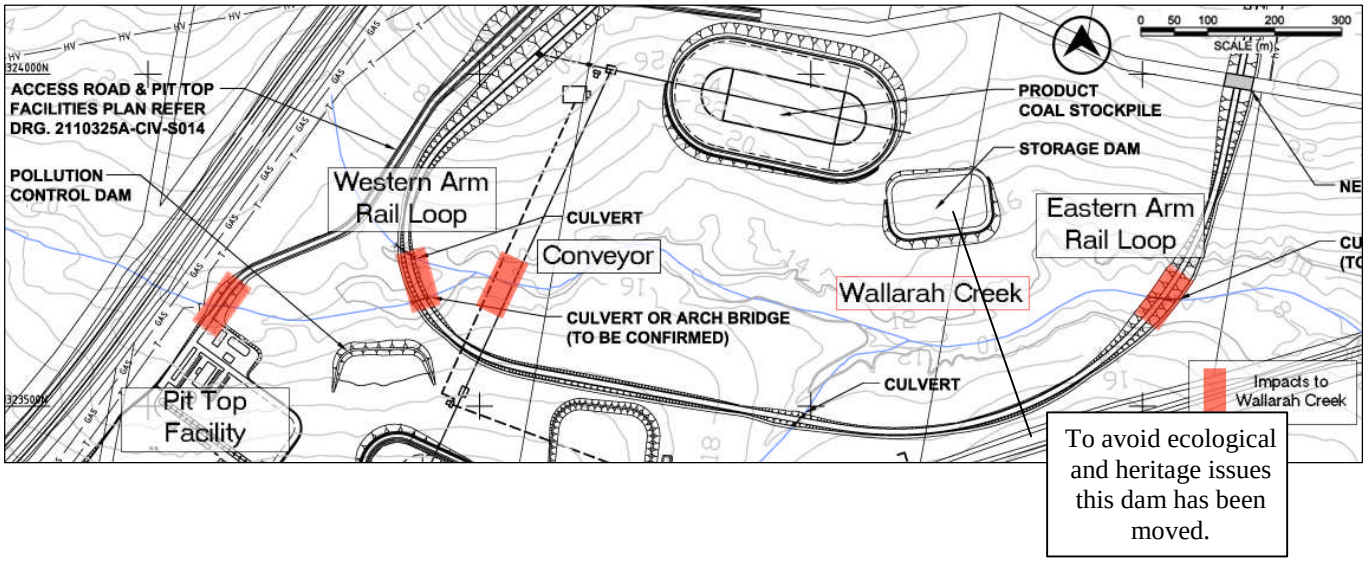
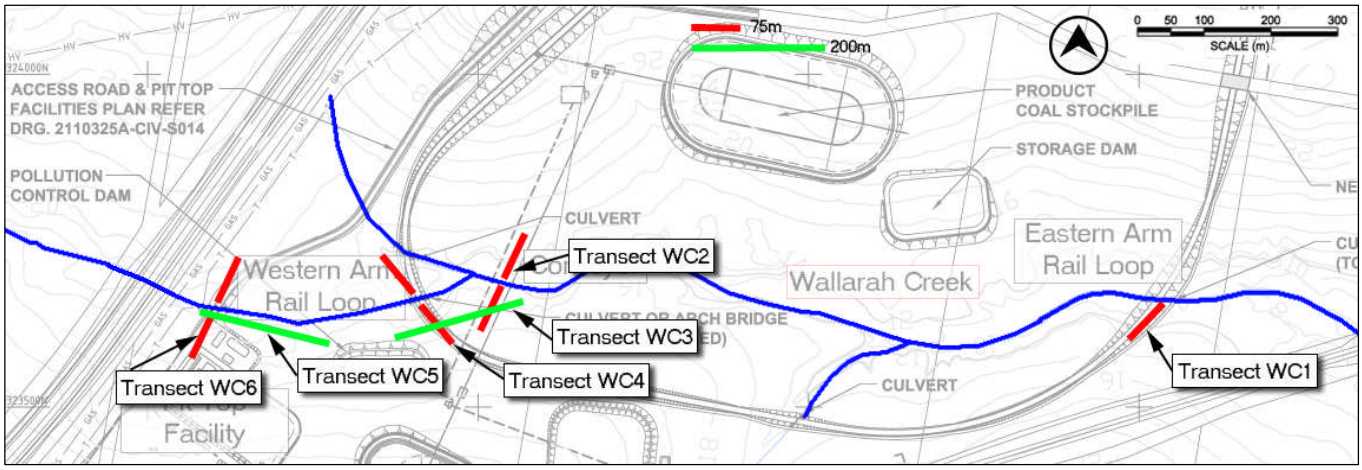


Figure 21: Proposed Transect Lines in the vicinity of Wallarah Creek. Base map supplied by WACJV.



[4] It is also noteworthy that this area contains an endangered ecological community that we should not impact for the purpose of archaeological investigations if development impacts are not proposed there.

The proposed impacts to Wallarah Creek are: The creek crossings for the Eastern and Western Arms of the Rail Loop; the creek crossing for the Conveyor Belt, the creek crossing for the Access Road to the Pit Top Facility and the construction of the northern portion of the Pit Top Facility (**Figure 20**). Otherwise all other areas of impact are more than 100m from the banks of Wallarah Creek. It is assessed that the impacts to Wallarah Creek will be localised, but severe, with little chance of heritage items surviving the construction process. As ground surface visibility was low, hampering the detection of site, a test excavation programme is necessary in those areas of high impact to determine the nature and extent of any subsurface deposits.

Test excavation design

The aim of the testing programme is to sample six (6) transects; both in areas of direct impact, as well as in adjacent areas (**Figure 21**). Three transects will be 150m long and dissect Wallarah Creek north-south, sampling deposits on the north and south banks. One north-south transect is confined to the south bank only as the north bank has low potential for intact deposits. These north-south transects are located at the points where creek crossings will be directly impacted. In addition there are 2 east-west transects that, in places, link the north-south transects and generally allow a fuller examination of the southern bank of Wallarah Creek, an area that will be impacted more severely than the north bank.

The following six transects will enable a determination of the nature and extent of any archaeological deposits that may be encountered.

Transect WC1

Location: South bank Wallarah Creek

Direction: N/S

Length: 75m

Pit Number: 4

Planned Impact: This region of Wallarah Creek will be greatly altered by the construction of the Eastern Arm Rail Loop creek crossing which will involve culvert and embankment works.

Discussion: The north bank of Wallarah Creek is very steep and it has a low possibility of containing intact subsurface archaeological deposits. The southern bank is relatively flat although it is some 2m above the level of the creek. This area is assessed as having moderate potential to contain intact subsurface archaeological deposits as there is good depth of soil and it is close to water.

Transect WC2

Location: North and south bank Wallarah Creek

Direction: N-S

Length: 150m

Pit Number: 8

Planned Impact: This region of Wallarah Creek will be impacted by the construction of a conveyor belt which will cross the creek at this point.

Discussion: Both the north and south bank have relatively flat areas of land on either side of the creek. This area is assessed as having moderate potential to contain intact subsurface archaeological deposits as there is good depth of soil and it is close to water.

Transect WC3

Location: South Bank Wallarah Creek

Direction: E/W

Length: 200m

Pit Number: 10

Planned Impact: There is no specific impact although major construction work nearby could well cause damage to this area of the creek bank.

Discussion: The south bank of Wallarah Creek is assessed as having greater potential to contain intact subsurface deposits. This transect is designed to link up the N/S transects of Transect WC2 and Transect WC4. This area is assessed as having moderate potential to contain intact subsurface archaeological deposits as there is good depth of soil and it is close to water.

Transect WC4

Location: North and south bank Wallarah Creek

Direction: N-S

Length: 150m

Pit Number: 8

Planned Impact: This region of Wallarah Creek will be greatly altered by the construction of the Western Arm Rail Loop creek crossing which will involve culvert and embankment works.

Discussion: Both the north and south bank have relatively flat areas of land on either side of the creek. This area is assessed as having moderate potential to contain intact subsurface archaeological deposits as there is good depth of soil and it is close to water.

Transect WC5

Location: South Bank Wallarah Creek

Direction: E/W

Length: 200m

Pit Number: 10

Planned Impact: There is no specific impact although major construction work nearby could well cause damage to this area of the creek bank.

Discussion: The south bank of Wallarah Creek is assessed as having greater potential to contain intact subsurface deposits. This transect is designed to link up the N/S transect of Transect WC6 and to give better information along a terrace that exists at this location. This area is assessed as having moderate potential to contain intact subsurface archaeological deposits as there is good depth of soil and it is close to water.

Transect WC6

Location: North and south bank Wallarah Creek

Direction: N-S

Length: 150m

Pit Number: 8

Planned Impact: This region of Wallarah Creek will be impacted by the construction of the Pit Top Facility and the Access Road creek crossing which at this location.

Discussion: Both the north and south bank have relatively flat areas of land on either side of the creek. This area is assessed as having moderate potential to contain intact subsurface archaeological deposits as there is good depth of soil and it is close to water.

Table 8: Proposed Pit Numbers along the Transect Lines in the vicinity of Wallarah Creek.

Transect Number	Number of Pits (1 x 1m)
WC1	4
WC2	8
WC3	10
WC4	8
WC5	10
WC6	8
Total	**48**

It is estimated that proposed impact to landforms in the study area that are assessed as archeologically sensitive will total 30,375m^2. This includes areas to the north and south bank of Wallarah Creek, namely: Eastern Arm Rail Loop (11250m^2), Conveyor crossing (3000 m^2), Western Arm Rail Loop (11250m^2), Pit Head Facility and road area on south bank (2625 m^2) and north bank access road to the Pit Top Facility (2250 m^2). The level of impact from the proposed works is assessed as high to any potential archaeological deposits.

The proposed management option to excavate 48 1 x 1m test pits (Table 8) will assess only 0.16% of the proposed impact area. However large sections of the creek bed, included in these calculations, are unsuitable for retaining archaeological deposits, as are some areas such as the north bank at the Eastern Arm Rail Loop crossing.

Even if limited in scope, the proposed testing programme will excavate a representative sample of the landforms to be directly impacted by the proposed works. This information will allow a full heritage assessment of the archaeologically sensitive areas of the Tooheys Road study area to be made.

General excavation methodology

The following methodology is designed to retrieve an adequate sample from appropriately controlled excavations such that the aims of the testing programme can be adequately addressed. It also has to remain flexible, such that account may be taken of the ongoing results and the approach modified where results indicate. The basic system would comprise the following:

- The material would be excavated in c. 20cm spits (layers) and either taken directly to the sieving tables in labelled buckets if hand dug or stockpiled in labelled piles at the side of each pit if removed by backhoe. If the deposits turn out to be deeper than anticipated, then the depth of the spits may be increased. If in any particular areas there appears to be no stratigraphic information being retrieved from the spits, then remaining pits within that landform may be excavated in bulk.

- The excavated material from all pits would be sieved on site using wet sieving through nested sieves of 6-8mm and 2.5-3.5mm mesh. All the material excavated from hand dug pits would be sieved. Sample sieving of pits excavated by backhoe would occur ensure that equal quantities of material from each vertical and horizontal unit were sieved, thus making the results statistically meaningful and representative, without needing to sieve all material excavated. It is suggested that a minimum of c. 50 % of each excavated unit would be sieved[5].

- If features are noticed during excavation, small scale open excavation may be undertaken by hand in 1 x 1m units. A feature would include a high density of artefacts within a square, or a pit containing rare or unusual artefacts, or other signs of human occupation i.e. hearths;

This methodology should retrieve a large enough sample to correctly identify the presence of artefactual material and the nature of the assemblage. Further investigation of any features identified at test excavation level may be warranted at a later stage or as part of a salvage programme, depending on the significance assessment attached to the results of the test excavations. Should no artefacts be encountered within the initial test pits, several further pits may be bulk excavated (i.e. at 10 m intervals) to ensure that pit interval distance did not miss any artefact clusters;

The described methodology will guarantee due diligence and on site direction by the archaeological team of the geotechnical team.

The site should be mapped to scale and the location of the test pits clearly marked and identified. Sections detailing the stratigraphy and any features will be drawn and all pits will be photographed. Artefacts will be analysed professionally and if appropriate, a specialist geomorphological assessment of the area may be undertaken. This latter assessment allows a determination of the processes that have affected the landscape and

[5] Results from other studies suggest that a 20cm spit over a 1 x 1m area may produce c. 45-50 buckets of soil. As a result c. 20-25 buckets from each unit will be sieved, being a c. 50 % sample.

the stratigraphy of the landforms thus enabling an appropriate assessment of the likely integrity of the archaeological resource.

4.9.1b Buttonderry and Western shaft study areas

As no sites or specific areas of archaeological sensitivity in terms of Indigenous site location were delineated in these areas, there are no specific management recommendations and no constraints to the proposed development on the grounds of cultural heritage. Should impact alter significantly from those assessed for the current project, then further investigation may be required.

4.9.2 Potential off-set areas

Three Indigenous sites were located at the Hue Hue Road ecological offset investigation area along Wallarah Creek and its tributaries. The preferred management of these sites and indeed the entire creek line which encompasses the delineated area of archaeological sensitivity (Figure 19) is to see the area formally conserved through a mechanism such as a covenant on the title of the land.

5. NON-INDIGENOUS HERITAGE

5.1 Historical Background

The Wyong area was settled in the early 1820s, though timber getters worked and lived here from the 1790s, when large grants over 1000 acres were given in the Dooralong Valley and in Wyong township. In the 1840s land grants were given in the Ourimbah, Wyong and Jilliby areas in 1000 acre parcels. The poorer land of Warnervale and Gorokan was not 'taken up' until the 1870s.

The timber industry has been a major influence of the Wyong Valley since the 1800s. During the 1820s, timber getters came into the Valley to fell cedar, forest oak and rarer rainforest trees. This practice occurred in both the Dooralong (since the 1820s) and Yarramalong (since the 1830s) valleys, with timber often being and shipped to Sydney. By the 1880s, there were three timber mills operating in the Yarramalong Valley producing rims for wagon wheels, fruit cases and house timber.

The timber industry also opened up the valleys and attracted farmers and settlers who cleared the river flats in the 1850s. These were mainly subsistence farmers growing fruit and vegetables and grazing stock. By the 1860s there was an influx of settlers along the Wyong River, its tributaries and Jilliby Jilliby Creek, attracted by settlement incentives offered as part of the Robertson Land Acts. By 1880s much of the river flats of the valleys were cleared and under cultivation. With the opening of the Sydney/Newcastle railway in 1889, Wyong's population increased and a quicker link to Sydney was created encouraging agriculture and fishing (supplying the Sydney markets), encouraging the development of Wyong as a railway town and initiating tourism. After 1889, new timber mills built in Wyong and in the valleys, opened the timber industry and local vegetable and dairy producers to overseas markets as a result. The height of timber industry was in the early 1900s when exports boomed, however by the late 1920s, much of the local timber had been felled and the area exhausted.

Farming remains the second biggest industry in the Wyong region. By the late 1880s many citrus orchards were planted in Wyong and the valleys. The industry peaked in 1970s. Dairy farming was also a major industry in 1930s, peaking 40 years later when there were roughly 100 operational dairies in the area. However, dairy farming declined in the 1980s, and by 1995/6 no dairy farms were operational in the Wyong Valley. Poultry farming remained a smaller industry, which peaked in the 1960s. Fishing was significant from the earliest days.

Residential development increased with opening of the Sydney Freeway in 1987. An influx of hobby farmers and rural residential development has centred in the Yarramalong Valley (Wyong Valleys Planning Report, 1998). Traditional large acreage agriculture has given way in the last twenty years to smaller hobby farms, rural weekend retreats, market gardens, orchards, nurseries, horse studs and turf farms.

Turf farming, which occurs mostly in the Yarramalong and Dooralong Valleys in the wider floodplains, is the primary agricultural output of the area. Orchards are usually located on the footslopes where the soil is relatively rich and deep and outside the flood zone, confining this to the lower half of the valleys. Stud and beef cattle are common in the valleys along the floodplain and low slopes.

The Wyong region has been subject to a wide variety of documented land use practices since European settlement. As a result of the timber industry and agricultural practices in and around the study area substantial parts of the landscape, especially along river flats and low slopes along the Dooralong and Yarramalong Valleys, have undergone significant modifications.

5.2 Regional and Local Context

In conjunction with the Indigenous heritage survey conducted by ERM in 2000 (see Section 4.2.1), a non-Indigenous heritage survey was also carried out (ERM 2001c).

During the non-Indigenous survey of the Tooheys Road study area, four features of potential interest were identified. Namely:

- 24/NI Possible old fence line along Wallarah Creek (south of Tooheys Road and west of the Freeway within survey unit A)
- 25/NI Rig and furrow with associated old dam (north of Tooheys Road and south of the transmission line within survey unit B
- 26/NI Possible foundations of old property with drainage gully, introduced plants and possible foundation stones (south of Tooheys Road within survey unit C)
- 27/NI Two old dams possibly in association with 26/NI (on the south side and adjacent to Tooheys Road within survey unit C)

The surveyors concluded that no features of high significance were identified during the survey of the Tooheys Road study area (ERM 2001c). However, the authors noted that the features that were identified may indicate further archaeological remains that were not immediately evident during the survey.

In 2000 a non-Indigenous heritage survey was also conducted by ERM (2001d) that surveyed a much larger area of land that included the mine subsidence area and the construction areas at Kiar Ridge.

During the survey, 23 features were identified of potential value. Table 9 lists the 23 items recorded. No item from this list is within the current study area, but all are within close proximity.

Table 9: Summary of sites of potential heritage significance identified during the ERM survey (2001d).

ID Number	Site Type	Location
1/NI	Residential property	1136 Yarramalong Road
2/NI	Residential property	1150 Yarramalong Road
3/NI	Residential property	1152 Yarramalong Road
4/NI	Bridge	Yarramalong Road
5/NI	Residential property	1163 Yarramalong Road
6/NI	Community Hall	Yarramalong Road
7/NI	House with associated dairy and cattle run	1182 Yarramalong Road
8/NI	Residential property	Jilliby Road
9/NI	Residential property	50 Jilliby Road
10/NI	Residential property	686 Jilliby Road
11/NI	Residential property	Jilliby Road
12/NI	Residential property	Jilliby Road
13/NI	Residential property	Little Jilliby Road
14/NI	Residential property	Little Jilliby Road
15/NI	Residential property	Little Jilliby Road
16/NI	Residential property	Little Jilliby Road
17/NI	Bridge	Little Jilliby Road
18/NI	Bunya Pine	Little Jilliby Road
19/NI	Farm buildings and silos	Durren Road
20/NI	Picket fencing	724 Durren Road
21/NI	Residential property	Durren Road
22/NI	Farm buildings and silos	Dickson Road
23/NI	Pottery sherds	Kiar Ridge site

5.3 Survey Methodology

The entire study area was divided into those areas where there will be direct impacts (Tooheys Road study area, Buttonderry study area and Western shaft study area) and those where there will be no impacts (Buttonderry off-set study area, Hue Hue Road ecological offset investigation area).

Direct Impact Areas: The study areas within direct impact zones were traversed using pedestrian transects by three or more surveyors. The surveyors assessed all regions within the direct impact zones, as well as a buffer surrounding the impact zones.

Off-set Areas: The study areas outside direct impact zones were traversed using pedestrian and vehicle transects by a survey team. The surveyors assessed all regions within the off-set zones where the proximity to water and/or suitable landform appeared to suggest that heritage items might be retained. Thus in these study areas, the surveyor's interpretation of the area's landforms was the primary determiner of what land was surveyed.

5.4 Results

5.4.1 Direct impact areas

5.4.1a Tooheys Road study area

No items of non-Indigenous heritage items were recorded within the Tooheys Road study area. Items noted by ERM from within the current Tooheys Road study area were relocated and assessed.

In a previous non-Indigenous heritage survey (ERM 2001c), recorded the following items as 'of interest':

- 24/NI Possible old fence line along Wallarah Creek (south of Tooheys Road and west of the Freeway within survey unit A);
- 25/NI Rig and furrow associated with old dam (north of Tooheys Road and south of the transmission line within survey unit B);
- 26/NI Possible foundations of old property with drainage gully, introduced plants and possible foundation stones (south of Tooheys Road within survey unit C); and,
- 27/NI (two old dams possibly in association with 26/NI (on the south side and adjacent to Tooheys Road within survey unit C).

The current survey's observations of the items noted by ERM are:

- 24/NI This fence line is outside the current study area and was not visited;
- 25/NI There had been recent earthworks in this area and it was hard to discern the rig and farrow noted by ERM;
- 26/NI This feature was revisited and while at the site the present property manager told the authors that the site was once a large chicken shed with runs once belonging to the McCloud family. Very little remains above ground today and what is remaining suggests that it was an insubstantial building when first constructed. Very unlikely to be over 50 years old (**Plates 42 and 43**).
- 27/NI ERM gives little information on why these dams were noted and the present survey could find nothing remarkable about them today. Very difficult to date, but probably less than 50 years old.

5.4.1b Buttonderry study area

No items of non-Indigenous heritage were recorded within the direct impact zones of the Buttonderry study area. Generally across the site, stumps of cut down trees are evidence prior logging of the area, although visual inspection of the stumps indicates the use of a chainsaw rather than a cross-saw (**Plate 23**).

Close to Hue Hue Road, in the direct impact area, there is cleared land that appears to have been pasture improved and grazed for dairy cattle over a considerable period. The remnants of cattle yards are still present in the low-lying portion of the study area, outside the area of direct impact.

5.4.1c Western shaft study area

No items or places of non-Indigenous heritage significance were recorded in this study area. The small scale of the Western shaft study area and its location in a State Forest are considered adequate explanative factors for this negative result.

5.4.2 Proposed off-set areas

5.4.2a Buttonderry off-set study area

As noted earlier, this property, like the adjacent impact area (the Buttonderry study area), has undoubtedly been used for selective logging over a considerable period of time. Remnant stumps (**Plate 41**) in this area have apparently been cut down using a chain saw and although timber cutting may have occurred in earlier times in this area, no evidence for the use of the cross-saw was noted during survey.

5.4.2b Hue Hue Road ecological offset investigation area

No places of non-Indigenous heritage significance were recorded within the Hue Hue Road ecological offset investigation area. It should be noted that full pedestrian survey was not undertaken here and there were certain portions of the study area, notably the western part of DP791157, that were not accessible during the survey as they are currently leased.

5.5 Discussion

5.5.1 Significance Assessment – General Principles

In determining the appropriate process for significance assessment, it must be determined whether the historic period remains should be classified as 'archaeological'.

The assessment of heritage significance[6] is a process of examining the various factors and values which bear upon a place, building or structure and determining what level of

[6] This summary of significance assessment has been gleaned from the NSW Heritage Office Manual, specifically the document entitled "Assessing Heritage Significance" 2001.

significance, if any, the item may have with respect to an established set of heritage criteria. Broadly speaking, these criteria are based on the four values set out in the Australia ICOMOS Burra Charter and are the methodology accepted by heritage authorities and professional consultants. These are:

- Historic significance;
- Aesthetic significance;
- Scientific significance; and
- Social significance

The Heritage Council of NSW has defined a set of heritage significance criteria against which the heritage significance of an item may be judged. The use of standardised criteria helps achieve consistency in the assessment process and provides a basis for comparative assessment between types or classes of items.

The Heritage Council significance criteria are as follows:

- **Criterion (a)** – an item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area);
- **Criterion (b)** – an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area);
- **Criterion (c)** – an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area);
- **Criterion (d)** – an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons;
- **Criterion (e)** – an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area);
- **Criterion (f)** – an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area);
- **Criterion (g)** – an item is important in demonstrating the principal characteristics of a class of NSW's:
    - cultural or natural places; or

- cultural or natural environments: or

A class of the local area's:

- cultural or natural places; or
- cultural or natural environments.

In many cases items or places will be significant under only one or two of these criteria. Structures or items that do not function in their original context are much less able to demonstrate the qualities for which they were originally designed and this thereby reduces their heritage significance.

5.5.2 Significance Assessment of Non-Indigenous Heritage Items

The following summary statement is based on an assessment against the significance criteria of the Heritage Council of NSW, as outlined in **Section 5.5.1**.

The non-Indigenous heritage items re-examined during the present survey are considered to be of limited importance at a local level and not important in the broader context of NSW's historical development. There are no known associations with significant people, or groups of people, only to the development of the local area for farming. The items do not have any particular aesthetic, technical or scientific characteristics which make them important to NSW or the local area. The items are unlikely to yield any further information about the cultural or historical development of NSW that is not already known. The items, however, may hold some value for the local community, representing an aspect of the historical development of the area for settlement through grazing.

5.6 Relevant Legislation

5.6.1 Introduction

Base line principles for the conservation of heritage places and relics can be found in the Burra Charter[7], which recognizes that there are places worth keeping because they can enrich our lives on many levels. The significance of such places may be embodied in fabric (physical material), environmental setting, contents, use or its meaning to people, and should be assessed through methodical data collection. Since its adoption in 1979, The Burra Charter has become the standard of best practice in the conservation of heritage places in Australia, and heritage organisations and local government authorities have incorporated the inherent principles and logic into guidelines and other conservation planning documents. The Burra Charter generally advocates a cautious approach to changing places of heritage significance. This conservative notion embodies the basic

[7] The Burra Charter defines the basic principles and procedures to be followed in the conservation of all kinds of places such as monuments, buildings, Aboriginal sites, roads, archaeological sites, whole districts or even regions. It was first adopted in 1979, based on the Australian ICOMOS (International Council on Monuments and Sites) review (1977) of the 1966 Venice Charter (Australian ICOMOS Inc. 1998).

premise behind legislation designed to protect our heritage, which operates primarily at a State level.

5.6.2 Commonwealth Legislation

Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act)

The Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) provides a national framework for the protection of matters of national environmental significance and the conservation of Australia's biodiversity. Under the EPBC Act, "environment" includes

- ecosystems and their constituent parts, including people and communities;
- natural and physical resources;
- the qualities and characteristics of locations, places and areas;
- heritage values of places; and
- the social, economic and cultural aspects of a thing mentioned in paragraph (a), (b) or (c).

Recently, Australia has changed the legislation that protects its national heritage places. Three new laws came into effect on January 2004, which provide changes that offer greater legal protection under the existing Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and repeal the Australian Heritage Commission Act 1975 .

The three new Acts are;

The Environment and Heritage Legislation Amendment Act (no.1) 2003

This Act amended the EPBC Act to include 'national heritage' and protect listed places to the fullest extent under the Australian Constitution. Under the new system, National Heritage joins six other important 'matters of national environmental significance' (NES matters) already protected by the EPBC Act. The Environment and Heritage Legislation Amendment Act (no.1) 2003 also establishes the National Heritage List which records places with outstanding natural and cultural heritage values that contribute to Australia's National identity; and the

Commonwealth Heritage List which comprises the natural, Aboriginal and historic places owned or managed by the Commonwealth.

The Australia Heritage Council Act 2003

This Act establishes a new independent heritage advisory body to the Minister for the Environment and Heritage, the Australian Heritage Council (replacing the Australian Heritage Commission established under the Australian Heritage Commission Act 1975) and retains the Register of the National Estate (RNE). The RNE was also established

under the Australian Heritage Commission Act 1975 which defined it as a register of those places being components of the natural environment of Australia, or the cultural environment of Australia, that have aesthetic, historic, scientific or social significance or other special value for future generations, as well as for the present community. Listings on the RNE are not legally binding but provide widely acknowledged recognition of the cultural value of the listed place or item.

Listing of an item or place on the RNE has certain implications for how Commonwealth agencies may deal with an item.

The Australian Heritage Council (Consequential and Transitional Provisions) Act 2003

This Act repeals the Australian Heritage Commission Act, amends various Acts as a consequence of this repeal and allows for the transition period whilst the National and Commonwealth Heritage Lists are finalised. During this transition period the Register of the National Estate will act in conjunction with the formative National and Commonwealth lists to provide full coverage for items already identified as having cultural heritage significance.

Approval under the EPBC Act is required if an action is proposed that will have, or is likely to have, a significant impact on the National Heritage values of a National Heritage place and/or any other NES matter. This action must be referred to the Australian Government Minister for the Environment and Heritage. The Minister will decide whether an action will, or is likely to, have a significant impact on a matter of national environmental significance.

The heritage provisions of the EPBC Act allow for a transition period whilst the National and Commonwealth Heritage Lists are finalised. During this transition period the Register of the National Estate acts in conjunction with the formative National and Commonwealth lists to provide full coverage for items already identified as having cultural heritage significance.

Application to the study area – Commonwealth Listings

- No items within the study area are listed on the Register of the National Estate, the National Heritage List or the Commonwealth Heritage List

5.6.3 State Legislation

The Environmental Planning and Assessment Act 2005

The EP&A Act 2005 is founded on the Environmental Planning and Assessment Act 1979 that requires environmental impacts, including cultural heritage, are considered at a land-use planning and decision making level.

Under this Act Aboriginal heritage is protected in three different ways:

1. Through planning instruments such as Regional Environmental Plans (REPs) and Local Environmental Plans (LEPs). Such plans outline permissible land

use as well as identifying potential constraints. Section 112 (1) of the EP & A Act delineates that no approval for either prescribed developments or developments likely significantly affect the environment, may be granted without prior appropriate environmental impact assessment.

2. Section 90 of the Act (Part 4, Division 5) lists impacts to the environmental resource, including cultural heritage, which must be considered before development approval is granted.

3. All State Government agencies acting as determining authorities on environmental issues must consider a range of community and cultural factors, including Aboriginal heritage, in their decision-making process. The factors to be considered in such assessments are set out in the EP&A Regulations (1980), Part VII.

NSW Heritage Act 1977 (amended 1999)

The NSW Heritage Act 1977 (amended 1999) is the primary piece of legislation affording protection to all historic heritage in NSW. The aim of the Act is to conserve the 'environmental heritage' of the state which includes items such as buildings, works, relics moveable object or precinct significant for its historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value. A 'Place' is defined as an area of land, with or without improvements and a 'Relic' is defined as any deposit, object or material evidence: which relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and which is 50 or more years old.

Approval must be obtained from the NSW Heritage Council when making changes to a heritage place listed on the State Heritage Register (Section 60 Permit), or when excavating any land in NSW where there is a possibility that archaeological relics may be disturbed (Section 140 Permit).

In addition, Section 170 of the Act requires that culturally significant items or places managed or owned by government agencies be listed on the departmental Conservation and Heritage Registers – the State Heritage Register (SHR). NSW Heritage Council approval is required for any works proposed to a place or item on the SHR, or covered by an Interim Heritage Order (IHO).

The State Heritage Register is a list of places of particular importance to the people of New South Wales, made under the Heritage Act 1977. Heritage Council approval is required for works proposed to an item on the State Heritage Register or covered by an Interim Heritage Order (IHO).

Relics Provisions: The NSW Heritage Act 1977 currently affords automatic statutory protection to 'relics' that form part of archaeological deposits. The Act defines a 'relic' as;

> Any deposit, object or material evidence relating to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and which is 50 or more years old.

Sections 139-145 of the Act prevent the excavation of a relic, except in accordance with a gazetted exception or an excavation permit issued by the Heritage Council of New South Wales.

Application to the study area – NSW State Heritage Register listings

- There are no heritage items within the study area listed on the NSW State Heritage Register.

Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 requires that environmental impacts are considered prior to land development. This includes impacts on Aboriginal and non–Aboriginal cultural heritage items and places. The Act also requires that Local Governments prepare Local Environmental Plans (LEP) in accordance with the Act to provide guidance on the level of environmental assessment required.

Section 34(1) of the Wyong Local Environmental Plan (WLEP) (1991) states that:

> The council may grant consent to the carrying out of development on an archaeological site that has Aboriginal heritage significance or a potential archaeological site that is reasonably likely to have Aboriginal heritage significance only if:
>
> - it has considered an assessment of how the proposed development would affect the conservation of the site and any relic known or reasonably likely to be located at the site; and
>
> - it has notified the Director-General of National Parks and Wildlife of its intention to do so and taken into consideration any comments received from the Director-General within 28 days after the notice was sent.

Schedule 1 of the WLEP lists the heritage items in the shire.

Application to the study area – Wyong Local Environmental Plan 1991 Schedule of heritage items

- There are no items within the study area on the WLEP Schedule of Heritage Items

Other Listings – The National Trust

The National Trust of Australia (NSW) is a community based conservation organisation. The Trust maintains a Register of heritage items and places. Although the Register has no legal foundation or statutory power, it is recognised as an authoritative statement on the significance to the community of particular items, and is held in high esteem by the public.

The NT lists items or places which have heritage or cultural value to the community and as such the NT encourages and promotes the public appreciation, knowledge, and enjoyment of heritage items for future and present generations.

Application to the study area – NSW National Trust

- There are no items within the study area listed with the NSW National Trust.

6. RECOMMENDATIONS

6.1 Indigenous Heritage

Under Section 91 of the NP&W Act (1974 as amended) the Director-General of the NSW DECCW must be notified of the location of all Aboriginal sites recorded under any auspices. As a professional in the field of cultural heritage management it is the responsibility of OzArk EHM to ensure this process is undertaken.

To this end it is noted that three (3) Aboriginal sites were recorded as part of the current survey. The site cards (**Appendix 7**) will be forwarded to DECCW[8] with a copy of this report for registration on the AHIMS database. It is noteworthy that the Sensitive Archaeological Landforms identified are not considered as PADs and hence have not been registered on the AHIMS.

The following recommendations are made on the basis of:

- Legal requirements under the terms of the *National Parks and Wildlife Act 1974* (as amended) whereby it is illegal to damage, deface or destroy an Aboriginal relic/object without the prior written consent of the Director-General, DECCW or without approval of the Minister for Planning under Part 3 of the *Environmental and Planning Act 1979* (as amended);

- The findings of the current investigations undertaken within the study area; and,

- The interests of the Darkinjung Local Aboriginal Land Council, Guringai Tribal Link Aboriginal Corporation and other local Aboriginal and community groups.

It is recommended that:

1) An area of archaeological sensitivity was delineated along Wallarah Creek in the Tooheys Road study area, which will be directly impacted by the proposed works. As there is inadequate information available to determine the presence, nature and extent of potential subsurface archaeological deposits in these areas, a programme of limited and focused test excavation is proposed (outlined in detail in **Section 4.9**). The results of these excavations will provide the basis for the formulation of appropriate management recommendations for this area with respect to the proposed impacts. The possible outcomes are summarised in **Section 4.8**.

2) An area of archaeological sensitivity was delineated along Spring Creek in the Tooheys Road study area, which will be directly impacted by the proposed works. As this area has been significantly disturbed and the likelihood of potential deposits (if present) being intact is considered low, (as outlined in **Section 4.9.1a**), it is recommended that impacts in this area be managed through the monitoring of works by members of the Aboriginal community.

[8] These site cards have already been lodged, however, the report will not be sent until it has been finalised.

3) No Indigenous sites were located at the other two locations of direct impact –the Buttonderry or the Western shaft study areas. There are consequently no constraints to the proposed development on the grounds of cultural heritage in these locations so long as the nature and extent of the proposed impacts do not alter significantly from those assessed within the parameters of the current project.

4) Three Indigenous sites were recorded, and an area of archaeological sensitivity delineated, along Wallarah Creek in the Hue Hue Road ecological offset investigation area. No impacts are proposed for this area and it is recommended that the high Indigenous heritage values of this zone be recognised through formalising conservation of the zone using some long-term instrument such a covenant on the land title.

5) Ensure that all staff and contractors undertake induction that includes a cultural heritage awareness component. This should briefly cover general topics such as rudimentary site identification (e.g. some photos of stone tools, flakes, scarred trees and grinding grooves etc.) and an introduction to cultural values.

6) A contingency procedure should be devised for the discovery of previously unrecorded Aboriginal objects, including burials. Such a document should form part of an Aboriginal Heritage Management Plan (AHMP) and be within the CEMP for the project.

7) One copy of this report should be sent to:

Chairperson,
GTLAC
19 Coolibah Road
Wyongah NSW 2259

One copy of this report should be sent to:

Chairperson,
Darkinjung LALC
PO Box 401
Wyong , NSW 2259

Two copy of this report should be sent to:

Attention: Cheryl Brown
AHIMS Registrar
Department of Environment, Climate Change and Water
PO Box 1967
Hurstville NSW 1481

6.2 Non-Indigenous Heritage

As no items of non-Indigenous heritage value were recorded during the current survey, there are no specific recommendations regarding non-Indigenous heritage items over any of the assessed study areas.

Specifically (using ERM 2001c nomenclature):

- Item 24/NI (possible old fence line along Wallarah Creek) is outside the current study area.
- Item 25/NI (rig and furrow associated with old dam) was assessed as having low significance with no further recommendations made here for its avoidance or retention. Very difficult to date with no obvious sign that it is more than 50 years old.
- Item 26/NI (possible foundations of old property with drainage gully, introduced plants and possible foundation stones) was assessed as having low significance with no further recommendations made here for its avoidance or retention. Reasonably modern and according to local memory it is only a chicken yard, not a residence.
- Item 27/NI (Two old dams possibly in association with 26/NI) was assessed as having low significance with no further recommendations made here for its avoidance or retention. Very difficult to date with no obvious sign that it is more than 50 years old.

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Appendix 1 - Plates

Plate 1

View west showing Spring Creek in November 2006. Un this view the rail bridge is just at the photographer's back.

Plate 2

The western bank of Spring Creek. View east. The Rail bridge can be seen in the background. This view shows the tracks found in this area.

Plate 3

The eastern bank of Spring Creek. View south-east. This photo shows the more substantial tracks on the eastern bank of Spring Creek.

Plate 4

The northern bank of Wallarah Creek. View south-west. This photo shows sheet erosion just south of peg 1780.

Plate 5

The southern bank of Wallarah Creek. View south-west. This panorama shows the existing landform south of Wallarah Creek.

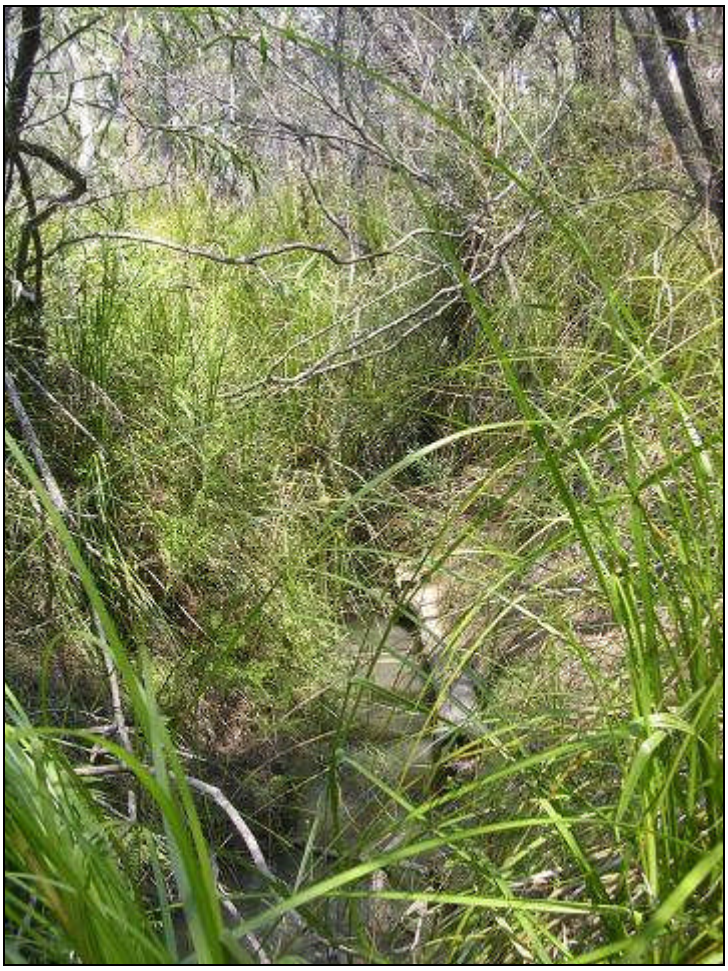

Plate 6

The unnamed tributary that flows from the south into Wallarah Creek. View south-west. This photo was taken near peg 1976.

Plate 7

The TransGrid easement on the Darkinjung LALC's property. In this view the rail loop location is to the far left.

Plate 8

Typical vegetation found in the impact corridor for the rail loop on the Darkinjung LALC's property.

Plate 9

Typical ground surface damage found in the impact corridor for the rail loop on the Darkinjung LALC's property. The damage is a result of unauthorised vehicle traffic.

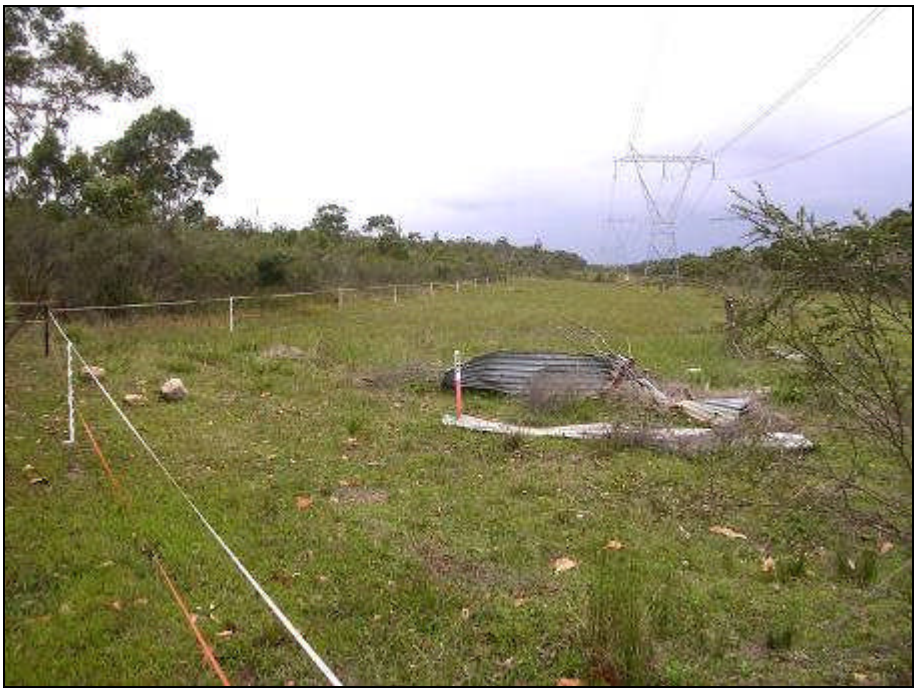

Plate 10

View northeast along the TransGrid easement. This photo shows the western portion of the easement. Photo taken from peg 1584.

Plate 11

View south from Tooheys Road between pegs 3130 and 3131. In this view Wallarah Creek is at the bottom of the hill beyond the cleared fields and disused dairy shed.

Plate 12

View north-east from Wallarah Creek and peg 3183. The rail loop travels from the location of the photographer, up the hill just to the right of the house on the rise.

Plate 13

View south from Tooheys Road and peg 2156. The rail loop travels from the location of the photographer, down the hill towards Wallarah Creek.

Plate 14

View north-east from peg 2036. The rail loop is travelling in the line of sight of this photo. This photo shows the typical vegetation on the southern bank of Wallarah Creek in Zone D of the Tooheys Road study area.

Plate 15

View east showing slope and disturbance in the Buttonderry study area. Note the regrowth trees, the slope and the poor ground surface visibility.

Plate 16

View northeast over the cleared portion of land within the Buttonderry study area. Although cleared, grasses inhibit ground surface visibility.

Plate 17

View west within the Buttonderry study area showing one of the two existing dams.

Plate 18
View into sectioned deposits (dam excavation) in the Buttonderry study area. Note the thin 'A' soil horizon, only approximately 10 cm in depth, overlaying heavy clays. These soils are extremely skeletal. (Scale 20 cm total length).

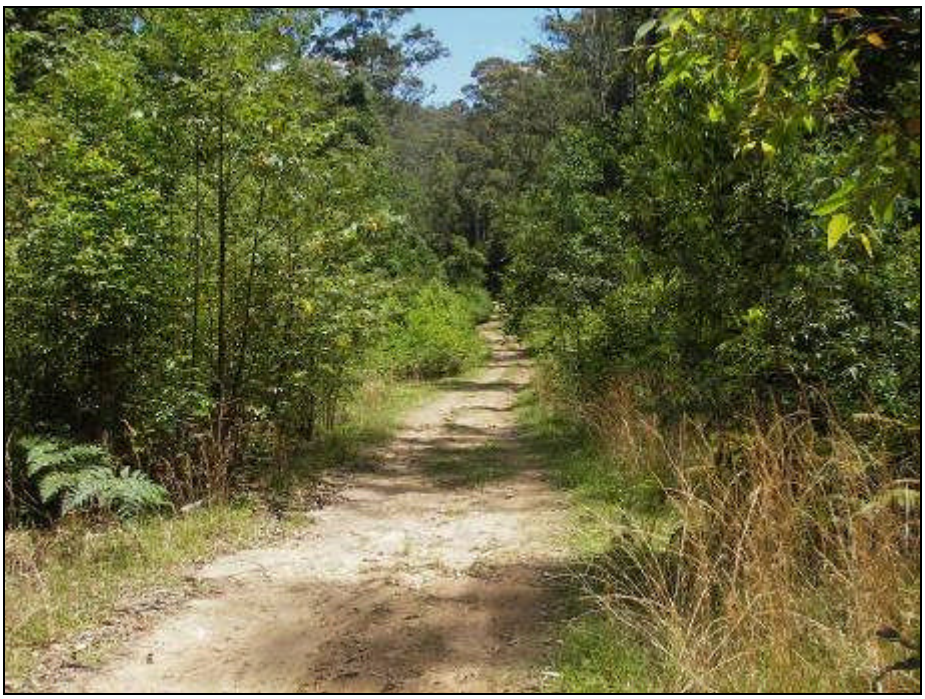

Plate 19
View along dirt road that runs through the centre of the Western shaft study area.

Plate 20
View down the densely vegetated, steep slope immediately west and adjacent to the Western shaft study area. This area will not be impacted by the proposed shaft construction activities.

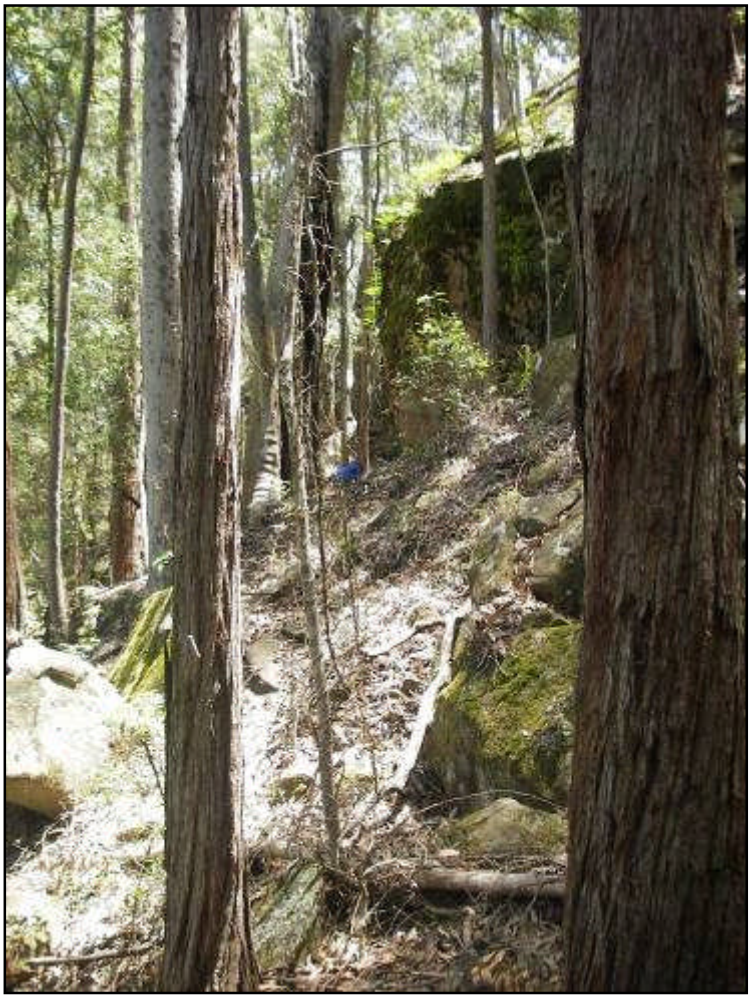

Plate 21
View along the sandstone escarpment adjacent to the Western shaft study area. This area will not be impacted by the proposed shaft construction activities.

Plate 22
View of the sandstone escarpment adjacent to the Western shaft study area. Note its boulderised nature. Caves are present such as that shown in Plate 23.

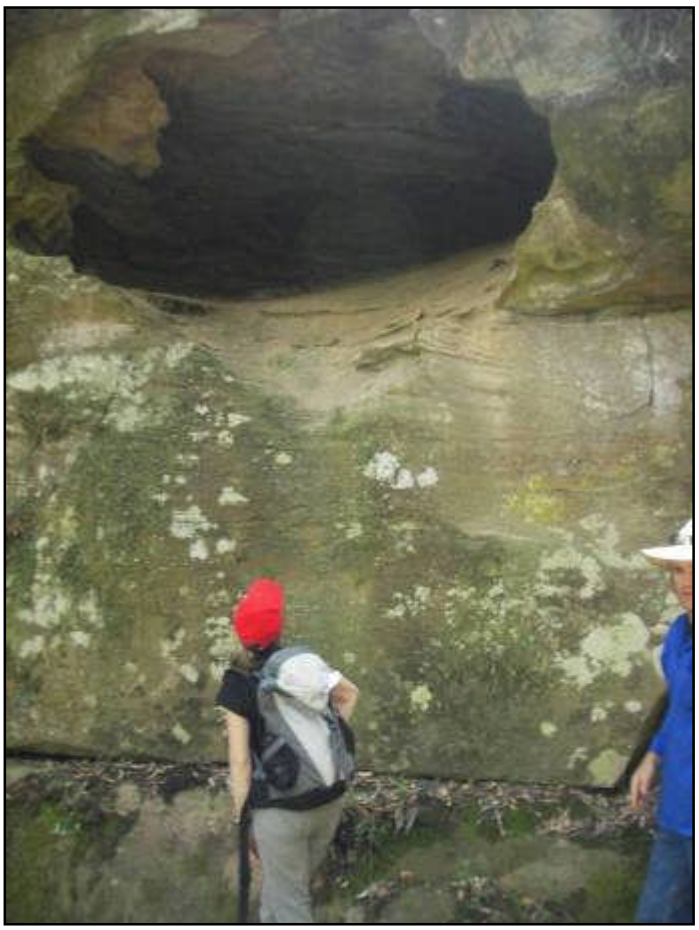

Plate 23
View of a cave in the escarpment adjacent to the Western shaft study area. Access was not feasible due to the steep slope behind and the sheer nature of the sandstone. The cave floor also appeared to be significantly sloped such that human occupation of the cave may have been difficult.

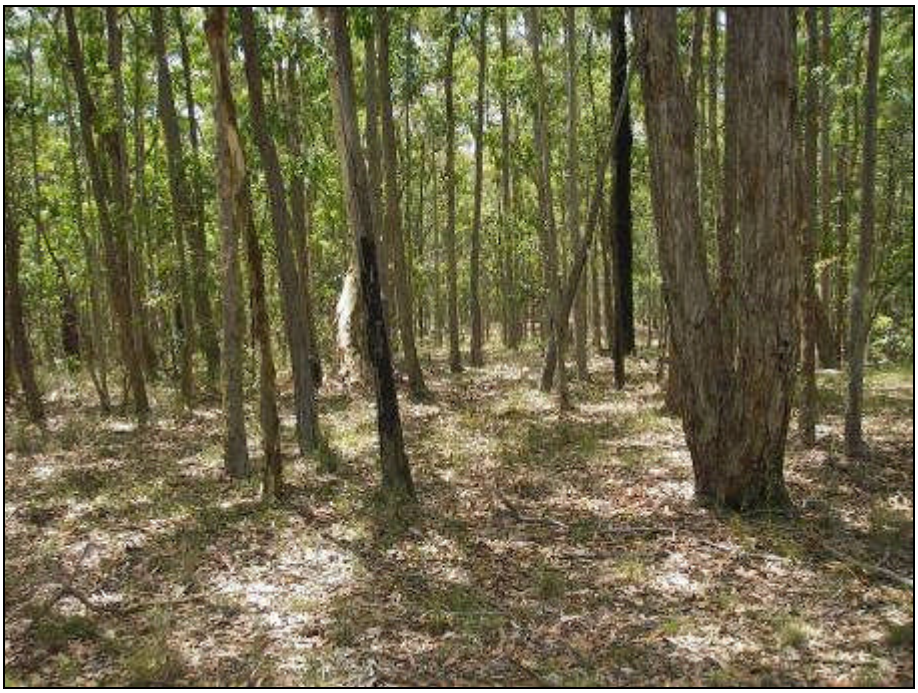

Plate 24
General appearance of portions of the Buttonderry off-set study area. Considerable regrowth, deep leaf litter and mild slopes are characteristic landscape features.

Plate 25
Visibility was primarily found on the tracks that traverse the Buttonderry off-set study area. This track is located on the western boundary (view north) and shows the slope and vegetation.

Plate 26
Example of an old growth tree from the Buttonderry off-set study area. This scar appears to be the result of a recent branch tear and was not assessed as Indigenous in origin. The tree is a spotted gum (*C. maculata*).

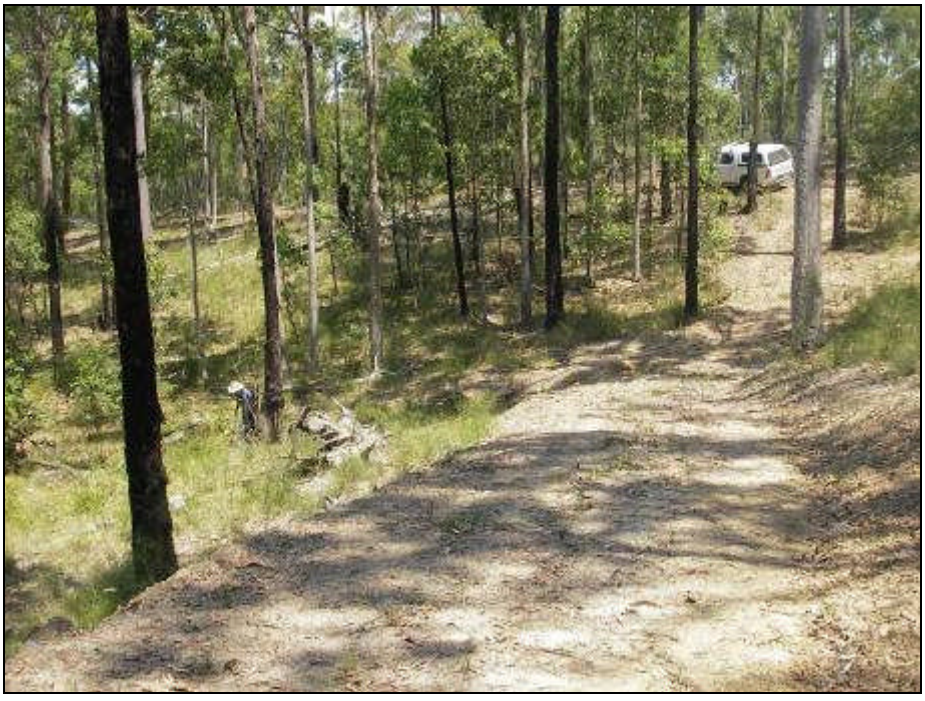

Plate 27
View of the northwestern corner of the Hue Hue Road ecological offset investigation area (DP719762). Note the steep slope and lack of visibility except on the track. Regrowth trees illustrate the impacts of selective, long term logging of the area.

Plate 28
View from the ridge-top in the northwest of the Hue Hue Road ecological offset investigation area, overlooking DP 755245.

Plate 29
View of the general visibility on the ridge tops in the Hue Hue Road ecological offset investigation area.

Plate 30
View northwest towards Wallarah Creek at the location of the rail loop crossing. This view is taken on the southern bank.

Plate 31
View northeast towards Wallarah Creek from peg 1847. This is at the location of the rail loop crossing and is taken on the southern bank.

Plate 32
View southwest towards Wallarah Creek from peg 1397. This is at the location of the rail loop crossing and is taken on the northern bank.

Plate 33
View north at the location where the conveyor crosses Wallarah Creek.

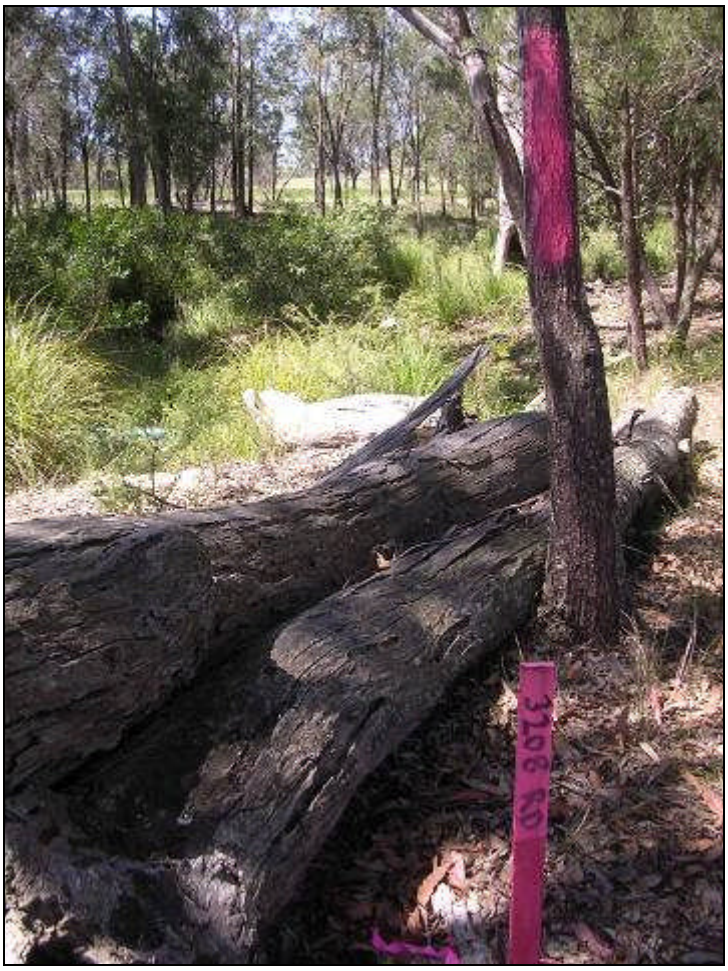

Plate 34
View northeast at the location where the Pit Top Facility access road crosses Wallarah Creek. Photo taken from peg 3208.

Plate 35
View east along the transmission line in the Hue Hue Road ecological offset investigation area showing the location of WC-OS1. The white arrow indicates artefact location.

Plate 36
View northwest along the track in the Hue Hue Road ecological offset investigation area. This is the area that incorporates part of site WC-OS1.

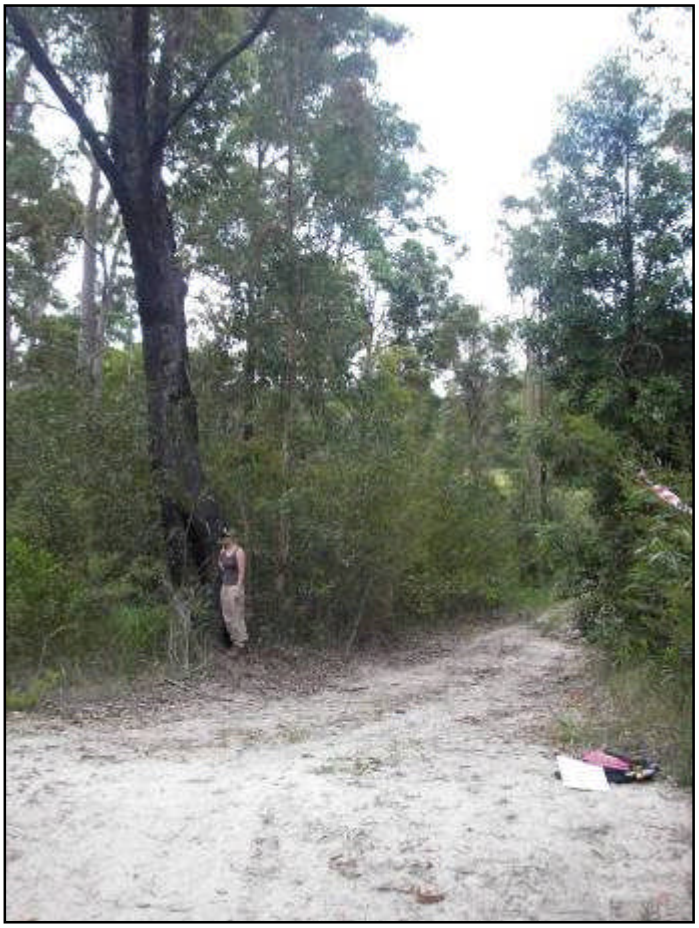

Plate 37
Southernmost portion of site WC-OS1, showing artefact location (where the folders are) and scarred tree WC-ST1. These are located at the confluence of a tributary into Wallarah Creek and the creek itself.

Plate 38
Artefacts from site WC-OS1.

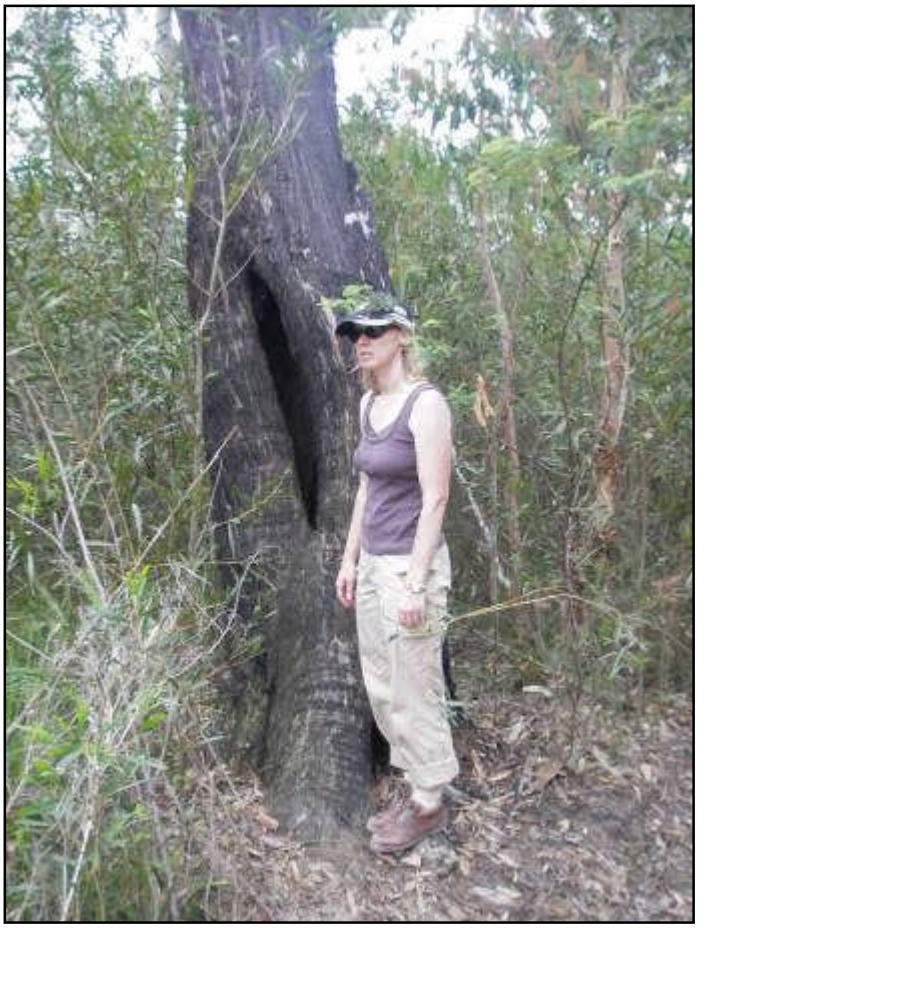

Plate 39
Scarred tree WC-ST1

Plate 40
Location of isolated find WC-IF1, located on the banks of a tributary into Wallarah Creek.

Plate 41
An example of a stump from the direct impact area at Buttonderry showing the evidence of having been cut down with a chain saw.

Plate 42
View northeast of the farm ruin south of Tooheys Road and on the site of the Product Stockpile.

Plate 43
View west of the farm ruin south of Tooheys Road and on the site of the Product Stockpile.

Appendix 2: Community Consultation Log

Preparation for Field Investigation and Community Consultation Log

ACTION	**Date**	**Method**	**Comment**
Advertisement	23.8.06		Closes 8.9.6. placed by IEC, submissions to be in writing to OzArk
Site Search	29.9.06		
CONTACT			
Darkinjung LALC	28.8.06	letter reply	Expressed interest in participating in project
Native Title service - Steve Ryan	5.9.06	Phone Steve Ryan	KAS called native title service to find out where to forward letter for Wallarah No. Coal Project
Natalie Rotahah, Native Title Service Coffs Harbour.	5.9.06	letter	Forward to Natalie Rotahah Com. Facilitator in Coffs Harbour requesting knowledge of existing or pending NT claims. Response requested by 18.9.06
Local Government - Wyong Shire Council	5.9.06	letter	Mr K Yates, GM letter seeking details of indigenous groups know to council
DECC - Syd office	5.9.06	letter	Letter seeking details of indigenous groups know to DECC in Wyong area
DECC - North East - Brendan Diacono	15.9.06	letter reply	Letter from DECC re indigenous groups in Wyong district. Guringai Tribal Link Aboriginal Corp, Mur-Roo-Ma Inc.
Wyong Shire Council	19.9.06	Phone call from Jonathan Luke	Called to reply to letter with name of Gudaga who he understands is a traditional owners group in the Wyong area and knew the surname 'Smith' believed to be associated with group but no further contact details available.
DECC	20.10.06	Brendan Diacono	Seeking phones/faxes for groups provided
Darkinjung Local Aboriginal Land Council	20.10.06	faxed	Rodger Sentence Fax of Conditions of Engagement to Policy on Insurance for Community Groups
Guringai Tribal Link Aboriginal Corporation	20.10.06	phoned and emailed	Letter seeking expression of interest from group in participating in field assessment.
Rob Byrnes IEC	20.10.06	phoned and emailed	CC fax of engagement and discussion of fee paying procedure
Mur-Roo-Ma Inc.	20.10.06	phoned and emailed	Letter seeking expression of interest from group in participating in field assessment.
Darkinjung Local Aboriginal Land Council	12.10.06		Commencement of field assessment on LALC leasehold land
Darkinjung Local Aboriginal Land Council	Oct-06	report	Report by David Pross on assessment supplied to Ozark
Darkinjung LALC/Guringai Tribal Lin Aboriginal Corp	12-14.11.06	field work	Representatives participated in field assessment
Guringai Tribal Link Aboriginal Corporation	20.11.06	letter	Letter stating participation in field assessment giving community comment and feed back

Appendix 3: Community Correspondence

Guringai Tribal Link
Aboriginal Corporation ABN 18 351 198 069
(Traditional Owners of the NSW Central Coast)

19 Coolabah Road,
Wyongah NSW 2259
Phone:(02) 4392 8743
Fax:(02) 4396 3525
Mobile: 0404 182 049
Email: guringai@kooee.com.au

20th November, 2006

OzArk Environment & Heritage Management P/L
P.O Box 2069
Dubbo, NSW, 2830.

Attention: Dr. Jodie Benton, Director.

Dear Jodie,

Re: Aboriginal Heritage Assessment conducted on 14th, 15th, & 16th November, 2006.
Wallarah 2 Coal Project- Tooheys Rd, Wyong. (Bushells Ridge)

The initial field survey was attended by Guringai Tribal Link Aboriginal Corporation (GTLAC) Representatives; Tracey-lee Howie and Kevin Robinson.

All areas of the proposed project have been discussed with the Guringai Mob by Kevin and myself and it has been agreed upon to request that test excavations be performed around the areas of;Crossings of Wallarah Creek of proposed road,rail loop and conveyor transacts, paying particular attention to southern side of Wallarah Creek, below proposed areas for Pit top facility, Dam A and rail loop due to this area being of Cultural significance. (ie; flat terrace areas for camping, water & food source).

The Guringai Mob also request that should any Aboriginal artefacts/relics be recovered in this process, that they remain in an appropriate keeping place designated by GTLAC.

We look foward to reading the Draft when constucted, and working with you in the future.

Kevin Robinson
Secretary
Male Culture and
Heritage Officer
Ph: (02) 4397 4175
Mobile: 0408 733 820
Email: guringai@binternet.com.au

Tracey-lee Howie
Chairperson
Female Culture and
Heritage Officer
(contacts above)

DARKINJUNG LOCAL ABORIGINAL LAND COUNCIL

SHOP 3, 61 HOWARTH STREET, WYONG
POSTAL ADDRESS:
P.O. BOX 401, WYONG NSW 2259
A.B.N. 99 583 297 167

TELEPHONE: (02) 4351 2930
FAX: (02) 4351 2946
EMAIL: darkinjung@dlalc.org.au

Aboriginal Heritage Site Assessment

Lot 195 DP: 1032847, Prescient 15
Bushells Ridge NSW

October 2006

Prepared by:

David Pross
Advanced Diploma of Applied Aboriginal Studies
Diploma of Community Development
Heritage Officer
Darkinjung Local Aboriginal Land Council
Shop 3
61 Howard Street
Wyong NSW 2259

Table of Contents

1. Introduction

This report was prepared as an Aboriginal Heritage Assessment appendix to the Archaeological Assessment conducted by Mr Ben Churcher of OzArk EHM for their client Kores Coal Pty Ltd. The report assesses the impacts if any, for any future proposed development on the parcel of land, and on known and subsequently identified places of significance to the Aboriginal community. In so doing it reviews the regions prehistory, ethnography and the lands recent history and provides a description of the features of the cultural landscape, and methodology used to identify these features. The report also makes an assessment of the significance of the cultural landscape to the local Aboriginal and wider community and provides recommendations for ensuring that the cultural features if any on Lot 195 are conserved during any development processes in the future.

2. Development proposal

Kores Coal Pty Ltd propose to construct a two rail spur line on the northern side of the power line easement that runs through Lot 195. This spur will connect with the Northern Rail Line (eastern boundary) near the Springs Creek Bridge. The spur will run through Lot 195 onto connecting properties (western boundary) then to a coal loader for Wallarah number two mine. This spur will divert at pylon five (21lt19) on Lot 195, going under the power lines on the easement forming a loop to the coal loader (via southern boundary) and then back to the Northern Line to Newcastle Harbour.

3. Aims of the assessment

The aims of the Aboriginal Heritage Assessment are to provide the proponent with information to meet the statutory obligations of the National Parks and Wildlife Act 1974 (sections 87 and 90), and general terms of approval pursuant to Section 91 and 91A of the Environmental Planning and Assessment Act 1979. The assessment is produced in association with the Darkinjung Local Aboriginal Land Council to provide for the identification of any places of significance to Aboriginal people in lieu of any future proposed development and management of the heritage described.

4. Statutory requirements

"Sites of cultural heritage significance in N.S.W. are protected by laws that are designed to accord with Australia's responsibilities as a signatory to the World Heritage Convention" (1975).

There are three main pieces of legislation in NSW that provide the legislative framework for the management of Aboriginal heritage. These are the National Parks and Wildlife Act (1974) that provides protection for all Aboriginal places and objects, the Environmental Protection Act (1979) which establishes the requirements for the assessment of Indigenous Heritage values in the environmental planning and development process and the Heritage Act 1977 which provides for the protection of sites listed on the State Heritage Register. The Native title Act (1993) also provides a vehicle for assessing and defending native title rights that may exist on certain lands. The Commonwealth's Aboriginal and Torres Strait Islanders Heritage Protection Act 1984 may also be used to protect places of national significance if State based laws and processes described above are unable to do so.
Under the National Parks and Wildlife Act (1974) an Aboriginal 'object' is any deposit or material evidence relating to (pre-contact) Aboriginal habitation .... and can include pre-contact features such as scarred trees, middens and artefact scatters, as well as physical evidence of post contact use of the area in question. An 'Aboriginal place' is a place that has been declared by the minister because he or she believes it has special significance to Aboriginal culture (and may, or may not contain aboriginal objects).

Aboriginal Heritage Impact Assessments commonly occur as part of the approvals process for a wide range of developments and activities. For the purposes of Section 91 of the EPA Act an Aboriginal Heritage Impact Assessment is required if the development will or is likely to impact on an Aboriginal object or place. Under Section 79C(b) of the EPA act, consent authorities must consider the impacts of a proposed development, including the impacts on Aboriginal heritage values. Under the draft guidelines for Aboriginal Heritage Impact Assessment issued by the National Parks and Wildlife Service (Buckley 2004, 9), it is stated that an Aboriginal Heritage Impact Assessment is unlikely to be required where the proposed development is on land previously subject to intensive ground disturbance when the development will impact only on the area subject to previous disturbance.

Part 4 of the Environmental Protection Act (1979) provides for the linking of some approvals granted by the State Government agencies in the development consent process. Integrated Development Approvals (as these are known) require applicants to provide agencies with sufficient information to allow them to provide general terms of approval, prior to the development of any development consent. This Act also requires that in reaching a decision to grant development consent, a consent authority is to take into account the likely impacts of that development, including the impact on all Aboriginal Heritage values, including natural resource uses or landscape features of spiritual importance, as well as the impact on Aboriginal objects or places.

5. Identifying Heritage Values

A number of factors support the contention that this area had some strategic importance for the Darkinjung people. The parcel of land is on a ridge top close to Wallarah Creek a very significant water-way to the Darkinjung people, supplying numerous food sources, example eels, fish, shellfish, water reeds and grasses. A search of the Aboriginal Heritage Information Management System - AHIMS database revealed current knowledge of a number of sites within the study area. A total of 30 sites have been recorded within a 5-kilometre radius of the study area.

The assessment area is within a half days walk to a range of coastal environments including rocky foreshores and beaches as well as intertidal bays and mudflats, an hour to Wallarah Creek that flows into to Tuggerah Lake, also within a few hours walk to Lakes Munmorah and Manning.

The diversity of land systems in the vicinity of the assessment area and the presence of a number of known food resources and useful plant species also suggests this area would have been strategically important.

6. Prehistoric and Archaeological context

'The hunter gatherer past, in Australia...is not necessarily the record of passive, long term acquiescence to natural forces and trends...but of dynamic participation within both natural and socio-cultural environments during both long and short term time scales' (Lourandous and Ross. 1994)

Our understanding of prehistoric settlement patterns environmental, cultural and technological change in the east coast region during the prehistoric era have been advanced by the work of a number of researchers (Lampert 1971, Dyall 1972, Mulvaney 1976, Bowdler 1976, Vinnicombe 1980, Lourandous 1984,Hiscock 1992, McDonald 1994, Morwood 2000, Appleton 2003-2004a-2004b). For the east coast, the work of Lampert was the first to establish the presence of people on the coast at 20,000 years before the present (BP) at Burril Lake on the south coast. Further research by Bowdler (1976) and others supported this contention. Indications from these sites indicate that Aboriginal society at this time had advanced to utilise a wide range of environments. Technological evidence from early sites on the east coast indicates that indigenous culture had adapted to the exploitation of food resources in forest, lacustrine, coast and hinterland environments.

Indigenous technology remained fairly constant and unchanging until the early Holocene period. There were then an apparent number of technological shifts including the arrival of specialised stone implements in the archaeological record after 4,000BP. This is seen as a cultural response to a changing environment as post-glacial seas encroached upon the territories of coastal Aboriginal groups. These new technologies were observed in an increasing number of sites that first became inhabited during this period. Specialised composite tools such as the 'backed blades first appear after 4,000 BP in many sites (see Hiscock 1993). There remained a

remarkable consistency of stone tool technology until 2,000 BP when gradual change was observed. Some items such as the backed blades dropped out of the sequences and there was a proportional increase in others such as the ground edge axe. Simple flakes were utilised without the careful preparation techniques employed in previous implement types. There was also a greater use of bone and shell for tool-making. Shell fish hooks first came into use in this later period. Dyall excavated a coastal site at Swansea in 1972 revealing crescentic, shell, fishhooks were widely adopted in this region in the more recent past.

There is overwhelming evidence for a widespread increase of indigenous population and technological change in coastal areas in the last few thousand years (Lourandous 1984, 1994). It is suggested that there was an increase in the use of hook and line fishing in the east coast in response to this population pressure. Implements such as the multi-pronged spear and less-specialised flaked tools are evidence of the changing nature of indigenous settlement throughout this period. The dynamic nature of the east coast over the last 20,000 BP greatly complicate theories of local and regional adaptation, however it can conclusively be said that Aboriginal culture in the ethnographic present and prehistoric past had:

A coastally orientated economy

Access to a wide range of environments

Undergone technological change within the last 5,000 years BP

Traded knowledge and technological templates

Witnessed localised variations in technological templates

Developed more specialised technological strategies within the last millennia (i.e. shell fish hooks)

Many sites have been described for the central Coast region by a number of observers. In 1979-80 Pat Vinnicombe carried out an Extensive Study of Aboriginal Sites in the Gosford Wyong region prior to the extension of urban development in the area. Earlier studies required for Environmental Impact Assessment to this date were uncoordinated.

7. Aboriginal Heritage Site Classification

Rock Engravings

The Aboriginal People of the Central Coast were also known as the Sandstone People this been given because of the many engravings sites that exist in the area.
rock engravings, carving or pecking where produced using a pointed edge of a stone and hitting it with a hammer stone very simular to a hammer and chisel method, creating a drawing very simular to a child's join the dots painting, once the outline was marked a smoother stone was used to join all the pecks together, with the finished product looking like a channel. Figures of animals, fish, birds and humans are the most common found, some sites have animal tracks and human feet and some areas also circles, on more scarred engraving sites figure of ancestral heroes are displayed. Engraving sites are commonly found on sandstone outcrops located on ridgelines and cliff tops, some have been located in creek beds and shelters.

Axe Grinding Grooves

Grooves where made for sharpening axe's and other tools and weapons, axe grinding grooves are more commonly found in creek beds or water holes which provide the water for the sharpening process, several shelters have flat rocks with grinding grooves engraved on them.

Water & Cooking Holes

Some water holes where manufactured by Aboriginal people by placing a hot fire on the sandstone to brake and weaken it, once weakened they could dig the stone out leaving a hole in the platform surface, then smooth the sides of the hole. Darkinjung people where one of the groups that also carved channels on the sandstone platform leading to the holes, thus directing water to them, they also carved channels around the holes diverting the water away from the hole and these holes could be used for cooking. David Pross uncovered such channels and grinding grooves in a pristine state, with sharp edges whilst undertaking an Aboriginal Heritage Survey at the Somersby Industrial Estate for the Australian Museum (2001)

Modified Trees

Scarred trees are known to be located in all landscapes in New South Wales, Scarred trees result when the bark has been removed from the tree to manufacture tools and implements such as shields, coolamons and some times shelters.

Canoe trees another form of modified tree.

Toe Hole trees are more commonly found in the western region of NSW, to my knowledge very few have been located on the Central Coast.

Carved trees have geometric patterns carved into the wood to indicate the presence of ceremonial grounds, initiation sites and burial grounds

Shelters

There are two groups of shelter sites:

1.Shelter with art:
Some shelters have art in the form of drawings of animal, fish, birds, tools, weapons, human or hero figures, the drawings could be done in ochre or charcoal or both.

Some shelter have stencil art of hands, feet, weapons or tools, the stencils are done by placing the hand or tool etc on the rock face surface, and then ochre mixed with water, and sometimes blood added and placed the mouth, then sprayed over or around the item.

2. Shelter with deposit:
Shelters with deposit on the floor surface, where more commonly used for domestic usage than for ceremony use, they are simular to middens as food material is often found, or maybe just small stone tool artefacts.

Midden Sites

Middens contain waste material from meals, such as fish bones, shellfish shells along with animal bones, they are primarily found on or close to the seashore, estuaries, riverbanks and inland lakes. Burial Sites have also been located beside middens.

Open Camp Sites

Open camp sites are detected primarily by the discovery of waste material or scattered artefacts on the surface or just below the ground cover, these sites may constitute the remains of gathering or hunting activities, or living areas for a more longer period. These sites are more commonly found on open flatter land, but can also be located close to or in shelters.

Isolated Find

An isolated find could consist of one to several artefacts usually 10 to 50 meters from another artefact, the artefacts might have been dropped on a walk to another area, or whilst hunting, or even a tool that was not right and disgarded.

Quarry Sites

Quarry sites show evidence of where human extraction or processing of siliceous, basalt, chert and quartz rock types has been conducted for tools or weapons.

Ochre quarry sites where used for the removal of the coloured clays and sands for artwork or body paint for ceremony and battle.

8. Recent ethnography

Prior to European settlement of the Central Coast, the primary Aboriginal clans occupying the Central Coast region were the Mial (Broken Bay) Erina, Narara, Tuggerah, Wyong all part of the Darkinjung country. Darkinjung territory stretched from Hawkesbury River in the south, and north to Munmorah took in the Wollombi Valley in the north, and to Rylstone in the west.

The Darkinjung lived by fishing, gathering bush foods and hunting. They took part in a regional trade and ceremonial exchange gatherings with their neighbours and with those further a field. Ourimbah, in the middle of the Central Coast region, was a ceremonial ground in which boys were initiated. (Vinnicombe 1980).

Mulvaney (1976) provides material evidence for reciprocal exchange networks operating in the Central Coast area recorded by ethnographic accounts. These networks centred on cultural sites within the landscape. Many hundreds of people were known to gather at these places in the pre and post contact era when conditions were favourable. These gatherings were likely to have included tribes related on kinship lines for shared ceremonial life, adjacent tribes on a basis of mutual benefit and agreement, and between tribes separated from each other by geographic distance (Wheeler 1910, 70). Similar cultural centres were recorded for the Worimi, north of the Hunter River and Gamilaroi to the northwest on the Namoi and other rivers. Contact took place in the primary sense through face-to-face meetings and secondary contact took place through the passage of an object in ceremonial or mutually beneficial exchanges.

9. Recent history

Indigenous sites found throughout the Wyong/Wallarah region pertain to the complex cultural life of the regions inhabitants before the devastating contact with European culture. Little is known today of the lifestyles of the Darkinjung people following decimation by disease and conflict. A useful, historical overview of the Darkinjung people is however provided by Blair (1995) of the University of Newcastle and members of Darkinjung Local Aboriginal Land Council

Some early records relate to the Brisbane Waters region which noted amongst other things that;

'The natives, though friendly, appeared numerous' (Shortland et.al. 1792).

There were some reports of conflicts between Aboriginal people and settlers in the early years of settlement in the northern region of Brisbane Water yet these are obscure (Bean 1827). Bean reported that there were five family groups of Aboriginal people in the district, naming them the Broken Bay, the Narara, Erina, Tuggerah Beach and Wyong totalling about 65 persons in all. Reverend Threlkeld reported that people from the Tuggerah tribe were resident at his mission/reserve on Lake

10. Site History

10.1. Landscape information

The study area is adjacent to the Northern Rail Line on the eastern boundary, and containing Spring Creek, that flows to Wallarah Creek and finally into the Tuggerah Lake. Lot 195 is mainly a sloping parcel of land on a sandstone ridge, and over thousands of years sediment has been collected to form sandy to clay spots of solis covering the sandstone.

The parcel of land is densely vegetated with grasses, weeds, native plants and tress, in places there are shallow rooted trees because of the soils not being of great depth over the sandstone, this is displayed with the numerous large trees that have fallen on the ground.

10.2 Traditional Land use.

Fire regimes employed by traditional people typically involved frequent 'patch burning' of low to moderate intensity fires timed to make resource based decisions, flush game and improve access through the bush. This practice has had long-term consequences for the type and distribution of vegetation communities throughout Australia. Typically the growth of wetlands and closed forest communities were discouraged by this practice and the spread of grasslands encouraged. It is likely with this type if fire regime in the study area and the impoverished sandy soils it would have supported a mosaic of grassland, heathland and open woodland vegetation communities.

10.3 European Land Use

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The Central Coast region has been one of the fastest growing areas outside of Sydney and this area has been no exception. The majority of development has occurred since the late 1960's, which has seen a surge of development along the Brisbane Water, and the surrounding coastline, and now within the last five years the growth has moved to the Wyong Shire

The study area while escaping residential development has seen some major disturbance with land clearing, road construction, and the erection of a transmission/ power line grid, containing six pylons on the assessment area.

11. Assessment methodology

The strategy used to identify sites if any located in the survey area focussed on known sites and identifying new features with respect to the development areas and the study area in general. Topographic maps and air photographs were utilised to identify areas of interest if any, there was several such areas displayed on the air photographs showing cleared areas of land sandstone outcrops having no vegetation, these areas where marked for a more intense investigation.

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12. Assessment fieldwork

The assessment was conducted on the 13th October 2006 by Mr. Ben Churcher of OzArk EHM and Mr.David Pross of Darkinjung Local Aboriginal Land Council.

A traverse was made by foot on the assessment area focussing on any sandstone outcrops, old growth trees, any cleared areas, and the numerous tracks and roads running through the said area. A detailed walk along and beside the tracks and easement was undertaken looking for any scattered items that might have been brought to the surface by movement over these areas.

The assessment was conducted in sections, from pylon to pylon starting from 21lt15.

P1 to P2: We walked over a wider area at this starting point allowing for extra room for earthmoving equipment to be unloaded and storage areas at the beginning of the spur, checking the other side of Spring Creek, a possible artifact deposit was located in this traverse. Most of this assessment area was densely covered with grasses and other ground cover, making it impossible to see all the ground.

P2 to P3:
The ground cover made near impossible to locate any findings, but a detailed investigation was given to any area that was cleared of ground cover, no finding of any artefacts or any other significant Aboriginal heritage item.

P3 to P4:
This section was completely covered in vegetation and shrubs and trees making impossible to locate anything.

P4 to P5:
The ground cover made near impossible to locate any findings, but a detailed investigation was given to any area that was cleared of ground cover, no finding of any artefacts or any other significant Aboriginal heritage item.

P5 to P6:
The ground cover made near impossible to locate any findings, but a detailed investigation was given to any area that was cleared of ground cover, no finding of any artefacts or any other significant Aboriginal heritage item.

13. Fieldwork results

One site located: A possible grinding stone was located on a track that has been made by trail bike riders, this stone was placed at the edge of the track, a detailed investigation around the find was undertaken and no other stones where located, this stone is to large to washed there, a check of the bottom of Spring Creek was done to observe what it detailed, no other stones where noticed, so this must have been brought into the area from another place. This PAD maybe situated just outside of the proposed development area.

SITE TYPE Possible Isolated Deposit
GRID COORDINATES
0359086 E
63025411 N
COMMENTS and DESCRIPTION
Oval base:
Length 223 mm Width front edge 20mm centre 135mm bottom edge 45 mm
Crown Sides
Hight front 29 mm centre 115mm bottom edge 25mm
The side forming a crown shape, the base is smooth with the centre showing a much more smoother section.
Approx 65 metres west of Northern Rail Line (between Spring Creek Bridge and the northern edge of the Power Line Easement) and 20 metres south of Spring Creek.

14. Recommendations

Recommendation One

As no Aboriginal Heritage Sites, and only one (1) possible Artifact pertaining to the prehistoric and contact periods was located in the assessment areas of Lot 195 DP 1032847 Bushells Ridge, and recommendation two is accepted, that Darkinjung Local Aboriginal Land Council DLALC display no objection to the construction of the said Rail Line Spur being development on the said areas of Lot 195.

Recommendation Two

(a) Whilst initial earthwork removal are being conducted on the designed rail spur: A DLALC Aboriginal Heritage Sites Officer be present to monitor if any artefacts or sites are uncovered

(B) If in the event of an Aboriginal Cultural Artifact or any other Archaeological Deposits are uncovered in the areas mentioned in Recommendation One, works must cease immediately and DLALC Cultural Heritage Office be contacted immediately to arrange the relevant DLALC officer and DEC NSW to conducted a more intense investigation of the area the Artifact was located.

David Pross
Heritage Officer
Darkinjung Local Aboriginal Land Council

Appendix 4: Site type definitions

Open camp sites

Often called stone artefact scatters, these sites (for the purposes of the NPWS ASR database) are defined by the presence of two or more stone artefacts located within 50 m of one another. So few artefacts cannot obviously provide evidence for the range of activities that may have been undertaken at a particular site, including the production of stone tools and the preparation of food such as the butchering of animals or grinding of seeds. However, the distinction between a single, isolated artefact versus a place where numerous artefacts have been recorded together, provides a necessary division in terms of the possible information that a site can reveal about past activities. Further information recorded about open sites includes assessments of the sites' integrity (how intact the site is) and subsequently whether sub-surface deposits are thought to be present.

Isolated Finds

An artefact, usually of stone, but possibly of other materials, that is located but has no relationship to other identifiable archaeological features.

Scarred Trees

This site type results from the deliberate removal of bark (and sometimes wood) from trees, for the purpose of obtaining raw material for the manufacture of various items of material culture – i.e. shields, coolamons, shelters, canoes, cradles. They may also result from foraging and hunting - for instance, toe holes cut in trees to allow access to upper branches and hollows, and axe marks around natural hollows for the extraction of small tree-living fauna (such as possums or birds) or honey.

The identification and interpretation of a scar as being Aboriginal in origin can often be difficult, as bark can be removed from trees by a variety of means e.g. animal foraging, the natural breaking off tree limbs, the result of machinery damage to trunks and the removal of bark by Europeans to define land boundaries. To assist archaeologists in the accurate identification of Aboriginal scarred trees, the NPWS Western region provides a set of criteria against which each scar must be assessed.

These diagnostic criteria are as follows:

1. *The scar must not touch the ground* - (scars resulting from fire, fungal attack or lightning nearly always reach the ground). Such a termination does not necessarily preclude an Aboriginal origin. Ethno-historic accounts of canoe manufacture occasionally demonstrate scarring to ground level. If the scar does run to the ground, the sides must be relatively parallel (i.e. not triangular);

2. *The ends of the scar should be squared off or evenly tapered* - Different shapes at the top and bottom (e.g. pointed at top, squared at bottom; round at top, flaring at bottom) are suggestive of natural processes (e.g. branch loss);

3. *The sides of the scar should be parallel or symmetrical* - Few natural scars are likely to have these properties, with the possible exception of fire scars which may be

symmetrical but are usually wider at their base. Modern surveyors' marks are typically triangular, and often adzed. These also (regardless of shape) usually have a number carved in the wood, within the scar;

4. *The length of the scar must be on the same axis as the tree and not oblique or slanting across the tree or the branch* - Scars which are natural in origin tend to have irregular outlines, sometimes have irregular regrowth and may occur against the axis of the tree.

5. *The tree should be reasonably old – i.e. over 100 years* - The tree upon which the scar is found should be old enough (i.e. of sufficient age) to have been used by Aboriginal people in (at least) a semi-traditional manner. This means the tree should be at least c. 100 years old. The age of the scar should also be reflected in the thickness of the regrowth. Young scars (e.g. some natural scars caused by branches falling or birds or horses gnawing, have characteristically thin regrowth);

6. *There must be no obvious natural or other artificial cause* such as a branch rip, lightening strike, cockatoo chewed bark or healed bark tears from machinery damage or car impact – Any signs that the scar may not be Aboriginal should be carefully assessed; and,

7. *The tree must not be an introduced species* – For obvious reasons, the tree upon which the scar is found should be endemic to the region, i.e. this excludes historic (exotic) plantings.

Also helpful, but not within the NPWS criteria are the following points:

8. *Axe or adze marks* - A scar with cut marks on the original wood is likely to be anthropogenic in nature (i.e. as a result of human actions). The location and shape/size may lend support to the scar's origin. For example stone axe marks would indicate an Aboriginal origin, while steel axe marks post-date the arrival of Europeans. These of course could still have been made by an Aboriginal person in the post-contact era; and,

9. *The presence of epicormal growth* – Many scars of Aboriginal origin tend to have an epicormal shoot originating at the base of the scar. This is a new branch shooting from the point of damage and is part of the trees self preservation mechanism.

As noted in the NPWS criteria, any tree that does not fit these rules cannot be accepted as likely to be of Aboriginal origin. This may mean that a few authentic scars are omitted from the Aboriginal Sites register, but it is the only means to establish consistency in identification.

However, even when applied, the above criteria cannot always provide a definitive classification, and a natural origin for the scar cannot be ruled out. For this reason interpretations of Aboriginal origin are qualified by the recorders degree of certainty. The following categories are used:

- DEFINITE ABORIGINAL SCAR

This is a scar which conforms to all of the criteria stated above and/or has in addition a feature or characteristic that provide definitive identification, such as diagnostic axe or adze marks, or a historical identification. All conceivably natural causes of the scar can be reliably discounted.

- ABORIGINAL SCAR

This is a scar where Aboriginal origin is considered the most likely. The scar conforms to all of the criteria and a natural origin is considered unlikely and improbable.

- PROBABLE ABORIGINAL SCAR

This is a scar which conforms to most of the criteria, and where an Aboriginal origin is considered to be the most likely. Despite this, a natural origin cannot be completely ruled out.

- POSSIBLE ABORIGINAL SCAR

This is a scar which conforms to most of the criteria but where an Aboriginal origin would appear unlikely[9].

For the purposes of the current study, on the advice of Allan Hutchins (NPWS Western Region), only scars of the first two categories have been recorded as sites to be entered into the NPWS ASR. As a general rule, the "Aboriginal scar" and "Probable Aboriginal scar" categories have been collapsed into one, called "Aboriginal scar". Other scars have been photographed and their locations recorded, but will not be treated at Aboriginal sites.

Carved Trees

The graves of some individuals were marked by carved trees. These had a section of the bark removed from the trunk and geometric designs carved into the exposed wood. The designs resemble rectilinear or curvilinear motifs which were also found decorating wooden weapons and skin cloaks. It is possible that these motifs signified totemic or kinship affiliations of the deceased. Very few such trees remain due to the wholesale land clearance since the advent of European land-use practices. (Maynard 1992: 2).

Axe Grinding Grooves

Aboriginal axe heads were usually made from very hard igneous rock, which was first flaked roughly to the appropriate shape and then pecked or ground to an even surface. To keep the edges of these axes sharp, they were ground on the surface of a relatively softer stone (usually sandstone). As the axe is rubbed repeatedly in the same location, a groove forms to fit the shape of the axe. This groove has a roughly elliptical shape and a smooth,

[9] Occasionally scars are encountered which have all the necessary criteria to be anthropogenic in origin, but have additional features (such as letters or numbers) which suggest that they may have been produced during historic times by non-Aboriginal people.

regular surface along its base. Arrowheads may also have been sharpened in grooves, which generally appear narrower and deeper.

Grinding groove sites are most often located on the floodplains of rivers and creeks, although they can be in elevated positions above water as well. Sometimes, sandstone flats near water may exhibit hundreds of such grooves, and it is thought that once an axe blank has its edge ground in a groove, then it can only be sharpened in the same groove. Hence, if the owner of the axe is away from its place of origin, then a new groove has to be created for the sharpening of that particular axe head[10]. Grooves are also frequently recorded in smaller groups, especially along more ephemeral water courses.

Burials

Human skeletal remains can occur as either single individual burials or as cemeteries containing multiple individuals. Several have been found in the local region (Section 5.2). Individuals may be buried either in a standing or sitting position, often oriented to the east and sometimes marked by carved trees.

Natural Mythological or Cultural / Ceremonial sites

Natural mythological sites can be any natural feature and like a cultural / spiritual are not detectable without the traditional knowledge of specific areas. Lindsey Moran from the BLALC is a keeper of such knowledge and was present in an effort to establish the presence of any such site type.

Rockshelter sites

Rockshelters occur as weathered overhangs or recesses in sandstone cliffs or boulder outcrops. To have archaeological potential they should be sheltered (i.e. dry inside), large enough for people to sit or stand and possess a reasonably flat floor. Occupation deposits, stone tools, food remains, hearths may build up as a layer on the floor depending on the length or frequency of occupation. Burials may also occur in rock shelter sites. A suitable shelter with a build up of deposit but without visible Indigenous artefacts is known as a shelter with Potential Archaeological Deposit (PAD). Paintings, drawings or stencils may be found on the walls or roofs of rockshelters, usually where the stone is smooth and provides an appropriate surface.

[10] As read at the Terramungamine Reserve grinding groove interpretation sign.

Appendix 5: DECCW Site Cards and location sketches

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

New Recording ☒ Additional information ☐

SITE IDENTIFICATION					
Site name	***WC-OS1***			**NPWS Site Number**	
Owner/manager	*Wyong Area Coal Joint Venture*				
Owner Address					
LOCATION					
Location	*Banks of Wallarah Creek*				
How to get to the site	Hue Hue Road Exit of the Sydney Newcastle Freeway (through Owners)				
1:250,000 map name	***Dooralong***			**NPWS map code**	
AMG Zone	56	**AMG Easting**	355185-355115 E	**AMG Northing**	6324252 - 6324292N
Method for grid reference	Hand-held GPS	**Map scale (if method = map)**	1:25 k	**Map name**	Dooralong
NPWS District Name (see map)				**NPWS Zone (see map)**	
Portion no.				**Parish**	Morisset
SITE DESCRIPTION					
Site type(s)	Open site			**Site type code (NPWS use only)**	

Description of site and contents

CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.
DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.
ART: area of decorated surface, motifs, colours, wet,/dry pigment, engraving technique, no. of figures, sizes, patination.
BURIALS: number & condition of bone, position, age, sex, associated artefacts.
TREES: number, alive, dead. likely age, scar shape, position, size, patterns, axe marks, regrowth.
QUARRIES: rock type, debris, recognisable artefacts, percentage quarried

This open artefact scatter site is situated on the banks of Wallarah Creek at an elevation of c. 20m AHD. The site is located within an alluvial landform, at the base of long, low gradient slopes stretching back from the drainage line. In general visibility was low and in areas of better visibility, surface erosion was active, potentially removing evidence from the skeletal soils that characterise the lower slopes. The site is considered to extend at minimum c. 150m along the bank of Wallarah Creek on the west and extends to the east bank, at minimum beneath the electricity transmission line, although it is likely to extend further.

The artefacts were recorded in several exposures along a sandy vehicle track, illustrated on a site sketch. The track is better established in the vicinity of the transmission line, allowing significantly better exposures in this location, coinciding with higher surface artefact visibility.

Artefacts included flakes and cores of a creamy, fine grained material, possibly an indurated mudstone / chert. Also present were artefacts of good quality silcrete.

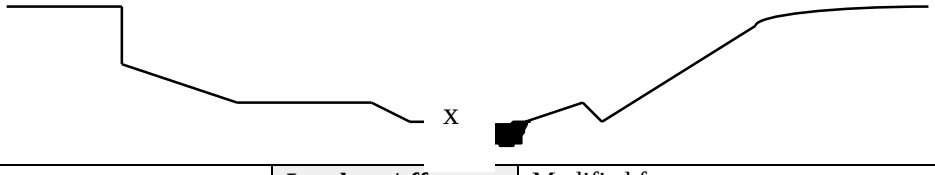
It is considered that the nature of the landform combined with the lack of visibility, makes it very likely that artefact material will be found beyond the locations at which surface manifestations exist. The confluence of a tributary into Wallarah Creek at this point is by no means an accident, as this particular environmental setting is a proven popular location for Aboriginal occupation during prehistory. Given its proximity to other sites and the suitable landform, there is potential for sub-surface deposits in this area, although their condition may be questionable due to the affects of erosion.

Attach photographs and sketches, eg. plan & section of shelter.
Do NOT dig, disturb or damage site or contents.

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

SITE ENVIRONMENT						
Land form	***Creek bank***		**Aspect**		**Slope**	
Mark position of the site						
Local rock type	sandstone		**Land use/effect**	Modified for easement		
Distance from drinking water	1 m		**Source**	Wallarah Creek		
Resource zone (eg. estuarine, river, forest)	Fresh water		**Vegetation**	Cleared		
Edible plants	Yes		**Faunal resources** (include shellfish)			
Other exploitable resources (eg. ochre)						
Are there other sites in the locality	yes	**Are they in the Sites Register**	No	**Other site types include**	1 scarred tree and 1 isolated find.	

SITE MANAGEMENT			
Site condition	Cleared but soil profile appears to be intact.		
Management recommendations	Will not be impacted by proposed development.		
Have artefacts been removed from site	No	**When**	
By whom		**Deposited at**	
Consent applied for	☐	**Consent issued**	☐
Date of issue		**Consent number**	

SITE INSPECTION AND RECORDING			
Reason for investigation	Proposed Wallarah 2 Coal Project		
Were local Aborigines contacted or present for the recording	☐Not contacted ☒Contacted and present ☐Contacted but not present	**Names and addresses**	Kevin Robinson & Tracey-Lee Howe Guringai Tribal Link 19 coolabah Rd Wyongah NSW 2259 Sharon Hodgetts,& Jason Taylor Darkinjung LALC PO Box 401 Wyong NSW 2259
Is the site important to local Aborigines			
Verbal/written reference sources	OzArk Environmental & Heritage Management, 2006 Heritage Survey Wallarah 2 Coal Project, Wyong	**ASR report number(s) (or title)**	C- C-
Photographs taken	Yes	**No. of Photos attached**	
Site recorded by	Jodie Benton & Phil Cameron	**Date of recording**	Nov 2006
Address/institution	OzArk EHM PO Box 2069 Dubbo 2830		

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

New Recording ☒ Additional information ☐

SITE IDENTIFICATION						
Site name	***WC-ST1***			**NPWS Site Number**		
Owner/manager	*Wyong Area Coal Joint Venture*					
Owner Address						
Location	*Banks of Wallarah Creek*					
How to get to the site	Hue Hue Road Exit of the Sydney Newcastle Freeway (through Owners)					
1:250,000 map name	***Dooralong***			**NPWS map code**		
AMG Zone	56	**AMG Easting**	355 162 E	**AMG Northing**		6324 145 N
Method for grid reference	Hand-held GPS	**Map scale (if method = map)**	1:25 k	**Map name**		Dooralong 9131-1S
NPWS District Name (see map)				**NPWS Zone (see map)**		
Portion no.				**Parish**		Morriset
SITE DESCRIPTION						
Site type(s)	Scarred tree			**Site type code (NPWS use only)**		ST

Description of site and contents

CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.
DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.
ART: area of decorated surface, motifs, colours, wet,/dry pigment, engraving technique, no. of figures, sizes, patination.
BURIALS: number & condition of bone, position, age, sex, associated artefacts.
TREES: number, alive, dead. likely age, scar shape, position, size, patterns, axe marks, regrowth.
QUARRIES: rock type, debris, recognisable artefacts, percentage quarried

This scarred tree is a Blackbutt (*E. pilularis*) located on the southern bank of a tributary flowing into Wallarah Creek and within c. 50 m of this confluence, at an elevation of AHD c. 25m. The tree is situated on a sandy, creek bank landform on DP 258692.

The scarred tree is alive, c. 25m in height, and 2.73m in circumference. The elongated, south-southeast facing scar has dimensions of 104 x 13cm, with a depth of c. 15cm. The original dimensions, based on regrowth, may have been c.132 x 43cm.

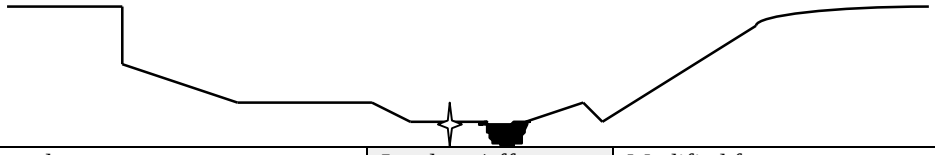
The scar on this tree is assessed as being of **possible** Indigenous cultural origin, but it must be noted that the tree is adjacent to a vehicle track and could be the result of damage from a vehicle, or from previous natural processes that have affected the tree. Morphological characteristics of the scar, however, such as its alignment with the trunk, its elongate nature and more specifically the tapered appearance of both ends, lend themselves to an interpretation of the scar as anthropomorphic in origin. Further support for this contention comes from the presence of artefacts in direct association with the scarred tree (those noted in Table 6 as being from the southern exposure as there is positive evidence for the Indigenous use of the area in prehistory.

Attach photographs and sketches, eg. plan & section of shelter.
Do NOT dig, disturb or damage site or contents.

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

SITE ENVIRONMENT						
Land form	***Creek bank***		**Aspect**		**Slope**	
Mark position of the site						
Local rock type	sandstone		Land use/effect	Modified for easement		
Distance from drinking water	1 m		Source	Wallarah Creek		
Resource zone (eg. estuarine, river, forest)	Fresh water		Vegetation	Cleared		
Edible plants	Yes		Faunal resources (include shellfish)			
Other exploitable resources (eg. ochre)						
Are there other sites in the locality	yes	**Are they in the Sites Register**	No	**Other site types include**	1 open site. and one possible scarred tree, site cards will be submitted with this site card.	

Site condition	cleared		
Management recommendations	Will not be impacted by proposed development.		
Have artefacts been removed from site	No	**When**	
By whom		**Deposited at**	
Consent applied for	☐	**Consent issued**	☐
Date of issue		**Consent number**	

Reason for investigation	Proposed Wallarah 2 Coal Project		
Were local Aborigines contacted or present for the recording	☐Not contacted ☒Contacted and present ☐Contacted but not present	**Names and addresses**	Kevin Robinson & Tracey-Lee Howe Guringai Tribal Link 19 coolabah Rd Wyongah NSW 2259 Sharon Hodgetts & Jason Taylor Darkinjung LALC PO Box 401 Wyong NSW 2259
Is the site important to local Aborigines			
Verbal/written reference sources	OzArk Environmental & Heritage Management, Dec 2006 Heritage Survey Wallarah 2 Coal Project, Wyong	**ASR report number(s) (or title)**	C- C-
Photographs taken	Yes	**No. of Photos attached**	
Site recorded by	Jodie Benton, Phil Cameron	**Date of recording**	Nov 2006
Address/institution	OzArk EHM PO Box 2069 Dubbo 2830		

Aboriginal Sites Register of NSW

NPWS, PO Box 1967, Hurstville NSW 2220

Standard Site Recording Form

New Recording ☒ Additional information ☐

SITE IDENTIFICATION						
Site name	***WC-IF1***			**NPWS Site Number**		
Owner/manager	*Wyong Area Coal Joint Venture*					
Owner Address						
Location	*Banks of Wallarah Creek*					
How to get to the site	Hue Hue Road Exit of the Sydney Newcastle Freeway (through Owners)					
1:250,000 map name	***Dooralong***			**NPWS map code**		
AMG Zone	56	**AMG Easting**	355 002 E	**AMG Northing**		6324 087 N
Method for grid reference	Hand-held GPS	**Map scale (if method = map)**	1:25 k	**Map name**		Dooralong 9131-1S
NPWS District Name (see map)				**NPWS Zone (see map)**		
Portion no.				**Parish**		Morriset
SITE DESCRIPTION						
Site type(s)	Isolated find			**Site type code (NPWS use only)**		

Description of site and contents

CHECKLIST: eg. length, width, depth, height of site, shelter, deposit, structure, element eg. tree scar, grooves in rock.
DEPOSIT: colour, texture, estimated depth, stratigraphy, contents-shell, bone, stone, charcoal, density & distribution of these, stone types, artefact types.
ART: area of decorated surface, motifs, colours, wet,/dry pigment, engraving technique, no. of figures, sizes, patination.
BURIALS: number & condition of bone, position, age, sex, associated artefacts.
TREES: number, alive, dead. likely age, scar shape, position, size, patterns, axe marks, regrowth.
QUARRIES: rock type, debris, recognisable artefacts, percentage quarried

Isolated find WC-IF1 is located on the northern bank of a tributary into Wallarah Creek. The site was recorded on a dirt track that is actively eroding. Surrounding areas are unlikely to have been ploughed but may have been grazed, and have been selectively cleared. Visibility was good on the track, but poor off it .

This is the same tributary that provides evidence of occupation at its confluence with Wallarah Creek, several hundred metres to the east. Although this isolated find has been presented as a separate site from WC-OS1, it is in essence considered to be part of the same site complex. It is likely that visibility and erosion have influenced the appearance of the archaeological record in this area, although it is also plausible that temporal variation may also be a factor.

The artefact comprising WC-IF1 is a cream flake possibly of indurated mudstone. Given its proximity to other sites and suitable landform, it is likely to have at some point been associated with other artefacts, and there is potential for sub-surface deposits in this area, although their condition may be questionable due to the affects of erosion

Attach photographs and sketches, eg. plan & section of shelter.
Do NOT dig, disturb or damage site or contents.

Aboriginal Sites Register of NSW

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Standard Site Recording Form

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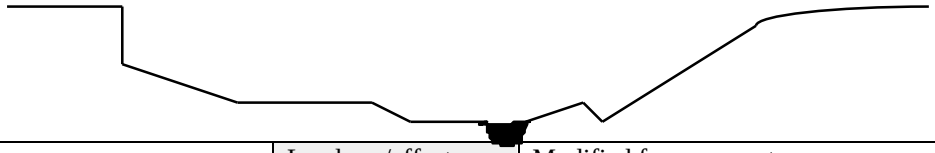
Mark position of the						
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Address/institution	OzArk EHM PO Box 2069 Dubbo 2830		