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RESEARCH

Archaeological and Cultural Heritage Assessment: Review of West Cliff Area 5 – Longwalls 34-36, Appin, NSW

Report for BHP Billiton Illawarra Coal

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ABBREVIATIONS

AHC	Australian Heritage Council
AHIMS	Aboriginal Heritage Information Management System
ATSIC	Aboriginal and Torres Strait Islander Commission
BHPBIC	BHP Billiton Illawarra Coal
CHL	Commonwealth Heritage List
CBNTAC	Cubbitch Barta Native Title Aboriginal Claimants
DEC	Department of Environment and Conservation (now DECC)
DECC	Department of Environment and Climate Change
DEH	Department of Environment and Heritage
EP&A	Environmental Protection and Assessment
EPBC	Environment Protection and Biodiversity Conservation
GSV	Ground surface visibility
ICOMOS	International Council on Monuments and Sites
TLALC	Tharawal Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
MGA	Map Grid of Australia – unless otherwise specified all coordinates are in MGA
NHL	National Heritage List
NNTT	National Native Title Tribunal
NPWS	National Parks and Wildlife Service (now part of DECC)
PAD	Potential Archaeological Deposit
REP	Regional Environment Plan
RNE	Register of the National Estate
SHI	State Heritage Inventory
SHR	State Heritage Register
SMP	Subsidence Management Plan

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EXECUTIVE SUMMARY

BHP Billiton Illawarra Coal (BHPBIC) are continuing and extending their underground coal mining operations at West Cliff Colliery near Appin. Biosis Research Pty Ltd has been commissioned to conduct an archaeological assessment for proposed Longwalls 34 to 36 within West Cliff Area 5. The majority of this area has been subject to previous archaeological investigation (Sefton 1998, 2002a, 2002b; Navin Officer 1992, 2002a, 2006; ERM 2002; Biosis Research 2005, 2007a, 2007b) (see Figure 3). As such, detailed survey of the longwall layout out was not undertaken. Rather, previously identified sites were relocated and their condition status updated, and any previously unsurveyed areas likely to yield archaeological sites along landforms likely to be subject to mining related subsidence movements were targeted.

Nine previously recorded Aboriginal archaeological sites are situated within the Subsidence Management Plan (SMP) Area surrounding Longwalls 34 to 36. These include three stone artefact scatter sites, and six shelter with art and / or deposit sites. All of these sites have been registered on the Aboriginal Heritage Information Management System at DECC. All six of the shelters with art and / or deposit sites are situated within the SMP Area.

One previously identified historic heritage item, the Upper Canal, is situated within close proximity to the SMP Area. The Upper Canal system is listed on the Register of the National Estate, the State Heritage Register, the Campbelltown LEP 2002 – District 8, Heritage Schedule 1 and the Sydney Catchment Authority S170 Heritage and Conservation Register. The Upper Canal comprises several identified components (such as the Cataract Tunnel, the canal, and numerous flumes, culverts and aqueducts) and has been identified as a heritage item of state-level heritage significance.

Four other historic features have been identified within the SMP Study Area, including the remains of an early pub site, grave site, former house site and a former crossing and related roadway over the Georges River.

Potential Impacts to Aboriginal sites

Subsidence prediction data for the nine Aboriginal archaeological sites within the SMP Area was supplied by MSEC (2007). The likelihood of significant impacts to these Aboriginal archaeological sites is considered to be low.

As the shelter with art sites are situated within the valleys of the Georges River and Mallaty Creek, these site types have the potential to be impacted by mine subsidence movements. The MSEC (2007) predictions highlight shelter with art and deposit site Ousedale Creek 3 (52-2-2237) to have the maximum predicted systematic subsidence, strain and tilt related movements. This may result in fracturing of the sandstone bedrock causing rock instability (MSEC 2007:91). The remaining shelter with art sites have relatively small maximum predicted tensile and compressive strains and are therefore unlikely to be impacted by the extraction of the proposed longwalls. However, due to the predicted instability of Cliff GR-

CL 01 the two shelter with art sites located on this cliff line have a slightly higher likelihood of impact due to cliff line instability as a result of mining subsidence.

Subsidence impacts to the three open sites, Douglas Park (52-2-0021), Leafs Gully 1 (52-2-2265) and Georges River 2 (52-2-2266) is considered to be highly unlikely (MSEC 2007:90).

Potential Impacts to Historical sites

The Upper Canal is on the western margin of the SMP Area, and at least 290 metres from the end of Longwall 36. As it is located outside the predicted 20 mm subsidence contour, it is unlikely to be subjected to any significant subsidence movements (MSEC 2007). It could however be subject to far-field horizontal movements. As such movements tend to be bodily movements associated with very low levels of strain, it is again unlikely that the canal would be impacted by far-field horizontal movements resulting from extraction of Longwalls 34 to 36.

Subsidence predictions have been calculated for wrought iron aqueducts where the Upper Canal crosses Leafs Gully and Nepean Creek. The maximum predicted total subsidence, upsidence and closure movements at the creek crossings are minimal, however, it has been recommended that these results are reviewed by the SCA and that necessary preventative measures are implemented (MSEC 2007:62).

SUMMARY OF RECOMMENDATIONS

Aboriginal archaeological sites

There are nine Aboriginal archaeological sites situated within the current SMP Area.

Aboriginal Recommendations

Based on the subsidence predictions provided by MSEC (2007), it is unlikely that there will be significant impacts to the archaeological sites resulting from the proposed longwall mining.

However, as six of the Aboriginal archaeological shelter with art sites (52-2-2234, 52-2-2237, 52-2-2241, 52-2-2242, 52-2-2243, and 52-2-2244) are located within the SMP Area, a monitoring program will be implemented.

The monitoring program would involve site visits prior to the commencement of extraction of Longwalls 34 to 36, during extraction and 3, 6 and 12 months following the completion of extraction adjacent to the sites.

Notwithstanding the low probability of damage to these sites, BHP Billiton Illawarra Coal will apply for consents under s90 of the National Parks and Wildlife Act 1974 *for sites:*

- *52-2-2234*
- *52-2-2241*
- *52-2-2242*

- *52-2-2243*
- *52-2-2244*

An application for a Section 90 consent for site 52-2-2237 has been submitted to the DECC in light of the low probability of damage that may arise from mining Longwall 33.

Ongoing consultation will continue between BHP Billiton Illawarra Coal, the Tharawal Local Aboriginal Land Council, Cubbitch Barta Native Title Claimants, and DECC as required.

A copy of this report will be distributed to the Aboriginal communities for their review and comment on receipt of final comments from BHP Billiton Illawarra Coal.

Historical archaeological sites

The Upper Canal and its components are listed on the NSW State Heritage Register. The Upper Canal, WH1, WH2, WH3 and WH4 are located within the current SMP Area. Although no impacts were observed to any of the heritage items during and following the extraction of Longwalls 31-33, the following recommendations should be undertaken.

Historical Recommendations

Upper Canal

The existing CMP for the Upper Canal should be followed at all times. The potential for far-field subsidence movements identified by MSEC (2007) should be taken into consideration, and if required, the management plan (CMP) amended accordingly.

Consultation between BHP Billiton Illawarra Coal, MSEC, the Sydney Catchment Authority heritage officer and the NSW Heritage Council / NSW Heritage Office should be an integral component of this process. If required, a Statement of Heritage Impact should be completed prior to the commencement of Longwalls 34-36.

Heritage Features

Prior to mining works occurring in the area detailed recording of sites WH2 – WH4 should be undertaken. This should include photographic recording and plan mapping. Copies of these records should be lodged in a publicly accessible repository.

Although it is unlikely that these sites will be impacted as a result of mining associated within Longwalls 34-36, it is recommended that monitoring of historic road site (WH1) on the Georges River, should occur prior, during and after longwall extraction.

1.0 INTRODUCTION

Cultural heritage legislation protecting Aboriginal and historic heritage places applies in New South Wales. These places are an important part of our heritage. They are evidence of more than 40,000 years of occupation of New South Wales by Aboriginal people, and of the more recent period of post-contact settlement.

Heritage places can provide us with important information about past lifestyles and cultural change. Preserving and enhancing these important and non-renewable resources is encouraged.

It is an offence under sections of legislation to damage or destroy heritage sites without a permit or consent from the appropriate body (see Appendix 3 for a discussion of relevant heritage legislation and constraints).

When a project or new development is proposed, it must be established if any cultural heritage places are in the area and how they might be affected by the project. Often it is possible to minimise the impact of development or find an alternative to damaging or destroying a heritage place. Therefore, preliminary research and survey to identify heritage places is a fundamental part of the background study for most developments.

The first stage of a study usually incorporates background research to collect information about the land relevant to the proposed development project (the study area). A second stage often involves a field inspection of this area.

Possibly the most important part of the study involves assessing the cultural heritage significance of heritage places in the study area. Understanding the significance of a heritage place is essential for formulating management recommendations and making decisions.

1.1 Project background

This report has been commissioned in order to identify and assess Aboriginal and historic cultural heritage values of proposed Longwalls 34-36 within West Cliff Area 5, north of Appin (Figure 1). Results of this investigation will be used to assess the impacts of subsidence on Aboriginal archaeological and cultural heritage sites and historical archaeological and heritage sites associated with the three longwalls. Subsidence predictions associated with the Subsidence Management Plan (SMP) Area have been developed by Mine Subsidence Engineering Consultants (MSEC) from which impacts to archaeological sites will be predicted.

Recommendations designed to minimise and manage impacts to cultural heritage places have been formulated according to legislative constraints and ‘best practice’ heritage management.

1.2 Study area

The study area is located at a number of private properties immediately north of the township of Appin, NSW (Figure 1). Situated on the Woronora Plateau, within the Wollondilly Local Government Area (LGA), the study area is located between the Georges River in the east and the Nepean River in the west. The study area includes the proposed longwall areas and the SMP area surrounding the longwalls (Figures 2 and 3).

The study area is dissected by Mallaty Creek running east-west, the Moomba to Sydney gas pipeline and two overhead electricity easements. The majority of the study area comprises open cleared grazing farmland with pockets of modified native vegetation located along creek and drainage lines.

Mapping of the study area (see Figures 2 and 3) shows the proposed longwall area (shown as a yellow area), the Subsidence Management Plan (SMP) area (shown as a green line) and the predicted 20 mm vertical subsidence contour (shown as an orange line). The area of the SMP is determined by a line representing either the 35 degree angle of draw or the 20 millimetre subsidence contour, whichever is the greater area. For this project, the SMP area has been based on the 35 degree angle of draw line, however the 20 mm subsidence contour has also been indicated as it is included in the impact assessment discussions.

1.3 Aims

The following is a summary of the major objectives.

- Conduct heritage register searches to identify previously recorded cultural heritage sites within the study area (SMP Area). Searches will include the Aboriginal Heritage Information Management System (AHIMS), the National Heritage List, Commonwealth Heritage List, Register of the National Estate, State Heritage Register, Local Environmental Plan and National Trust heritage lists.
- Conduct additional background research in order to recognise any identifiable trends in site distribution and location.
- Consult with identified stakeholders in the area.
- Undertake field reassessment of known archaeological sites most likely to be impacted by subsidence.
- Record and assess sites identified during the survey in compliance with the guidelines issued by the NSW Department of Environment and Climate Change (DECC) and the NSW Heritage Office.
- Assess the heritage significance of all identified Aboriginal and historic cultural heritage sites and places.
- Identify impacts to all identified Aboriginal and historic cultural heritage sites and places based on potential changes as a result of the proposed longwall mining activities.

- Make recommendations to minimise or mitigate impacts to cultural heritage values within the study area.

1.4 Consultation with the Aboriginal Community

Consultation for this project has been undertaken with the stakeholders including the identified Local Aboriginal Land Councils, registered Elders Corporations and Registered Native Title claimants that were involved in the original cultural heritage surveys for West Cliff Area 5. Consultation has been undertaken with representatives from the following Aboriginal stakeholder groups:

- Tharawal Local Aboriginal Land Council (Leanne Hestalow and Donna Whillock)
- Cubbitch Barta Native Title Claimants Aboriginal Corporation (Glenda Chalker and Jacara Clark)

A copy of this report will be forwarded to all the above listed Aboriginal communities for comment. The Aboriginal communities will provide advice regarding the cultural significance of the heritage sites.

Further consultation with the Aboriginal community will be conducted as per the DECC's *National Parks and Wildlife Act 1974: Part 6 Approvals Interim Community Consultation Requirements for Applicants* when Consent to Damage permits are sought from DECC.

1.5 Terminology

For consistency with other reports associated with the Subsidence Management Plan (SMP) for this mining application, the following terminology is used:

- SMP Area - the surface area that is likely to be affected by the proposed mining of Longwalls 34 to 36 in the Bulli Seam at West Cliff Colliery. The extent of the SMP area has been calculated by combining the areas bounded by the following limits: the 35 degree angle of draw line, predicted vertical limit of subsidence (20mm) and areas sensitive to far field movements. The study area – as referred to in this report only is the equivalent of this SMP area.
- Subsidence – in terms of this assessment subsidence is taken to mean the sum total of vertical (upsidence and subsidence) and horizontal surface movements due to the extraction of coal using longwall mining techniques. The MSEC report (MSEC 2007) describes these mechanisms in detail.
- The MSEC Report – Mine Subsidence Engineering Consultants have prepared the subsidence predictions and impact assessment for this report. It is cited above as (MSEC 2007). The report will hereafter be referred to as the MSEC report unless otherwise stated.

2.0 HERITAGE STATUS AND PLANNING DOCUMENTS

2.1 National Registers

2.1.1 The National Heritage List, Commonwealth Heritage List and Register of the National Estate

The *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) establishes two mechanisms for protection of heritage places of National or Commonwealth significance. The National Heritage List provides protection to places of cultural significance to the nation of Australia. The Commonwealth Heritage List comprises natural, Aboriginal and historical heritage places owned and controlled by the Commonwealth and therefore mostly includes places associated with defence, communications, customs and other government activities.

Nominations to these two lists are assessed by the Australian Heritage Council (AHC), which also compiles the Register of the National Estate, a list of places identified as having national estate values. There are no management constraints associated with listing on the Commonwealth Heritage List or Register of the National Estate unless the listed place is owned by a commonwealth agency.

APPLICATION TO THE STUDY AREA – NATIONAL HERITAGE REGISTERS

There is one item listed on the Register of the National Estate that is situated 400 metres north west of the end of the proposed longwalls. The item is the Upper Canal Water Supply System.

2.1.2 National Native Title Register

The Commonwealth *Native Title Act* 1993 (Cth) establishes the principles and mechanisms for the recognition of and determination of Native Title for Aboriginal people.

The purpose of searching the register is to identify any Traditional Owner groups with current registered claims close to the study area that may identify themselves as relevant stakeholders with traditional knowledge or experience.

APPLICATION TO THE STUDY AREA – NATIONAL NATIVE TITLE REGISTER LISTINGS

A search of the National Native Title Register, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements was completed on 24 August 2007. There are no lands determined to have native title, no registered native title claims or indigenous land use agreements within the study area or its immediate vicinity.

However, the search identified a registered Native Title Claim lodged by the Cubbitch Barta Clan of the Dharawal People #3 (reference NC98/23) that is situated near Helensburgh. This group have relevant knowledge and experience within the immediate study area.

2.2 State Registers

2.2.1 National Parks and Wildlife Act 1974 Registers

The Department of Environment and Climate Change (DECC) maintains a database of Aboriginal sites within NSW under Part 6 of the NSW *National Parks and Wildlife Act 1974*. Aboriginal objects and places in NSW are legally required to be registered on the Aboriginal Heritage Information Management System (AHIMS) register.

The area searched on the AHIMS database was larger than the study area, as Aboriginal sites recorded within the wider area will provide a regional perspective on the types of sites that maybe expected to be found within the study area.

APPLICATION TO THE STUDY AREA – AHIMS DATABASE

A search of the AHIMS Database completed on 16 March 2007 identified 38 previously recorded Aboriginal sites within a 5 x 5 km search area centred on the study area (see Section 5.2.). Nine of these sites are situated within the current study area.

2.2.2 Heritage Act 1977 Registers

The NSW Heritage Office, part of the Department of Planning, maintains registers of heritage and archaeological items that are of State or local significance.

The State Heritage Register (SHR) contains items that have been assessed as being of State Significance to New South Wales. The State Heritage Inventory (SHI) contains items that are listed on Local Environmental Plans and/or on a State Government Agency's Section 170 registers that are deemed to be of local significance.

If an item or place does not appear on either the SHR or SHI this may not mean that the item or place does not have heritage or archaeological significance; many items have not been assessed to determine their heritage significance. An assessment is required for items that are 50 years or older. Items that appear on either the SHR or SHI have a defined level of statutory protection. This is discussed more fully in Appendix 2.

In addition, Section 170 of the NSW *Heritage Act 1977* requires that culturally significant items or places managed or owned by Government agencies be listed on departmental Conservation and Heritage Registers. Information in these Registers has been prepared according to NSW Heritage Office guidelines and should correspond with information in the State Heritage Inventory. There are no State Agency assets within the present study area.

APPLICATION TO THE STUDY AREA – NSW STATE HERITAGE REGISTER LISTINGS

The study area (SMP Area) contains one item listed on the State Heritage Register and no items listed on the State Heritage Inventory. The Upper Canal Water Supply System is listed on the State Heritage Register as a State Significant item currently managed by the Sydney Catchment Authority. As such the Canal is also listed on the Sydney Catchment Authority S170 Heritage and Conservation Register.

2.2.3 Environmental Planning and Assessment Act 1979 Registers

The *Environmental Planning and Assessment Act 1979* includes provisions for local government authorities to consider environmental impacts in land-use planning and decision making. Such impacts are generally considered in relation to the planning provisions contained in the Local Environment Plan (LEP) or Regional Environment Plan (REP).

Local Environmental Plans: Each Local Government Area (LGA) is required to create and maintain a LEP that includes Aboriginal and historic heritage items. Local Councils identify items that are of significance within their LGA, and these items are listed on heritage schedules in the local LEP and are protected under the *EP&A Act 1979* and *Heritage Act 1977*.

APPLICATION TO THE STUDY AREA – CAMPBELLTOWN LEP 2002 – DISTRICT 8, SCHEDULE 1

One item within the study area is listed in the heritage schedule of the *Campbelltown LEP 2002 – District 8, Schedule 1*. This item is the Sydney Water Supply Upper Canal.

2.3 Non-Statutory Registers

2.3.1 The National Trust of Australia (NSW)

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

APPLICATION TO THE STUDY AREA – NATIONAL TRUST OF AUSTRALIA (NSW)

The study area contains no heritage items classified (listed) by the National Trust of Australia.

2.4 Summary of heritage listings in the study area

There are 10 previously identified heritage items within the Longwalls 34-36 study area (SMP Area). These are summarised in Table 1 below.

ITEM	*RNE*	*CHL*	*NHL*	*AHIMS*	*SHR*	*SHI*	*CLEP 2002*	*NATIONAL TRUST*
Upper Canal Water Supply System	Y				Y	Y	Y	Y
Ousedale Creek No 3 (52-2-2237)				Y				
Leafs Gully 1 (52-2-2265)				Y				
Georges River No. 4 (52-2-2242)				Y				
Georges River No 3 (52-2-2244)				Y				
Georges River No 2 (52-2-2243)				Y				
Georges River No 5 (52-2-2241)				Y				
Georges River No 1 (52-2-2234)				Y				
Georges River (52-2-2266)				Y				
Douglas Park (52-2-0021)				Y				

Table 1: Summary of known heritage items within the study area.

3.0 ENVIRONMENTAL CONTEXT

The environmental background to the study area is provided in order to give a context to the archaeological assessment. The environmental conditions of the study area may have influenced the land use by people in the past, the conditions will also affect the processes by which archaeological sites are preserved, and the environmental aspects of an area also influence the type of archaeological sites that are likely to be present. Environmental values of an area can also contribute to the cultural significance and attachments people have to a place.

The following background is a summary of information relevant to the current assessment of archaeological values of the study area.

3.1 Geomorphology

3.1.1 Geology, Landforms and Soil

The study area is located within the Sydney Basin, a geological province that consists of Permian and Triassic aged sedimentary rock. The surface geology is characterised by shales of the Wianamatta Group and sandstones of the Hawkesbury Sandstone, which both date to the middle-Triassic. Below this lie the sedimentary units of the Narrabeen Group, and the Illawarra Coal Measures which include the Bulli and Wongawilli coal seams (Branagan and Packham 2000: 56-8).

More specifically, the study area is situated on the transitional zone between two distinct physiographic regions: the Cumberland Plain and the Woronora Plateau (Hazelton and Tille 1990). The Cumberland Plain is more commonly characterised by a moderate undulating landscape formed by the weathering of the underlying Wianamatta shales, while the Woronora Plateau can be characterised by steep blocky valleys and cliff lines of the underlying Hawksbury sandstone, exposed by major rivers and creeks. Both the open undulating ridgelines and sandstone scarps of these features have the potential to contain archaeological sites.

Within the study area, the Nepean and Georges rivers have dissected the underlying shales and sandstones to form significant steep sided sandstone valleys and rocky cliff lines. The smaller creeks and drainage features of the Nepean River, such as Ousedale, Mallaty, Leafs Gully, Nepean, Simpsons and Elladale creeks, also produce moderate sandstone valleys.

Four soil landscapes have been identified within the present study area (Hazelton and Tille 1990). The physiographic features of the landscape have been incised by the Georges River, and the smaller feeder creeks of the Nepean River. Each soil landscape has distinct morphological and topological characteristics. This results in each landscape having different archaeological potential. Because they are defined on a combination of soils, topography, vegetation and weathering conditions, soil landscapes are essentially terrain units that provide a useful way to summarise archaeological potential and exposure.

Luddenham (lu)

The first and predominate landscape is the Luddenham soil landscape, characterised by steep hills with narrow ridge lines and hill crests that grade into narrow concave drainage lines (Hazelton & Tille 1990). The vegetation is generally open woodland (dry sclerophyll). Trees in this landscape are typically spotted gums, red gums, broad-leaved and narrow-leaved ironbark. Understorey shrub species include blackthorn, coffee bush hickory and hairy clerodendrum (Hazelton & Tille 1990).

Lucas Heights (lh)

The Lucas Heights landscape is located along the western edge of the study area and accounts for approximately 10% of the land surface of the area in question. This soil landscape is a residual landscape of gently undulating crests, ridges and plateau surfaces of the Mittagong (Hazelton and Tille 1990:23). The soils consist of moderately deep podzols and soloths (acid soils) on ridges, plateau surfaces and crests and earthy sands in valley flats. Such soils have reasonable potential to contain archaeological deposits, including stone artefact scatter sites. However, impact from vegetation clearance for pastures results in site disturbance and poor preservation.

Hawkesbury (ha)

The Hawkesbury Sandstone soil landscape is characterised by rugged sandstone escarpment and ridges, with moderate to steep slopes and narrow, deeply incised valleys of the Woronora Plateau (Hazelton & Tille 1990). Sandstone rock outcrops are very common, and occur as boulders, benches and large blocks, often forming cliffs up to 10 metres high. The Hawkesbury soil landscape is confined to the margins of the major rivers including the Nepean and Georges, and larger tributaries. The soils in this landscape are shallow, discontinuous and generally sandy. The Hawkesbury landscape is the most archaeologically sensitive landscape in the study area, as the blocks and weathered valleys provide overhangs with a suitable environment for rock art and in some cases the accumulation of cultural deposits; however deposits with the potential for deep, stratified archaeological sites are very limited.

Blacktown (bt)

The Blacktown residual landscape characterises much of the Cumberland Lowlands and the Woronora Plateau. It has gently undulating rises without rock outcrops (local relief to 30 m with slopes less than 5% grade). Broad rounded crests and ridges with gently inclined slopes are the dominant topography of this landscape (Hazelton & Tille 1990). The soils consist of shallow to moderately deep podzols. Due to their age and slow accumulation residual soil landscapes have reasonable potential to contain archaeological deposits in an open context, such as stone artefacts derived from occupation sites. However, the slow accumulation and high impact of extensive land clearing (usually associated with pastoral development) during more recent times often results in poor preservation of archaeological material.

3.2 Climate

The climate at Picton (15 kilometres west of the Appin) generally consists of mild summers with an average maximum of 28.6 degrees Celsius and minimum of 15.4 degrees Celsius in February, and cold, wet winters with an average minimum of 1.7 degrees Celsius and a maximum of 16.8 degrees Celsius in July (Bureau of Meteorology 2004). Recorded rainfall readings taken in 2004 indicate an average annual rainfall of 803.6 millimetres. The average number of rain days at Picton is 10 days during summer and 28 days during winter (Hazelton and Tille 1990). Whilst conditions and temperatures are wide ranging, the conditions in the study area can be summarised as being mild and very suitable for year round hunter-gatherer occupation of all parts of the region.

3.3 Flora & Fauna

Much of the study area comprises open grassed paddocks as a direct result of settlement and land clearing that has occurred in the area since Appin was historically settled in c1811. Some remnant vegetation communities occur along the Georges River, and smaller drainage features including Nepean, Leafs Gully, Ouesdale and Mallaty creeks. These vegetation communities are indicative of the species that once thrived across these areas prior to exploration and settlement in New South Wales. The three major vegetation communities within the study area include Shale Sandstone Transition Forest, Shale Plains Woodland and Western Sandstone Gully Forest (Biosis Research 2007c).

Shale Sandstone Transition Forest (SSTF) occurs in the transition zone between the surrounding Hawkesbury Sandstone and the clay derived Cumberland Plain, with small patches occurring along Mallaty, Ouesdale, Leafs Gully and Nepean creeks. It is dominated by *Eucalyptus tereticornis*, with *E. eugenioides*, *E. crebra*, *E. fibrosa* with *E. punctata* occurring less frequently (Biosis Research 2007c). The sub-community SSTF – High Sandstone Influence is dominated in the understorey by sandstone shrub-layer species such as *Kunzea ambigua* and *Persoonia linearis* (NPWS 2001). The other sub-community SSTF – Low Sandstone Influence is dominated in the understorey by *Bursaria spinosa, Themeda australis* and *Echinopogon ovatus* (NPWS 2001).

Shale Plains Woodland is found in flatter areas of the Cumberland Plain characterised by clay influenced soils derived from Wianamatta Shale, and is located along Mallaty, Ouesdale, Leafs Gully and Nepean creeks, and along the Georges River, out of the creek channel. The dominant tree species include *Eucalyptus moluccana* and *E. tereticornis* with *E. crebra, E. eugenoides* and *Corymbia maculata* occurring less frequently. *Exocarpus cupressiformis, Acacia parramettensis* ssp. *parramettensis* and *Acacia decurrens* may occur as a small tree layer and the shrub layer is usually dominated by *Bursaria spinosa*. Ground covers *Dichondra repens, Aristida vagans, Microlaena stipoides* var *stipoides, Themeda australis, Brunoniella australis, Desmodium varians, Opercularia diphylla, Wahlenbergia gracilis* and *Dichelachne micrantha*.

Western Sandstone Gully Forest is dominated by *Angophora costata*, *Corymbia gummifera* and *E. pilularis*, with *E. punctata* occurring sporadically on mid-slopes. This community is limited to the Georges River channel. A sparse layer of smaller trees is usually present, and dominated by *Ceratopetalum gummiferum* and *Allocasuarina littoralis*. The shrub and ground strata are also sparse and often contain slightly fewer species relative to ridgetop communities. Shrub species include *Acacia terminalis*, *Leptospermum trinervium*, *Persoonia linearis* and *Banksia spinulosa* var. *spinulosa*. In the ground stratum, the fern species *Pteridium esculentum* is invariably present, along with the climber *Smilax glycyphylla*. These species were seldom recorded in other communities. Other species frequently recorded in the ground stratum include *Entolasia stricta, Dianella caerulea, Lomandra obliqua, L. longifolia, L. gracilis, Lepidosperma laterale* and *Gonocarpus teucriodes*.

This transitional zone would have provided a wide diversity of resources, in a relatively small geographic area, for the Aboriginal hunter-gatherer population. This diversity is even greater when it is considered how close the coastal resource areas are to the rugged plateau.

Land mammals such as kangaroos and arboreal mammals such as possums would have been important prey species. Birds, reptiles and fish would also have been important resources. As well as being important food sources, animal products were also used for tool making and fashioning myriad utilitarian items. For example, tail sinews are known to have been used as a fastening cord, while ‘bone points’, which would have functioned as awls or piercers, are often an abundant part of the archaeological record.

3.4 Resource Statement

The landscape would have provided various sources of stone material for the Aboriginal people, from which a range of stone tools could be manufactured. Raw materials types might have included quartz and quartzite, silcrete, and harder stone such as basalt which could be sourced from the west. Locally, quartz would have been the main stone raw-material type suitable for tool manufacture that would occur in the vicinity of the study area in any abundance. This would be in the form of pebbles derived from the Hawkesbury sandstone. Such pebbles would have been available along the Georges and Nepean River channels as they eroded or weathered out of the sandstone. Other raw materials, including tuff, mudstone, silcrete, chert, quartzite and basalt would have been sourced outside the present study area.

Depending on seasonal variations the Georges River may have once flowed all-year-round. In recent years, during the summer months the river stops flowing. During such times in the past, many of the large open pot holes on the sandstone platforms along the river bed would have held a significant amount of water.

Seasonal knowledge for harvesting plants and hunting food and material resources was an important factor in the timing of movements in to, and out of the study area. This might have involved exploiting resources along the coast at one time of year and resources throughout the plateau at another. Various plant and animal species present within the study area would have provided a range of resources for Aboriginal people. Food, tools, shelter and ceremonial items

were derived from floral resources, with the locations of many campsites predicated on the seasonal availability of resources. These include using wood to make implements; berries, leaves and tubers for food and medicines, as well as bark for shelter construction. Some of the plants exploited may have been the banksia, whose flowers could be placed in a bowl of water in order to obtain the sweet nectar to drink (Botanic Gardens Trust 2005). The wood was also used to manufacture tools for weaving baskets. The liquid of the young ferns stems was rubbed onto the skin to relieve insect bites (Zola and Gott 1992: 56) and the roots were roasted and then ground into a paste in order to make a damper (Zola and Gott 1992: 37).

4.0 ABORIGINAL CONTEXT

4.1 Ethnohistory & Contact History

Our knowledge of the social organisation of Aboriginal people prior to European contact is, to a large extent, reliant on documents written by European people. Such documents are necessarily affected by the inherent bias of the class and cultures of these authors. They can, however, be used in conjunction with archaeological information in order to gain a picture of Aboriginal life in the region.

Many of the documented details of different social units and information relating to language groups in the greater Sydney region were not recorded until the late nineteenth century by which time significant disruptions to the pre-existing societies had already taken place (Turbet 2001).

According to Tindale (1974) the study area was part of the lands of the Tharawal people. The Gandangarra were known to have inhabited much of the Wollondilly area in the 18th and 19th Century according to early non-indigenous records (ERM 2002). The interface of the two groups seems to have been around Appin. Some of the confusion relating to group names can be explained by the use of differing terminologies. A variety of studies of the language groupings that made up the greater Sydney region have been summarised by Attenbrow (2002). She suggests four main language groupings for the region. In the vicinity of the study area there were two (a coastal and a hinterland) Darug dialects, Dharawal and Gundungurra. It is suggested the hinterland Darug dialect covered the Cumberland Plain from Appin to the Hawkesbury River to the west of the Georges River, Parramatta, the Lane Cove River and Berowra Creek. The Gundungurra covered the area west of the Georges River on the southern rim of the Cumberland Plain as well as the southern Blue Mountains (Attenbrow 2002:34). These areas are considered to be indicative only, and would have changed through time, and possibly also changed depending on circumstances.

Language groups were not the main political or social units in Aboriginal life. Instead, land custodianship and ownership centred on the smaller named groups that comprised the broader language grouping. There is some variation in the terminology used to categorise these smaller groups; the terms used by Attenbrow (2002) will be used here.

Land ownership was centred on small extended family groups or *clans* (also referred to as local descent groups, local clans or territorial clans). As it was normal practice to disallow intermarriage in close family bands, a number of groups would travel together making up larger units. These units are often referred to as *bands*.

Groups were delineated by physical boundaries within the landscape, such as watercourses and particular varieties of vegetation. Group members were usually united by common dialect, descent, history, and a shared 'Dreaming' ancestor, with each group led by influential individuals. In the Sydney area spiritual attachment and allegiance to land was centred on the clan. Bands were an economic, resource based grouping and do not seem to have been named,

although in other parts of the country band-sized groupings were named and carried different emphasis to the cultural life of local people (Attenbrow 2002).

Gatherings of numbers of smaller groups such as bands occurred for ceremonial reasons or to share in seasonally abundant resources. These larger groupings could number many hundreds of individuals. Occasions for large gatherings included predictable seasonal events such as bird migrations but also one off 'windfall' events such as whale beachings (McDonald 1992).

Interactions between different types of social groupings would have varied with seasons and resource availability. It has been noted that interactions between the groups inhabiting the multiple resources zones of the Sydney Basin (coastal and inland) would have varied but were continuous. This is reflected in the relatively homogenous observable cultural features such as art motifs, technology and resource use (McDonald 1992).

It is likely that groups in different resource areas would have had regular contact, although it is not known exactly how much each group's territory was restricted by a particular resource. It is known that some specific technology was used to adapt to the particular conditions of an area. Aboriginal people in the mountains were frequently observed wearing cloaks of animal skins in contrast to the coastal people. Items such as grub catching 'hooks' described by Barrallier in 1802, special 'squirrel traps' in tree hollows and bird catching nets described by Collins (cited in McDonald 1992) in and around Menangle, are evidence of specific locally adapted technology.

The arrival of Europeans had a rapid and dramatic effect on peoples of the Sydney Basin and beyond. Even so, evidence of the continued presence of Indigenous people, despite the disruptions to prior lifestyle, is also recorded and historically significant throughout the region. As in many places competition for land and resources and cultural differences led to conflict. This happened rapidly within the region and the study area following European settlement.

The arrival of settlers in the region around Appin and new competition for resources began to restrict the freedom of movement of the Indigenous inhabitants from around 1813 (McGill 1994). This was quickly followed by severe drought in 1814 and 1816. By 1814 numbers of Aboriginal people had begun to congregate in the Appin area in search of food and other resources. These people were not only the original inhabitants of the area but also other Aboriginal people from elsewhere who had been pushed off their own lands. In May 1814 the militia killed an Aboriginal boy. When others of the group sought revenge they attacked three militia members before they had time to reload killing one of them (McGill 1994). The trouble brewing between settlers and local inhabitants and the growing pressure on resources resulted in Governor Macquarie sending a punitive military expedition in 1816. The expedition ended in the 'Appin Massacre'. The militia claimed their intentions were to capture prisoners but as they found and pursued a group of Aboriginal people on Broughton's property panic ensued. Fourteen Aboriginal men, women and children were driven over a cliff to their deaths. The exact site of the massacre is not known but Broughton's original 1810

land grant was at Brooks Point. It is therefore unlikely that the massacre took place within the current study area.

4.2 Regional Overview

It is generally accepted that people have inhabited the Australian landmass for at least 50,000 years (Allen and O'Connell 2003). Dates of the earliest occupation of the continent by Aboriginal people are subject to continued revision as more research is undertaken. The exact timing for the human occupation of the Sydney Basin is still uncertain. The earliest undisputed radiocarbon date from the region comes from a rock shelter site on the western side of the Nepean known as Shaws Creek K2 which has been dated to 14,700 years before present (BP) (Attenbrow 2002: 20). This site is over 50 km north from the study area along the Nepean River. To the south along the coast just north of Shell Harbour the site of Bass Point has been dated at 17,101 +/- 750 BP (Flood 1999). On the Woronora Plateau the oldest date for Aboriginal occupation so far recorded is 2,200 +/- 70 BP (Sefton 2002a). Such a 'young' date is probably more a reflection of poor conditions of site preservation and sporadic archaeological excavation, rather than actual evidence of absence of an Aboriginal hunter-gatherer population prior to this time.

The area around Appin has been subject to reasonably continuous archaeological study during the last 20 years. The majority of this work has been undertaken for impact assessments (see Section 4.4), with only a small amount of work associated with research grants and post-graduate theses, and limited archaeological excavations.

The most significant exploratory studies have been undertaken by the voluntary Illawarra Prehistory Group, which has successfully recorded hundreds of Aboriginal archaeological sites across the Woronora Plateau. The majority of these sites are sandstone shelters and overhangs containing art and / or archaeological deposit. The abundance of this site type is a reflection of the predominant incised Hawksbury Sandstone along major drainage features including the Georges and Nepean rivers, and their feeder tributaries, such as Brennans, Simpsons, Ouesdale, Mallaty and Nepean creeks. The incised sandstone gullies and valleys result in significant outcrops and overhangs suitable for occupation or art depiction. Other site types do occur, and can include open artefact scatters, axe grinding grooves, and scarred trees. Open artefact sites are usually present on the undulating land above the gullies or within shelter sites, while scarred trees are limited to what little remnant vegetation remains. The low frequency of these recorded site types can be attributed to previous land use history, disturbance, visibility and exposure within the landscape.

The recorded frequency of sandstone overhang / rockshelter sites can also be attributed to the intense survey effort on the Hawksbury Sandstone landform across the Woronora Plateau. Sefton (1988:86, 1998:12) has completed extensive analysis of data collected from this work over the past 15 years that describes the frequency and distribution of art techniques on the Woronora Plateau (1988). As part of this analysis, Sefton (1998:12) has provided a review of the techniques and motifs of shelter art within the Georges River Basin. Her summary is

reproduced in Table 2 below. It clearly shows that the most common defined art technique within sandstone shelters on the Woronora Plateau is charcoal drawings.

Summary of art techniques (Sefton 1998)				
Technique	**No. of Shelters**	**% of Shelters**	**No. of Motifs**	**% of Motifs**
Charcoal drawing	427	92	3906	78
Red stencil	86	18	490	9
Red drawing	86	18	183	4
White stencil	37	7	201	4
White drawing	38	8	119	2
Bichrome	28	6	46	1
Ochre painting	19	4	172	3

Table 2: Summary of art techniques by method of application and colour, Woronora Plateau (from Sefton 1998)

Charcoal drawing accounts for 78% of the total motifs in 92% of shelters that contain art. Whilst there is a wide diversity of charcoal drawn motifs, the majority of the motifs depict forms that are indeterminate, a situation arising from poor preservation, and also possibly the fact that some motifs are complete but not readily interpretable (Table 3).

Summary of charcoal drawings in the Georges River Basin (Sefton 1998)			
Motif	**Number**	**% of identifiable motifs**	**% of all motifs**
Kangaroo	488	41	15
Frontal human	244	21	7
Profile human	130	11	4
Track / symbol	93	8	3
Fish	59	5	2
Bird	41	3	1
Snake	39	3	1
Eel	35	3	1
Echidna	24	2	1
Bat	11	1	<1
Lizard	9	1	<1
Tortoise	3	1	<1
Indeterminate	2130	-	64
Total:	*3306*		

Table 3: Motifs drawn in charcoal in the Georges River Basin

4.3 AHIMS Results

A search of the NSW Department of Environment and Climate Change (DECC) Aboriginal Heritage Information Management System (AHIMS) database was conducted on 16 March 2007. Thirty eight previously recorded sites (and seven duplicate entries) are located within a 5 km x 5 km search area centred on the study area (refer to Figure 2). Of these, nine sites are located within the identified SMP Area.

It should be noted that the AHIMS database reflects Aboriginal sites that have been officially recorded and included on the list. Large areas of NSW have not been subject to systematic,

archaeological survey; hence AHIMS listings may reflect previous survey patterns and should not be considered a complete list of Aboriginal sites within a given area.

Of the thirty eight sites recorded near the study area, the predominant site type are shelters with art (32.26%), shelters with art and deposit (22.58%) and stone artefact scatter sites (12.9%). The remaining site types include axe grinding grooves (9.7%), shelters with PAD (9.7%), shelters with deposit (6.46%), open campsites (3.2%) and scarred trees (3.2%). These site frequencies are representative of the site types previously located across the transitional zone between the Woronora Plateau and the Cumberland Plain.

Table 4 (following) provides details of the sites located within the SMP Area. Details of specific site location are considered sensitive and have not been included in this report.

AHIMS SITE NO.	*SITE NAME*	*SITE TYPE*	*LANDFORM*
52-2-2237	Ousedale Creek No 3	Art Shelter with Archaeological Deposit	Hawkesbury Sandstone
52-2-2265	Leafs Gully 1	Artefact Scatter	Hawkesbury Sandstone
52-2-2242	Georges River No. 4	Art Shelter	Hawkesbury Sandstone
52-2-2244	Georges River No 3	Art Shelter	Hawkesbury Sandstone
52-2-2243	Georges River No 2	Art Shelter with Archaeological Deposit	Hawkesbury Sandstone
52-2-2241	Georges River No 5	Art Shelter	Hawkesbury Sandstone
52-2-2234	Georges River No 1	Art Shelter	Hawkesbury Sandstone
52-2-2266	Georges River	Isolated find	Hawkesbury Sandstone
52-2-0021	Douglas Park	Artefact Scatter	Hawkesbury Sandstone

Table 4: AHIMS sites registered within the SMP study area

The site types within the study area generally reflect the regional patterning, although there is a lower frequency of stone artefact scatter sites.

4.4 The Archaeological Record – Localised Studies

There have been a number of localised archaeological impact assessment surveys undertaken in the Appin area, the majority of which are associated with longwall mining around Appin (AMBS 1996; Biosis Research 2005, 2006a, 2006b; Dibden 2002; Navin Officer 1996a, 1996b, 2000a, 2000b, 2002a, 2002b; Sefton 1995, 1996, 1988, 1998, 2000, 2002a, 2002b, 2002c, 2006). All of these studies resulted in the identification and assessment of Aboriginal archaeological sites. The following report summaries only include previous archaeological assessment work that has been undertaken within the boundaries of the current study area (see Figure 3).

Navin Officer (1992) conducted an archaeological survey of proposed pipeline easements between Appin and Rosemeadow. One of the proposed alignments runs north south through the present study area, crossing Mallaty Creek just west of the Moomba-Sydney gas pipeline (see Figure 3). Three isolated stone artefact sites were identified to the north near Menangle

within close proximity to a number of drainage features, while one rock shelter with archaeological deposit, one scarred tree and an open artefact scatter were identified south, near Ousedale Creek. Three sandstone overhangs with Potential Archaeological Deposit (PAD) were noted within Mallaty Creek. The nature, integrity and significance of the 3 PAD sites remains unknown, and could only be determined through sub-surface investigation (Navin Officer 1992:23). The isolated artefact finds were considered to be a common occurrence, containing typical artefact types and materials for this region, and therefore of low archaeological value. However, the scarred tree was considered to be of moderate significance due to the rare nature of this site type within the region.

Sefton (1998) completed an archaeological investigation for proposed Longwalls 1-6 in West Cliff Colliery Area 5, encompassing the south west corner of the present study area (Figure 3). Many of the sites along the Georges River had been previously recorded by the Illawarra Prehistory Group. Nonetheless, a comprehensive survey of both the eastern and western sides of the Georges River Valley was undertaken to identify and relocate all sandstone overhangs with art and / or deposit (Sefton 1998:21). The upper reaches of Ousedale Creek were also surveyed in detail. The assessment resulted in the identification of 15 Aboriginal archaeological sites, including previously recorded and unrecorded sites. Sites included sandstone overhangs with art and / or deposit, open stone artefact sites, grinding sites, and also Potential Archaeological Deposits (PAD) in sandstone overhangs (Sefton 1998: 24). The work involved reassessment of site condition and archaeological significance. A number of shelter with art sites were highlighted for monitoring, although none of these fall within the current study area.

Navin Officer (2002a) undertook an archaeological assessment of a cable route for a proposed personal emergency device to supply underground communication to the West Cliff Colliery. A large section of the cable route dissects the present study area. The proposed cable route alignment was 3 m wide and approximately 14 km in length, running between Minerva Road, along two sections, that both cross Appin Road as far as Mallaty Creek (Figure 3). The entire cable route alignment was traversed, resulting in the identification of three new Aboriginal sites, including two isolated artefact finds (GR1, 52-2-2264 and GR2, 52-2-2266), and an artefact scatter (LG1, 52-2-2265). Overall, the ground surface visibility was poor, however, considering the cable route traversed mostly grassed paddock, exposure was relatively good. The identification of three new Aboriginal artefact sites within a small survey area highlights this.

ERM (2002) completed an indigenous and historic heritage assessment of a section of Appin Road for a proposed road widening project, which begins 3.2 km north of Appin and terminates 4.1 km north of Appin. The survey focussed only on the western side of Appin Road. Despite reasonable areas of ground surface visibility along much of the proposed widening route, no Aboriginal archaeological sites were identified. Due to heavy disturbance resulting from the construction of Appin Road, tree clearance and ploughing, the road reserve was considered to have low archaeological potential for intact archaeological / cultural deposits.

Sefton (2002a) completed the archaeological survey of West Cliff Colliery Area 5, which encompasses the entire current study area. The survey focussed on identifying sandstone overhangs suitable for Aboriginal occupation and use, in particular, those shelters likely to contain art (Figure 3). This site type is most susceptible to impact by longwall mining subsidence. Therefore, no assessment of the cleared plateau areas likely to contain open stone artefact sites was undertaken as part of this assessment, although this site type does occur within the study area.

Overall, the study area had a lower concentration of sandstone overhangs with art and / or deposit than other survey areas on the Woronora Plateau (Sefton 2002a:44). This could be directly attributed to the geomorphology of the study area, being situated on a more open, undissected plateau with minor drainage features. A significant number of these sites also contain archaeological deposit, determined by the presence of surface stone artefacts. There was also a large number of sandstone shelters with Potential Archaeological Deposit (PAD) recorded along drainage features, the significance of which could not be determined without archaeological excavation.

The shelters with art sites comprised various art techniques, motifs and mediums. The most common art technique is outline and infill, of which most were drawn in charcoal. Other mediums included red ochre drawings, and red and white ochre hand stencils. The most common recognisable motifs were frontal human figures and kangaroos. However, the majority of motifs were indeterminate, due to poor preservation.

Overall, the art, the technique and depicted motifs were representative of this site type in other areas of the Woronora Plateau. Those sites that contain well preserved, rare motifs and techniques were considered to be of high archaeological significance. Of the 22 shelter with art sites, only 2 were considered to be of such significance, Sawpit Gully 12 and Georges River 2. However, only Georges River 2 is situated within the current study area.

Sefton (2002b) then carried out a review of archaeological studies and sites situated within the proposed 5A5 to 5A8 Longwall layout within West Cliff Area 5. These longwalls were once located immediately south of the present study area. All 11 archaeological sites within this area were previously described in Sefton (2002a). These include three grinding grooves (one of which included an engraved groove channel), one stone artefact occurrence, four shelters with art and / or deposit, three shelters with deposit and four shelters with PAD. Sefton's assessment of site condition has been taken from the 2002a report, and in conjunction with site contents, preservation and regional context, the assessment of significance for each site was determined (2002b:19).

Only three of all sandstone shelter sites with art and / or deposit were considered to contain intact, significant archaeological deposit of potential research value. The condition of and type of art at each of the art shelter sites were considered to be representative and of overall low archaeological significance. Of the three grinding groove sites, the more extensive grinding groove site Sawpit Gully 8 was considered to be of moderate significance, due to the

frequency of grooves, the presence of an engraved groove channel and the research potential. Overall, the low density artefact scatters were considered to be of low value due to disturbance from vehicle access track. However, an area between one of these tracks and a small Georges River tributary adjacent to Saw Pit Gully 3 remains undisturbed, and likely to contain further cultural material. This particular site is therefore considered to be significant as these are an infrequent site type on the Woronora Plateau (Sefton 2002b:20). Overall, all of the recorded archaeological sites were considered to be of low archaeological significance. However, the report identified Sawpit Gully 10, Ousedale Creek 3 and 4 as being most susceptible to impact from the proposed longwall mining, and that detailed recording of these sites should be undertaken prior to the commencement of mining.

Navin Officer (2006) completed a detailed cultural heritage assessment of the proposed gas turbine power station near Leafs Gully, situated in the north western corner of the present study area. Much of the study area was surveyed in detail, with the remainder being assessed on archaeologically sensitive landforms. This resulted in the identification of one area of Potential Archaeological Deposit (PAD) for Aboriginal cultural material across upper slopes and crests of a spur line complex that descends towards Leafs Gully and the Nepean River respectively (Navin Officer 2006:25). Navin Officer (2006:25) suggested that bioturbation within the sandy soils of LGPAD1 area causes stone artefacts to move down into the soil profile, thus remaining undetected during surface surveys. Despite moderate levels of disturbance due to previous land use, the likelihood of Aboriginal cultural material being present was considered high. It was therefore recommended that a program of archaeological sub-surface investigation be undertaken across the LGPAD1 area to determine the presence and nature of any remaining archaeological material.

Biosis Research (2005) completed an indigenous and historic archaeological site assessment of potential impacts of mine subsidence of proposed Longwalls 31 to 33. This involved re assessment of only two Aboriginal shelter with art sites most likely to be impacted by mine subsidence. The remaining sites were not relocated or reassessed. The study concluded that based on the predictions calculated by MSEC the risk of impact caused by mining subsidence would be low. It was recommended however, that these two sites be monitored for impacts regardless and appropriate s90 consents be attained.

Biosis Research (2007a) conducted an archaeological inspection of the Agility Gas Pipeline work stockpile adjacent to Mallaty Creek. This spoil stockpile will be created during preventative works associated with potential mine subsidence impacts for the Moomba to Sydney gas pipeline that crosses Mallaty Creek. One previously recorded Aboriginal archaeological site, a stone artefact scatter (52-2-0021), was situated within close proximity to the proposed stockpile site, on the northern side of the creek on a small spur. Only one stone artefact could be relocated during the survey, comprising a red silcrete medial flake. Due to continuous erosion at the site caused by a vehicle track no other material could be identified. No further Aboriginal archaeological sites were identified across the remainder of the study area due to poor ground surface visibility. One area of potential was identified on the open flat above the creek channel.

Biosis Research (2007b) have undertaken the most recent localised work assessing proposed gas well site locations south of Mallaty Creek. Each site takes up an area measuring approximately 50 x 50 metres, and is positioned above and spaced evenly along proposed longwalls within West Cliff Area 5 (Figure 3). The assessment involved site inspection of each proposed gas well site. The majority of proposed gas well sites were situated on open grassed paddock within close proximity to the existing chicken farm sheds. Due to poor ground surface visibility across these grassed areas, no archaeological sites could be identified. Much of these areas have been subject to high levels of ground disturbance, from land clearance, ploughing and grazing. Only one of the proposed gas well sites, situated on a small spur, overlooking Mallaty Creek to the north, was considered to have some potential to contain subsurface Aboriginal archaeological deposits.

4.4.1 Overhang and Rock Art Monitoring in the Illawarra Region

Longwall mining subsidence effects to the sandstone environments around the Sydney Basin have been incidentally documented for some time (Sefton 2000:12-13). In the southern coal field Caryll Sefton has conducted a long term monitoring program, and reviewed the effects of longwall mining on sandstone overhang Aboriginal archaeological sites over a 10 year period (Sefton 2000). The review included data collected form the longwall mine areas of Tahmoor Mine, Appin Colliery, Tower Colliery, West Cliff Colliery, Metropolitan Colliery, Elouera Colliery and Cordeaux Colliery. At the time of the review 52 sandstone overhang sites had been monitored by Sefton prior to, during and after longwall mining in the vicinity of the sites (Sefton 1998: 15). Of the 52 sites monitored only 5 had evidence of impact from the longwall mining (Sefton 2000:17-18). The impacts can be grouped into four effect categories: cracking; movement along existing joints / bedding planes; block fall; and change of water seepage.

Sefton conducted a Principal Components Analysis using 16 variables recorded for all the sites, including the subsidence parameters (2000:30). Sefton found that the components most associated with observed changes were the overhang size (particularly length); wet overhangs; location near the valley bottom; proximity to the end of longwalls; and block fall type shelters. No monitored overhang has collapsed. High estimated strain values were also associated with observed changes (Sefton 2000:31). Sefton concludes that ‘the over-riding factor which appears to be significant is overhang size where large overhangs are at greater risk (Sefton 2000:38). In particular, no monitored overhang less than $50m^3$ has suffered subsidence impacts, regardless of other risk components. Not all sites larger than $50m^3$ will be impacted. Of those monitored overhangs larger than $50m^3$ approximately one-fifth (5 of 23) have suffered impacts.

The size and subsidence parameter data for the 5 monitored sites that have shown impacts are summarised in Table 5 below.

Site name	Max predicted subsidence (mm)	Max predicted tilt (mm/m)	Max predicted tensile strain (mm/m)	Max predicted compressive strain (mm/)	Length (m)	Width (m)	Height (m)	Size (m^3)
WR1	638	-	0.4	0	8	3	4	96
WR2	341	-	0	0.1	50	9	6	2700
BR4	900	0	2.5	0	20	5	2	200
FRC152	345	1.7	0	0.15	20	3	1	60
P3	931	0	0.04	0	18	4	5	360
Data taken from Sefton 2000 pages 17 and 18								

Table 5: Data for monitored sandstone overhangs that have shown subsidence impacts in the southern coal fields

Sefton (2000) also notes that the task of accurately predicting subsidence impacts to individual archaeological sites is 'difficult and complex'. However, the overall ability to confidently predict subsidence effects within the landscape is constantly improving. By using Sefton's systematic monitoring framework both natural changes in sandstone overhangs, and changes attributed to longwall mining through overhang destabilisation may be documented.

Overhangs in the steep valleys and gullies of the Woronora Plateau are naturally and inherently unstable, and shelters are often formed by block fall via natural processes. Previous studies have shown that in most cases subsidence movements that can alter the stability of overhangs occur only directly over the mined longwall areas. A geotechnical study by SCT Operations concluded that 'outside of the mining area, subsidence movements are typically tensile or stretching in nature and so do not tend to result in increases in compressive stress that might impact on the stability of rock formations' (SCT 2005:12). This report also noted that overhang and cliff formations 'are relatively insensitive' to the levels of ground tilt associated with subsidence movements (SCT 2005:12).

4.5 Discussion and Predictive Model

The archaeological predictive model has been formulated based on the results of the location and type of Aboriginal sites that were recorded within the regional area, the results of the AHIIMS database search and information about previous archaeological work. This information has been broken down into patterns that have been compared to the character of the study area to allow for an understanding of Aboriginal archaeological potential.

Most of the sites described in Table 4 were identified as a result of surveys undertaken in response to proposed mining activities. The greater frequency of recorded rock shelter sites and the relatively low number of open artefact scatter sites is representative of surveys that have focused on areas containing rock shelters rather then being representative of the actual archaeological record, due to the nature of impacts associated with mining activities. It can also be attributed to the visibility of sandstone overhangs within the landscape compared to open surface scatter sites within the pasture covered paddocks of the Appin region.

It is however unlikely that additional Aboriginal archaeological sites will be encountered as the study area has previously been the subject of intense field survey (Figure 3).

The following section discusses Aboriginal sites types with regard to the likelihood for such sites to occur within the present study area.

- *Rock shelters with art and/ or deposit*

Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground as characterised by the cliff lines along the Nepean and George's Rivers, their tributaries and creek lines, such as Mallaty and Ousedale creeks. These naturally formed features may contain rock art, stone artefacts or midden deposits. The sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space occur, in areas where such geological features exist, such as the Hawkesbury Sandstone. Such topographical features occur within the present study area.

The AHIMS database search revealed that rock shelters with art and/or deposit are the most frequently recorded site types within the study area and surrounding region.

- *Open campsites, artefact scatters and isolated finds*

Open campsites and artefact scatter sites are generally considered to consist of 2 or more stone artefacts within 50 to 100 m of one another. Sites can comprise high-density concentrations or sparse low-density 'background' scatters. These represent campsites of everyday activities, hunting and gathering, or tool manufacture. Isolated stone artefact occurrences can be located anywhere in the landscape and most likely represent discard or loss during transitory movement.

The identification of these sites depends greatly on ground surface visibility, resulting in the boundaries of a site being defined by the visible extent of the artefacts on the surface. Thick vegetation occurs throughout the present study area and is likely to obscure stone artefact scatters or isolated occurrences. The infrequent occurrence of these throughout the region can be attributed to this lack of ground surface visibility rather than the absence of such sites.

Thus, there is a low likelihood of identifying such sites within the present study area, unless areas of open ground surface are visible. Stone artefact sites that have been previously recorded have been located along ridgelines, on the plateau associated with drainage lines and within close proximity to water sources where ground surface visibility was present, such as along vehicle tracks and fence lines.

- *Grinding Grooves*

Axe grinding grooves are often found on large open and relatively flat areas of sandstone shelving and outcrops. Individual grooves are elongated, narrow depressions often found in sedimentary rock, such as sandstone, in association with water sources, including creeks and swamps. Water was essential in the shaping and sharpening process in the manufacture of

each axe. In the Woronora Plateau region engraved channels, often used to divert the run of water, are a feature associated with some axe grinding grooves.

Although no grinding groove sites have been previously identified within the study area to date, they are still considered a frequently occurring site type in the wider region. There is potential for these to occur along any water course within the study area.

- *Scarred Trees*

Scarred trees can be expected to occur in all landscapes where stands of old growth timbers remain. Such stands should be present within the study area. Historically certain species were selectively harvested (i.e. Red Cedar and Ironbark), however, other mature eucalypt species may be present within the area. The likelihood of mature trees exhibiting evidence of scarification being present within the study area is consequently considered to be moderate, though the risk of damage to scarred trees by underground mining is very low.

- *Post-Contact Sites*

These are sites relating to the shared history of Aboriginal and non-Aboriginal people of an area. Many of these sites can hold special significance for Aboriginal people and may include places such as missions, massacre sites, post-contact camp sites and buildings associated with post-contact Aboriginal use. This site type is usually known from historical records or knowledge preserved within the local community. It is considered unlikely that any additional, unregistered post-contact sites will be present within the study area.

- *Aboriginal Places*

Aboriginal *places* may not have any "archaeological" indicators of a site, but are nonetheless significant to Aboriginal people. They may be places of cultural, spiritual or historic significance. Often they are places tied to community history and may include natural features (such as swimming and fishing holes), places where Aboriginal political events commenced or particular buildings. Often these places are significant in the living memory of a community. There is some potential that Aboriginal places of spiritual and cultural significance will be found in association with the study area.

- *Aboriginal Resource and Gathering sites.*

Aboriginal Resource and Gathering sites are sites where there is ethnographic, oral, or other, evidence that suggests that natural resources have been collected and utilised by Aboriginal people. These natural resources have a cultural significance and connection for the Aboriginal community, such as ochre outcrops that were used for art or ceremonial purposes. These sites are still considered important places today. Past land clearance within the study area limits the likelihood of such sites.

5.0 HISTORICAL CONTEXT

Historical research has been undertaken to identify the historical context of the study area. This history incorporates an understanding of land-use, building patterns and areas of disturbance. This research provides an understanding of historical archaeological potential for the site.

The following historic background is based on information gathered from the NSW Lands and Title Office, local Appin Parish Plans, local history sources, subdivision plans containing survey information and a number of useful historical websites. Register searches of the National and Commonwealth Heritage Lists, The Register of the National Estate, the State Heritage Register and Inventory, the National Trust of Australia and the Heritage Schedule for the Campbelltown LEP were all competed.

All of this information will be used to locate known and potential historical archaeological sites.

5.1.1 Establishment of Appin

The establishment of a reliable food supply for the settlers of Sydney was one of the driving factors behind expansion of the infant settlement of Appin. Chronic food shortages in the Colony were to be addressed by the creation of farming centres on the Hawkesbury, Airds and Appin plains. Governor Macquarie established the five Macquarie towns in the Hawkesbury, while he designed Liverpool to be the capital of the southwest, with the townships of Campbelltown and Appin in the Airds and Appin parishes respectively (Jack and Jeans 1996:24).

Governor Macquarie named Appin in 1811 after a small coastal village in Argyleshire (Scotland) where his wife was born. Deputy Commissary General William Broughton received the first local land grant that year. He called his 1000 acres Lachlan Vale after the Governor (www.stonequarry.com.au/towns/appin.html).

Hamilton Hume was granted 300 acres at Appin. The 1824 Hume and Hovell expedition to Port Phillip left from the Appin Road, at a point indicated by a monument erected in 1924 to mark the centenary of the expedition. The monument is made of stone taken from the Hume house (www.stonequarry.com.au/towns/appin.html).

Urban growth was slow, with most of the area held in large pastoral or agricultural holdings, settlers tending to establish cattle and wheat properties. The Appin town site was formally surveyed in 1834 by Mitchell. Other settlers followed and also established cattle and wheat properties. Produce from the farms was transported by horse and bullock drays to Sydney via the Appin Road. The Appin Road was an important communication and access corridor in the early years of the settlement, however, it declined in importance with the opening of the Hume and Princes highways.

5.1.2 Contact, massacre and continuation

By July 1813 Europeans had begun to encroach on traditional Aboriginal land, through establishment of farms in the area. Traditional Aboriginal custodians were experiencing severe economic and social disruptions as a result of lack of access to traditional lands, the introduction of diseases and the settlement of displaced Aborigines from other areas. All these factors placed pressure on food supplies and increased tensions between Aboriginal and settler communities. Section 4.1 outlines the 'Appin massacre' which resulted from escalating hostilities between Aborigines and settlers.

Despite the massacre of 1816, there remained a continued Aboriginal presence within the area. Aboriginal people became increasingly involved with European settlement, working as stockmen and labourers on farms and as domestic help (JRC 1993:20). The establishment of two Aboriginal reserves in Burragorang (one at Pocket Creek, the other at Tonalli), reflects an Aboriginal population in the Wollondilly region. These reserves, however, were not the sole focus for Aboriginal activity in the area. Aboriginal people contributed, and continue to contribute, to the economic and social fabric of the whole area.

5.1.3 Pastoral Expansion

Agricultural pursuits in the area commenced with grazing. Grazing was initially unplanned following the escape of cattle which prospered in the area (since known as Cow Pastures). Formal grazing pursuits commenced with establishment of the permanent settlement. Government stockyards were established and the landholders ran cattle. Later diversification saw dairying assume increasing importance to the community, although this was after the introduction of the railway and refrigeration (JRC Planning 1993:21). There are several examples of early dairy farms with byres and bails in the Appin area.

Wheat was another important early agricultural industry, with the area around Appin particularly suited for growing wheat. In response to this, several mills were established, where the grain was ground prior to dispatch. Severe outbreaks of rust in the 1870s largely destroyed the wheat industry in the area (JRC Planning 1993:22).

With the collapse of the wheat industry, diversification of agriculture occurred. Dairying and its related services remained an important regional industry until well into the twentieth century, declining in the 1960s. Orcharding was taken up in the areas surrounding Appin, reaching its peak in the 1950s. Grape growing for wine production enjoyed success in a few limited locations, while there was also a (commercially unsuccessful) brewery in operation at Blaxland's Crossing. Smaller, boutique industries such as Tang nuts and mushrooms have also contributed to the local economy.

The advent of the railway delivered the produce of the Appin area to larger markets. The railway did not pass through Appin, going instead to Picton. As a result, the increased development such as was seen at settlements graced with a railway station or siding, was not experienced at Appin.

5.1.4 The Upper Canal

The oldest public utility within the study area (SMP Area) is the Upper Canal, a component of the Upper Nepean Scheme. Higgenbotham (1992) has prepared a Conservation Management Plan (CMP) for the Upper Canal, and this has been endorsed by the NSW Heritage Council. Historical information in the CMP was largely derived from the detailed heritage assessment of the Upper Nepean Scheme and the Upper Canal also prepared by Higgenbotham (1992). Both these documents provide a detailed history of the Upper Canal, and form the basis of this summary.

The Upper Nepean Scheme was Sydney's fourth source of water supply and was designed to provide a secure source of water for the growing population of Sydney. Constructed between 1880 and 1888, 'the scheme diverted water from the Cataract, Cordeaux, Avon and Nepean rivers to Prospect Reservoir via 64 kilometres of tunnels, canals and aqueducts known collectively as the Upper Canal' (www.sca.nsw. gov.au/dams/history.html).

Construction of the Upper Canal was overseen by the Harbours and Rivers Branch of the Department of Public Works, although much of the work was completed by contractors. Design of the canal is attributed to Edward Moriarty, head of the Harbours and Rivers branch at the time.

> The canal transports water by gravity from the catchments in the Southern Highlands, through a 64.5 km long channel. From Pheasant's Nest Weir on the Nepean River, the Canal proceeds by Tunnel to the Cataract River at Broughton's Pass. A weir across the Cataract River diverts the flow of the river into the Cataract tunnel. From Broughton's Pass, the Upper Canal delivers water by gravity through open canal and tunnel to Prospect Reservoir, with a number of subsidiary off-takes such as the storage dams at Liverpool and Ingleburn, used to supply townships along its route including Camden and Campbelltown. From the Prospect Reservoir, the water is distributed to the Sydney water supply network.
>
> b cubed sustainability 2003b:11

'The great merit of the Upper Nepean Scheme is that it was, and still is, a gravity supply' (Higgenbotham 2002:8). The entirety of the system was designed to supply water by gravity, and there remain sections of Sydney, known as the 'gravitation zone', which still receives its water by gravity (Higgenbotham 2002:8).

The Upper Canal was designed and built in response to the conditions of the surrounding countryside. Section profiles were varied according to local conditions, in areas where the ground was soft, the Canal was V shaped and the sides pitched with shale or sandstone slabs. In other areas, the canal was U shaped and in these sections the canal was either cut directly into bedrock or the sides were walled with sandstone masonry. Tunnels were used under hills, unlined through bedrock or lined with brick or stone through softer materials. At the creek crossings (valleys) the water was carried across via wrought iron inverted syphons resting on stone piers (Higgenbotham 2002:8).

Modifications were made to the surrounding landscape to prevent the entry of contaminated water into the supply system. These included the creation of bunds and drainage channels to direct water to culverts (carrying water under the canal) or flumes (carrying water over the canal). The flumes were mainly originally constructed from timber, but these were gradually replaced with wrought iron, and later, concrete flumes. Bridges carried public traffic over the canal, while smaller 'occupation bridges' allowed land owners with land on each side of the canal access to both parts of their holdings.

After travelling a distance of 39 ¾ miles (64 kilometres) from Pheasants Nest, water entered the Trafalgar Tunnel, where it passed over a measuring or gauging weir and then along the inlet race into Prospect Reservoir. This is the end of the Upper Canal System, the Prospect Reservoir and the Lower Canal comprising the remaining components of the Upper Nepean Scheme (Higgenbotham 2002).

Development of the Upper Nepean Scheme continued, with upgrades and replacement of damaged materials. The largest development was the augmentation of the Scheme via the construction of four dams in the 1900s - Cataract Dam (1907), Cordeaux Dam (1926), Avon Dam (1927) and Nepean Dam (1935). Standard maintenance of the system has been an ongoing and integral component of the Upper Canal and Upper Nepean Scheme since construction.

5.1.5 Coal Mining Leases

Coal deposits in the Illawarra were first officially documented by George Bass in 1797 near Coalcliff (http://www.illawarracoal.com). A number of coal seams were subsequently discovered throughout the Illawarra over the next century, with coal mining becoming a major industry in the region. However, the first mining leases were not established in the Appin region until the early twentieth century, following the proclamation of the State Coal Mine Reserve in November 1926 (Wedderburn Parish Map 1972). This Reserve encompasses the present West Cliff study area. It was not however until 1976 that coal mining began at the West Cliff Colliery site, south east of the present study area.

5.2 Previous Archaeological and Heritage Work

5.2.1 Archaeological Investigations

There have been few historic archaeological projects in the Appin area, primarily as a result of the low levels of development requiring such investigations.

Stedinger Associates (2004) undertook monitoring works during the installation of a water main extension which crossed the Upper Canal at Menangle Park (north of the current study area). The monitoring included excavation of a trench on each side of the Canal. This was done with the aim of minimising impacts to historic fabric and to provide additional information on construction techniques. No artefacts or features associated with the

construction or use of the canal were identified, with deposits considered as shallow and sterile (Stedinger Associates 2004:16).

ERM (2002) undertook an indigenous and historic heritage assessment of a section of Appin Road that runs north south through the eastern half of the current study area. The report findings indicate that Appin Road remains a significant historic communication route between Liverpool and the Illawarra region. However, due to high levels of disturbance within the road reserve along Appin Road the liklihood that any intact sub-surface archaeological material being present was low. It was therefore recommended that there were no further historic issues associated with Appin Road.

Navin Officer (2002b) completed a review of historic cultural heritage sites above the proposed West Cliff Area 5 longwall panels 5A5 – 5A14. The sites to be assessed comprised known heritage items only, including the former site of Hamilton Hume's 'Brookdale' homestead, the Hume and Hovell Monument, and the Upper Canal of the Sydney Canal Water Supply (Navin Officer 2002b:5). The report identified the Upper Canal as a listed State Heritage Item, and indicated that advice from the NSW Heritage Office should be sought if any known or foreseeable impacts to the Canal and associated structures were likely to occur.

Navin Officer (2006) completed a detailed cultural heritage assessment of the proposed gas turbine power station near Leafs Gully, situated in the north western corner of the present study area. The north eastern most boundary of the study area touched on a portion of the Sydney Water Upper Canal System (Navin Officer 2006:26). The proposed development included an option to construct a pump station and pipeline connecting the Upper Canal to the Power Station. This required minor impacts to the fabric of the Canal. It was recommended that all works and impacts should be consistent within the existing Conservation Management Plan for the Upper Canal (Higginbotham 2002).

Biosis Research (2005) completed an indigenous and historic archaeological assessment for proposed Longwalls 31 to 33 in West Cliff Colliery Area 5. The assessment identified four historic items, including Bridge and Road remains (WH1) on the Georges River, a Grave Site (WH2), a House Site (WH3), and the remains of a Pub / Cellar (WH4). Together, these sites were considered to represent an early historic landscape, with high local significance. No other heritage items were identified during the field survey. The potential subsidence impacts calculated by MSEC indicated it was unlikely that impacts would occur to these sites. The bridge and road remains however were identified for monitoring before, during and after extraction of Longwalls 31-33.

Biosis Research (2006) *Douglas Area 7 Longwalls 701 to 704: Impacts on Indigenous and Historical archaeological sites.* This assessment of the Douglas Area 7 mining application was within the vicinity of two identified heritage items, the Mountbatten Group and Moreton Park buildings and garden. During survey for this project, two previously unidentified wells associated with the Mountbatten group were recorded. There were no additional historical heritage items identified during this study.

5.2.2 Upper Canal Investigations

Several built heritage assessments and impact statements have been prepared for the Upper Canal (Higginbotham 1992, 2000, 2001, 2002 and 2004; b cubed 2003a, 2003b and 2003c). The identification of the Upper Canal as a highly significant heritage item and its listing on the State Heritage Register is reflected in the great number of studies prepared for the structure.

All of these studies (listed above) detail the history of the Upper Nepean scheme and the components of the scheme, resulting in an overall assessment of heritage significance as well as an allocation of heritage values to individual components of the canal structure. This has resulted in the development of a number of conservation policies for the Upper Nepean Scheme, with the aim of preserving and enhancing heritage values associated with the scheme. Mitigation measures and recommendations have been identified in relation to any potential or proposed impacts to the fabric of the canal and associated components. The Upper Canal crosses the western side of the general SMP area and is located 290 metres from the end of longwall 36. It does not occur above proposed longwall extraction areas.

5.2.3 Site Prediction Model

Given the nature of historic development within the study area, it is unlikely that further historical sites, additional to those already discussed, will be present. Should any additional sites be identified, they are likely to be associated with known development, being components of Appin Road construction and development, pastoral use, including domestic remains or farming associated remains, or features associated with the Upper Canal.

6.0 SURVEY METHODS

The majority of the study area had been previously surveyed in detail by (Sefton 1998, 2002a, 2002b; Navin Officer 1992, 2002a, 2006; ERM 2002; Biosis Research 2007a, 2007b) (see Figure 3). This archaeological work has provided intense survey coverage of the Georges River, Mallaty Creek and Leaf Gully Creek. This is because these areas comprise the incised Hawkesbury landscape, which is the most archaeologically sensitive landscape in the study area, and has been demonstrated to contain sandstone overhang art and occupation sites. Such areas are therefore the focus of archaeological survey work. Other intensively surveyed areas have targeted proposed areas of impact, such as the road reserve along Appin Road, gas, electricity and water pipelines, and other small and large scale developments. The previous survey effort is clearly shown in Figure 3.

When undertaking assessments for potential subsidence impacts, it is important to detail the condition of all sites prior to the commencement of extraction works. In order to do this, previously recorded archaeological sites are inspected and a condition assessment made. Previously recorded Aboriginal shelters with art and / or deposit sites to be inspected within the present study area include Ouesdale Creek 3 (52-2-2237), Georges River 1, Georges River 2, Georges River 3, Georges River 4 and Georges River 5.

Based on the large amount of previous survey work and the nature of the potential Longwall 34-36 mine subsidence impacts, the survey methods employed were to:

- Relocate and reassess all previously recorded Aboriginal and historical archaeological sites within the SMP Area;
- Assess the potential for archaeological sites to occur within areas not previously surveyed, and identify sensitive landforms most likely to be impacted by mining subsidence.

The targeted site assessment of Aboriginal and historic archaeological sites was undertaken concurrently.

The survey team consisted of one archaeologist and one representative from each of the relevant Aboriginal communities. During the process of site relocation, team members walked along both sides of the major drainage features, targeting sandstone overhangs within the approximate site locations that match the original sites' descriptions on the site cards. Any incidental areas of exposure or unrecorded sandstone shelters of interest were inspected in detail.

All records were made on specifically designed recording forms for shelter and open sites. Survey track information and site co-ordinates were all logged on a hand-held GPS receiver, using the MGA co-ordinate system. All photographs were taken using a digital SLR camera.

Specific rock shelter observations include:

- Art panel condition
- Art condition
- Presence of graffiti
- Presence of micro-organisms
- Presence of geological features such as bedding planes, cracks and weathering processes
- Condition of shelter floor ie. intact or disturbed deposits
- Presence of artefacts

6.1.1 Constraints to the survey

Recorded Site Accuracy

As has been the case with many recent archaeological surveys, sites that have been previously recorded are not always easily relocated. This can be attributed to the original method of site recording. If sites were originally recorded by hand on a 1:25,000 map sheet, there is likely to be some inaccuracies. This coupled with a change in co-ordinate systems, from AMG to MGA, increases the likelihood of inaccuracies from the original recorded site co-ordinates. Quite often, recorded sites can be inaccurate to between 20 to 100 metres.

Safety

There are many small to moderate sandstone outcrops in the study area, and the edges of these were not approached closer than 2 m by the survey team. In some areas, though not common, the vegetation is impenetrably thick posing a risk of eye injury, falls and cuts or abrasions. In some places, areas were avoided or unapproachable due to terrain and vegetation. This is not considered to be a significant constraint to the adequacy of the survey of these areas.

6.1.2 Aboriginal Participation

Aboriginal representatives from the Tharawal Local Aboriginal Land Council and the Cubbitch Barta Native Title Claimants Aboriginal Corporation participated in the survey over two days in March 2007. Representatives from both of these communities were involved in the initial archaeological field work for this study area (Sefton 1998, 2002a). The representatives have been asked to provide comment on the cultural significance of the locality and any archaeological objects or areas that are recorded during this survey.

6.2 Survey Results

6.2.1 Existing Condition of the Study Area

The study area is dissected by Mallaty Creek running east-west, the Moomba to Sydney gas pipeline and two overhead electricity easements (Plate 1). The site can be accessed by a number of utility and farm vehicle tracks.

Plate 1: View showing vegetation along Mallaty Creek adjacent to open grassed paddocks

Plate 2: View south east along the Georges River showing sandstone outcrops

Both the Georges and Nepean Rivers are situated on the eastern and western boundaries of the proposed longwalls. Pockets of modified native vegetation and outcropping sandstone occur along these drainage corridors (Plate 2). However, the majority of the study area comprises open cleared grazing farmland, a number of small lots with housing and a number of chicken sheds owned by Ingham's.

6.2.2 Aboriginal Shelter Sites

The targeted site survey resulted in the assessment of all previously recorded Aboriginal archaeological sites and PAD sites identified by the Illawarra Prehistory Group surveys and Sefton (1998). Each site was photographed and reassessed for changes since the original site recordings and a new, more accurate, site position was recorded using a hand held GPS. The following section is an overview of each previously recorded site, summarising site features, contents and any changes. No new Aboriginal archaeological sites were identified as a result of the current assessment.

Ousedale Creek Number 3 (52-2-2237)

This extensive shelter with art and archaeological deposit is situated on the southern side of Mallaty Creek, between an existing overhead electricity easement and the Agility gas pipeline. It is located on the only sandstone cliff line situated along this section of the creek. The sandstone shelter is quite large, measuring 16 x 5 x 3.4 m (Plate 3). It has been formed by natural cavernous weathering and block fall formation processes.

Plate 3: Overall view of shelter facing east

Plate 4: Stone artefacts situated in the dripline of the shelter

The floor of the shelter consists of dark grey brown loamy sand that is estimated to be up to 50 cm deep in some areas. It is relatively undisturbed, although some animal movement in the shelter and water has caused some erosion damage. All visible stone artefact material was identified in the heavily eroded drip line of the shelter. This cultural material comprised flakes and cores manufactured from various raw materials (Plate 4).

The art within the shelter was originally described as containing charcoal infill and outline motifs including three indeterminate, two frontal human and one lower half of female frontal human motifs (Plate 5). During the recent assessment of the site, all of these motifs could be identified.

Plate 5: Example of charcoal art motifs located on rear wall

Plate 6: Western section of shelter with art, facing west

The condition of the surface of the overhang was originally described as being subject to continuous ‘active chemical weather’, and ‘fungal growth and water and red mineral staining’ (Sefton 2002b:15). The present site condition is considered to be the same, and the recorded art is still considered to be in a state of poor preservation due to these natural processes.

The overhang itself was identified as containing ‘four stabilised open joints’, all of which run vertically ‘from the floor to the ceiling’ (Sefton 2002a:15). No horizontal bedding planes are

present in this overhang, however, honeycomb weathering is present in some sections (Plate 6). Overall, the overhang is considered to be in a stable condition.

The dark, grey sandy loam deposit within the overhang is relatively undisturbed, although recent water runoff from the drip line and water running in from the side of the shelter has caused significant erosion damage, exposing additional stone artefacts. Apart from this, the deposit is considered to be in a good state of preservation.

Georges River 1 (52-2-2234)

This small shelter with art site is located on the second moderate continuous cliff line from the Georges River, on the western side (Plate 7). The overhang has been formed by block fall and cavernous weathering, with small sections of roof collapses located on the floor of the shelter. It measures 8 x 2.8 x 1.8 m and exhibits a weathered joint where the rear wall meets the ceiling of the overhang, from which water seeps (Plate 8).

Plate 7: Moderate overhang at site 52-2-2234

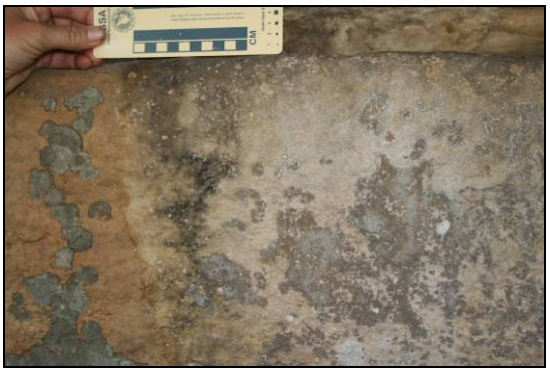

Plate 8: Example of water seepage and lichen growth on face of shelter

The shelter contains up to five charcoal infill and outline indeterminate motifs (Plate 9 and Plate 10). All of the motifs originally recorded were identified and appeared to be in the same condition. Most of the panels have been affected by water seepage apart from those sections that are protected by a thin silica skin (Plate 9 and Plate 10).

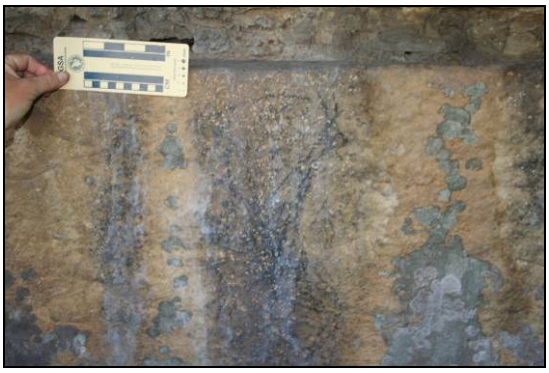

Plate 9: Charcoal motif that remains, showing water seepage and lichen growth

Plate 10: Another charcoal motif panel that has been impacted by water seepage

Where block fall has not occurred, the undisturbed deposit in the shelter is up to 40 cm deep and consists of medium yellow brown sand. No stone artefacts were visible on the surface however.

The condition of the art panels was identified as being 'poor' and that which does survive is beneath a protective, 'heavy silica skin' (Sefton 2002b:30). The art panels are considered to remain in the same condition, with the same amount of lichen growth and water seepage identified during the original recording.

The overhang itself is in a stable condition despite a horizontal, weathering joint where the roof of the overhang meets the top of the shelter wall. This survey also identified water seepage running over the lip of the overhang, across the angled roof of the shelter, to the weathering joint. Despite this the site remains, overall, in an unchanged condition.

Georges River 2 (52-2-2243)

This shelter with art and archaeological deposit site is located on a large, continuous sandstone cliff line on the western side of the Georges River. It is located on a sharp river bend, facing east, south east, it has views north east along the river bend and around the corner (Plate 11). This section of the cliff line measures 26 x 5 x 8 m and has been formed by cavernous weathering and block fall. The shelter exhibits a number of horizontal bedding planes and jointing from which water continuously seeps.

Plate 11: Large continuous cliff line overhang at site 52-2-2243

Plate 12: Small art panel located on sloping roof at site 52-2-2243

The art is located on the mid upper sloping roof, on a single, case hardened surface (Plate 12). It comprises one charcoal outline and infill male frontal human with an axe and ear lobes (?), one charcoal outline and infill kangaroo and up to three indeterminate charcoal outline and infill motifs (Plate 13). The art panel is situated between two open, horizontal bedding planes. Exfoliating and minor surface cracking occurs on the edge and within the art panel surface (Plate 13). Weathering causing granular loss is also occurring across much of the art panel.

Plate 13: Art panel showing kangaroo and human figure at site 52-2-2243

Plate 14: Stone artefacts situated in the drip line of the shelter

The deposit within the shelter consists of dark grey brown sand in the drip line and yellow sand towards the back of the shelter. The deposit depth varies between 15 and 35 cm. A number of stone artefacts were identified in the drip line of the shelter (Plate 15). These included quartzite, silcrete and quartz flakes. The deposit is relatively undisturbed apart from the drip line area, which is subject to continual water erosion.

The condition of the overhang appears to be unchanged, with no changes to horizontal bedding planes, with similar levels of seepage from bedding planes, and over the lip of the shelter. A number of 'jointed surfaces' were also noted, but these remain unchanged. During the current assessment, significant water seepage and run-off was occurring, over the lip of the shelter and from the bedding planes.

The art surface was described as being in moderate condition, despite adjacent exfoliation, 'flaking and cracking' on the edges of the case hardened surface of the art panel (Sefton 2002b:31). Part of the back section of the kangaroo has exfoliated and mineralisation is also occurring in this area. The continuous natural processes will eventually cause this art panel to crack and exfoliate from the roof of the shelter. Overall, the site is in an unstable, poor condition.

Georges River 3 (52-2-2244)

This shelter with art site is situated on a side gully on the western side of the Georges River, 350 m south of the Blackburn Road crossing of the river. It is located under the first cliff line up from the gully. The sandstone overhang is approximately 22 m long, 6 m wide and 2.8 m high and faces north east (Plate 15). It has been formed by cavernous weathering and block fall formation processes. A bedding plane was recorded at the junction between the curved ceiling and the rear wall. Some water seepage was noted over the rim of the shelter in the eastern and western corners.

Plate 15: Small sandstone overhang at shelter site 52-2-2244

The art was recorded on the back wall of the shelter and consists of one charcoal outline and infill lizard, one charcoal outline and infill wombat and two charcoal indeterminate drawings (Plate 16 and Plate 17). Sefton recorded the art surface as case hardened with water damage and granular loss and the heads of both animals were in poor condition (Sefton 2002b:31).

Plate 16: Example of charcoal art motifs located on rear wall

Plate 17: Example of charcoal art motifs located on rear wall

The art has weathered since Sefton's assessment and is currently in a poor condition. The charcoal has faded and a white leeching process was noted on the wall of the shelter and is partly obscuring the art. Overall the art was in an unstable, poor condition. The shelter has no deposit and a limited living area.

Georges River 4 (52-2-2242)

This shelter with art site is situated on the north side of the second gully to the south of the Balckburn Road crossing of the Georges River. It is located 80 m from the river on the western side and near where the side drainage line becomes deeply entrenched. It is under the first cliff line up from the river. The sandstone overhang is approximately 16 m long, 4 m wide and 2 m high and faces east (Plate 18). It has been formed by cavernous weathering and block fall formation processes.

The art was recorded on three separate panels: one charcoal outline and infill frontal human figure on the ceiling (south); one charcoal indeterminate drawing on the rear wall (north); and one charcoal indeterminate drawing on the ceiling (north) (Plate 19). The art surfaces were case hardened and showed some evidence of water damage and granular loss. Slight cracking was noted above the southern art. Overall the art was in a stable condition.

Plate 18: Shelter with art site 52-2-2242 facing north

Plate 19: Charcoal human figure motif (rotated) at 52-2-2242

Block fall was recorded throughout the shelter; in particular a large block fall was recorded in the southern corner. A bedding plane was recorded above the main art panels. Water seepage was evident across the lip of the shelter and has caused chemical leeching across parts of the roof of the shelter. Moss and lichen cover much of the floor surface. The shelter was very damp during the survey. Debris and detritus was recorded within the shelter and there is evidence of recent flooding from heavy rainfall. Only a thin layer of deposit was observed within the shelter and it is unlikely to contain cultural deposit.

Georges River 5 (52-2-2241)

This shelter with art and archaeological deposit site is located on a moderate sandstone overhang situated on the upper cliff line on the eastern side of the Georges River where a small tributary meets the river gully (Plate 20). The overhang has been formed by cavernous weathering and block fall and a large section of block fall is located at the front of the shelter. The overhang measures 19 x 3.2 x 3.2 m within a moderate size living space. A major horizontal bedding plane occurs where the roof of the shelter meets the rear wall, and there are a number of hair line cracks on some surfaces. The southern half of the shelter has fallen but not collapsed as it is held by a tree.

The main overhang contains between six and ten charcoal outline and infill indeterminate motifs and one identifiable charcoal outline and infill frontal human figure (Plate 21 and Plate 22).

Plate 20: Sandstone overhang at site 52-2-2241

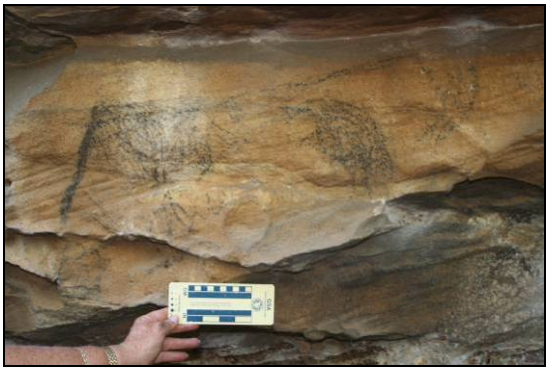

Plate 21: Example of charcoal art motifs located on rear wall

In a small concavity on the side of the large block at the front of the shelter are two charcoal outline and infill kangaroos (Plate 23). All of the originally recorded motifs were identified and appear to be in the same condition.

Plate 22: Another art panel located on rear wall of overhang

Plate 23: One of the kangaroos located in a small concavity in front of shelter

Large sections of some of the art panels still exhibit ‘water damage’ and ‘granular loss’ (Sefton 2002b:33), however these processes have not worsened since the original site recording. Water seepage over the lip of the shelter has clearly ‘washed’ sections of art (Plate

22). Some surfaces also contain small hair line cracks and most of the art is on case hardened surfaces. The most significant impact to the surface of the shelter is granular weathering.

The deposit consists of a medium yellow brown sand where there is no block fall, creating a large open living area of approximately 14 m². The deposit is estimated to be approximately 30 cm deep and a single quartz artefact was identified within this area. The deposit remains undisturbed although some surface movement from small animals was evident. Overall, the shelter is relatively stable and considered to be in good condition.

Douglas Park (52-2-0021)

Open Camp Site

This site was not inspected as it is unlikely to be impacted by subsidence movements.

Georges River 2 (52-2-2266)

Isolated Artefact Occurrence

This site was not inspected as it is unlikely to be impacted by subsidence movements.

Leafs Gully 1 (52-2-2265)

Open Camp Site

This site was not inspected as it is unlikely to be impacted by subsidence movements.

6.2.3 Historic Sites

The targeted site survey resulted in the assessment of previously recorded historic archaeological sites, including the Upper Canal and four other historic features on the western banks of the Georges River. Each site was photographed and reassessed for changes since the original site recordings, and a new, more accurate site position was recorded using a hand held GPS. The following section is an overview of each previously recorded site, summarising site features, contents and any changes. The details of these site recordings can be found in Biosis Research (2005). No new historic archaeological sites were identified as a result of the current assessment. A small stand of European trees were noted on a small ridge in open paddock, indicating land use history of the study area.

Sydney Water Upper Canal

This site is located at the very north western end of the proposed longwalls. The Upper Canal comprises the main alignment (either via tunnel or channel) as well as several individual elements such as overbridges, culverts, aqueducts and flumes (Plate 24 and Plate 25). The canal has been constructed form locally quarried rock. The Upper Canal has undergone many modifications since its original construction and no longer functions as it was originally designed to.

Plate 24: Section of Upper Canal

Plate 25: Structure of Upper Canal

WH1 – Bridge and road remains

This feature comprises eight post holes cut into the sandstone creek bed of the Georges River, representing the pier / bridge foundations. No features were present on the eastern approach to the bridge, however, the remains of timber abutments and roadway alignment are still identifiable on the western approach to the bridge (Plate 26). This feature remains in moderate condition and unchanged since its original identification and recording.

Plate 26: Former bridge post holes located in the sandstone, showing concrete packing, on the Georges River

WH2 – Grave Site

The grave comprises a foundation layer of dry coursed sandstone blocks, which originally had a cement capping. The cement is in poor condition, having cracked and lifted from its original position (Plate 27). The identity of the person interred is unknown and the overall condition of the site is poor and remains unchanged since its original identification and recording.

Plate 27: Grave site in poor condition

WH3 – House Site

The house remains include a carved sandstone block (Plate 28) with discontinuous lines of sandstone blocks forming a rectilinear shape. At one end is a concrete slab, likely to be the original kitchen / laundry. It is unclear if the slab represents an attached structure or a smaller, separate kitchen. The kitchen slab remains in good condition, although somewhat overgrown with grass since its original recording. The full extent of this site remains unknown due to vegetation cover.

Plate 28: Large carved stone from former house site

WH4 – Inn / Cellar Site

This site consists of the remains of a former Inn and associated cellar structure. The structure is built of roughly cut sandstone blocks laid directly into the soil. Some blocks display evidence of dressing with a single-tooth pick. The site is partially disturbed but some sections of wall appear to be undisturbed and in relatively good condition. The site was overgrown with vegetation during the survey.

6.2.4 Discussion

All previously recorded Aboriginal archaeological sandstone shelter with art sites were relocated during the targeted field assessment. Updated photos and condition assessments revealed some minor erosion changes to the deposit within shelter with art and deposit site Ousedale Creek 3, and deterioration of art motifs in shelter with art site Georges River 3. No changes were evident at the remaining shelter art and / or deposit sites. Stone artefact scatter sites were not relocated during the sites assessment as any potential impact from subsidence to such sites is considered to be negligible.

Previously recorded historic sites WH1, WH2 and WH3 were relocated and re-assessed during the field survey. Their condition appeared to be the same, although the sites have become overgrown with vegetation. Historic feature, WH4 could not be reassessed as vegetation cover obscured the walls associated within this feature.

The Canal is a clearly identifiable feature within the landscape. No specific assessment of this site was undertaken as numerous studies and an existing CMP have been completed for the Upper Canal and its associated infrastructure.

7.0 SIGNIFICANCE ASSESSMENT

7.1 Introduction to the Assessment Process

Heritage assessment criteria in NSW fall broadly within the significance values outlined in the Australia ICOMOS Burra Charter (Australia ICOMOS 1999). This approach to heritage has been adopted by cultural heritage managers and government agencies as the set of guidelines for best practice heritage management in Australia. These values include historical, aesthetic, social and scientific significance. The significance of Aboriginal and historic sites and places will be assessed on the basis of the significance values, the details of which are outlined in Appendix 2.

As well as the ICOMOS Burra Charter significance values guidelines, various government agencies have developed formal criteria and guidelines that have application when assessing the significance of heritage places within NSW. Of primary interest are guidelines prepared by the Commonwealth Department of Environment and Heritage (DEH) and the NSW Department of Environment and Climate Change (DECC) and the NSW Heritage Office. The relevant sections of these guidelines are detailed in Appendix 2.1. It includes the assessment of Aboriginal significance based on Part 1 of the *DECC Guidelines for Aboriginal Heritage Impact Assessment* (1997), which are based on the ICOMOS Burra Charter significance values. In addition to the previously outlined heritage values, the *DECC Guidelines* also specify the importance of considering cultural landscapes when determining and assessing Aboriginal heritage values (see Appendix 2).

7.1.1 Aboriginal Sites - Assessment of Significance

The following statements of significance are based on the categories defined in the Burra Charter. These categories include social, historic, scientific, aesthetic and cultural landscape values. Nomination of the level of value—high, moderate, low or not applicable—for each relevant category will also be proposed. The determination of cultural landscape value will be applied to both individual sites and places (to explore their associations) and also, to the study area as a whole. The nomination levels for the scientific significance and cultural significance of each site will be summarised in Plate 6 below. These values determine the 'what' and 'how' of conservation and direct management decisions. The following statements take into consideration the original assessments completed by Sefton (2002a) and the recent reassessment during this current study.

Statement of Archaeological Significance

Ousedale Creek 3 ***52-2-2237*** ***Shelter with Art and Deposit***

This is a shelter with art and deposit site. The art comprises charcoal infill and outline motifs including two frontal humans, one lower half of female frontal and three indeterminate. The art is in a poor state of preservation, from natural features and more recently graffiti. The shelter is quite large and has a good aspect across a deep pool on Mallaty Creek. The art,

however, is a poorly preserved example of the most common type of art. The deposit consists of numerous stone artefacts of varying raw materials and type, including retouched flakes and cores. The deposit itself is reasonably intact despite some erosion from natural water seepage at the front of the shelter. The deposit has high potential to contain information regarding archaeological assemblages and occupation of this shelter.

Significance: **MODERATE**

Georges River 1 ***52-2-2234*** ***Shelter with Art***

This is a shelter with art site. The art is five charcoal outline and infill indeterminate motifs in poor condition due to natural weathering processes. The art technique is considered the most common in the region, meaning the site has low rarity and representative value. There are no aesthetic or historical values associated within the site. The limited floor space and deposit gives the site low research potential and archaeological significance.

Significance: **LOW**

Georges River 2 ***52-2-2243*** ***Shelter with Art and Deposit***

This is a shelter with art and archaeological deposit site. The shelter has uninterrupted views north east along the river bend, giving the site moderate aesthetic values. The art consists of one charcoal outline and infill male frontal human with an axe and ear lobes (?), one charcoal outline and infill kangaroo and up to three indeterminate charcoal outline and infill motifs. The art is in a moderate state of preservation. The art technique is the most common in the region, however the male frontal figure with hand axe / distinct ear lobes gives a higher archaeological value on a regional basis as it is a rare charcoal depiction. The small scatter of stone artefacts occurs within the drip line on the edge of a moderate living area. The deposit is relatively undisturbed and contains moderate research potential.

Significance: **MODERATE**

Georges River 3 ***52-2-2244*** ***Shelter with Art***

This is a shelter with art site. The art consists of one charcoal outline and infill lizard, one charcoal outline and infill wombat and two charcoal indeterminate motifs. The art is a poorly preserved example of the most common art technique in the region, giving the site low rarity and representative values. This site has limited deposit and living area, it has no aesthetic values and no historic values. The site is therefore considered to have low research potential and low archaeological significance.

Significance: **LOW**

Georges River 4 ***52-2-2242*** ***Shelter with Art***

This is a shelter with art site. The art is located on three separate panels, one charcoal outline and infill frontal human figure on the ceiling (south); one charcoal indeterminate drawing on the rear wall (north); and one charcoal indeterminate drawing on the ceiling (north). The art is a well preserved example of the most common art technique in the region, meaning the site has low rarity and high representational value. The overall condition within the shelter is poor, and no deposit is present, giving the site low research potential and archaeological value.

Significance: **LOW**

Georges River 5 ***52-2-2241*** ***Shelter with Art***

This is a shelter with art site. The art consists of between six to ten charcoal outline and infill indeterminate motifs and one identifiable charcoal outline and infill frontal human figure. The art is in a good state of preservation. It is the most common art technique and is considered to be representative of the art in the art region. The shelter contains a reasonable living space that contains some intact deposit of moderate research potential, although overall, the site has low archaeological significance.

Significance: **LOW**

Douglas Park ***52-2-0021*** ***Stone Artefact Site***

This stone artefact site consists of a small number of flaked stone artefacts situated on the spur above Mallaty Creek. Stone artefact sites are common in the region and has been subject to disturbance through past land use activities. This low density site is considered to provide low research potential and low representational values.

Significance: **LOW**

Georges River 2 ***52-2-2266*** ***Stone Artefact Site***

This is a stone artefact site containing a single artefact. Stone artefact sites are not rare, and the low number of artefacts provides low representational and research potential value. The likelihood of stratified archaeological deposits is low, and notwithstanding the presence of deposit the site has low archaeological value.

Significance: **LOW**

Leafs Gully 1 ***52-2-2265*** ***Stone Artefact Site***

This low density stone artefact site consists of two artefacts; one quartz flake and one silcrete flake. The site is situated in a disturbed context on an existing unsealed road and the likelihood of stratified archaeological deposits is low. These low density artefact sites are not rare and provide limited research potential and low representational values.

Significance: **LOW**

Statement of Cultural Significance

All Aboriginal cultural heritage sites located in the study area are considered to be of cultural significance to the Tharawal Local Aboriginal Land Council and the Cubbitch Barta Native Title Claimants Aboriginal Corporation, and it is important that comment on the area is provided directly by members of these Aboriginal communities. Written comments from these Aboriginal stakeholders are provided in Appendix 1.

The sites are evidence of past Aboriginal occupation and use of the area, and are the main source of information about the Aboriginal past. In addition, any recorded (and unrecorded) pre-contact sites are of cultural significance because they are rare or, at least, uncommon site-types. In particular, many sites in the greater Sydney region have been destroyed as a result of land clearance and land-use practices in the historic period.

Cultural landscape values / significance

We firstly approach the assessment of cultural landscape values by considering the value of the assemblage of sites within the identified SMP Area (study area) – an assemblage of sites in a wider context of other sites, and in the context of the fragmented, localised bushland environment. It is important to note that the value of the cultural landscape as a social phenomenon does not have to rely on robust archaeological interpretation; but rather is a contemporary expression of value to the Aboriginal community, archaeologists, and the community at large. We believe this is in-line with current approaches and policy directions for the NSW DECC (NSW NPWS n.d., Byrne, Brayshaw and Ireland 2001).

The current study area is situated on the Woronora Plateau, in an area that has been subject to moderate levels of disturbance from various land use, from agriculture and housing development associated with the nearby township of Appin. As a landscape, the study area contains limited value as only a small number of archaeological sites occur there and the majority of the study area has been cleared and been subject to some level of disturbance. However, it is situated within a physiographic ‘transition’ zone, giving it a higher variation of site types, including isolated stone artefacts, open campsites, scarred trees, sandstone overhangs with art and / or deposit. These sites provide a detailed record of Aboriginal use of the study area prior to European arrival in the region. In addition, the presence of many archaeological sites on the Woronora Plateau is a well known fact amongst local Aboriginal

communities. This gives the landscape value as a well known and highly visible cultural resource for the local Aboriginal communities. Overall, the study area must be considered to have low to moderate value as a cultural landscape.

7.1.2 Aboriginal Sites Significance - Summary

The following table (Table 6) summarises the determinations of significance presented above.

SITE NAME AND NUMBER	*ARCHAEOLOGICAL OR SCIENTIFIC VALUE*	*COMMUNITY OR CUTLRUAL VALUES*
Ouesdale Creek 3 (52-2-2237)	Moderate	High
Georges River 1 (52-2-2234)	Low	High
Georges River 2 (52-2-2243)	Moderate	High
Georges River 3 (52-2-2244)	Low	High
Georges River 4 (52-2-2242)	Low	High
Georges River 5 (52-2-2241)	Low	High

Table 6: Summary of Cultural and Archaeological Site Values

7.2 Historic Sites – Assessment of Significance

7.2.1 Heritage Assessment Criteria

The State Heritage Register, which was established by the amendments to the NSW *Heritage Act* in 1999, has a separate set of significance assessment criteria broadly based on those of the Australia ICOMOS Burra Charter (1999) (see Appendix 2.2 for details of assessment criteria).

7.2.2 Historic sites – assessment of significance

One registered heritage item is located within the SMP Study Area. This is:

- The Upper Canal Water Supply System

The Upper Canal is significant as a major component of the Upper Nepean Scheme. As an element of this Scheme, the Canal has functioned as part of Sydney's main water supply system for over 120 years. As part of this System, the Canal is associated with Edward Moriarty, Head of the Harbours and Rivers Branch of the NSW Public Works Department. The Canal is aesthetically significant, running a serpentine route through a rural bushland setting as an impressive landscape element with sandstone and concrete-lined edges. The Canal is significant as it demonstrates the techniques of canal building, and evidence of engineering practice. The Canal as a whole is an excellent example of 19th century hydraulic engineering, including the use of gravity to feed water along the canal. The Upper Canal has been assessed as being of *state* significance under all heritage assessment criteria. The listing also includes a number of infrastructure elements, such as flumes, canal overbridges, canal tunnels, culverts, mile markers and aqueducts.

A number of other heritage items are located within the SMP Study Area. These include:

- WH-1 Historic bridge and road remains;
- WH-2 Grave site;
- WH-3 House site; and
- WH-4 Pub/Cellar site.

These features are inter-related to the early 'historic landscape' of the Appin region and were assessed in 2005 (Biosis Research) as an associated complex. The details of the assessment of significance can be found in:

Biosis Research (2005) *West Cliff Colliery Area 5 Longwalls 31-33: Impact of Subsidence on Indigenous and Historic Archaeological Sites*. A report to BHP Billiton Illawarra Coal.

The statement of significance from this report is as follows:

'The road and bridge crossing are significant indicators of transportation routes in the colony, while the house, grave and pub/cellar sites demonstrate the stability and growth prompted by stable links between communities. The features provide direct evidence of historic use, reflecting the evolution of the area in an easily understood context. Each item informs and enhances the significance of the others, with the overall grouping providing a significant indication of the physical history of the study area.

The sites recorded are considered collectively to have ***High Local*** significance.' (Biosis Research 2005:40)

8.0 IMPACT ASSESSMENT

8.1 Potential Subsidence Impacts

The potential impacts that result from subsidence relate to the tilt and strain that occurs during and after the coal has been extracted. The discussion below is based on MSEC (2007) predictions for the proposed 34 to 36 longwall mining area.

Subsidence

Subsidence refers to vertical and associated horizontal displacement of a point. In the case of this study it refers to subsidence resulting from the extraction of coal using longwall methods. The magnitude of subsidence is usually expressed in millimeters (MSEC 2007).

Tilt

Tilt is calculated as the change in subsidence between two points divided by the distance between those points. Tilt is, therefore, the first derivative of the subsidence profile. The convention usually adopted is for a positive tilt to indicate the ground increasing in subsidence in the direction of measurement. The maximum tilt, or the steepest portion of the subsidence profile, occurs at the point of inflection in the subsidence trough, where the subsidence is roughly equal to one half of the maximum subsidence. Tilt is usually expressed in millimetres per metre (MSEC 2007).

Strain

Strain is caused by bending and differential horizontal movements in the strata. Measured strain is determined from monitored survey data by calculating the horizontal change in length of a section of a subsidence profile and dividing this by the initial horizontal length of that section. If the section has been extended, the ground is in tension and the change in length and the resulting strain are positive. If the section has been shortened, the ground is in compression and the change in length and the resulting strains are negative. The unit of measurement adopted for strain is millimetres per metre. The maximum strains coincide with the maximum curvature and hence the maximum tensile strains occur towards the sides of the panel whilst the maximum compressive strains occur towards the bottom of the subsidence trough (MSEC 2007).

8.2 Aboriginal Archaeological Heritage Sites

Predicted mining subsidence movements and potential impacts to Aboriginal sites located within the SMP Area have been identified by MSEC (2007). Table 7 below shows the results of the subsidence modelling. The values, given in millimetres per metre, indicate the maximum parameters within a 20 metre radius of each site. The predicted tilts and strains at each site are the maximum values which occur anytime during or after the extraction of the proposed longwalls (MSEC 2007).

Site Name	Site Type	Maximum Predicted Cumulative Subsidence (mm)	Maximum Predicted Cumulative or Travelling Tilt (mm/m)	Maximum Predicted Cumulative or Travelling Tensile Strain (mm/m)	Maximum Predicted Cumulative or Travelling Compressive Strain (mm/m)
52-2-0021	Isolated Artefact Occurrence	890	2.8	0.1	0.4
52-2-2234	Shelter with Art	125	1.4	0.3	0.1
52-2-2237	Shelter with Art and Deposit	760	3.1	0.9	0.2
52-2-2241	Shelter with Art	<20	0.1	<0.1	<0.1
52-2-2242	Shelter with Art	70	0.8	0.1	<0.1
52-2-2243	Shelter with Art and Deposit	55	0.8	0.1	<0.1
52-2-2244	Shelter with Art	40	0.3	0.1	<0.1
52-2-2265	Stone Artefact Scatter	760	1.7	0.3	0.5
52-2-2266	Isolated Artefact Occurrence	225	1.6	0.3	<0.1

Table 7: Maximum cumulative subsidence, tilt and strain predictions for each of the Aboriginal archaeological sites within the Study Area. Provided by MSEC 2007).

Three open Aboriginal archaeological sites (52-2-0021, 52-2-2265 and 52-2-2266) are situated within the SMP Area. Although the predicted maximum subsidence, tilt and strain are greater than shelter with art sites, due to the nature of this site type, it is unlikely that the artefacts themselves would be impacted by potential subsidence effects like the surface cracking of soils (Table 7).

The remaining six archaeological shelter with art and / or deposit sites (52-2-2234, 52-2-2237, 52-2-2241, 52-2-2242, 52-2-2243 and 52-2-2244) are situated within the valleys of the Georges River and Mallaty Creek. These types of sites are susceptible to impacts from mine subsidence movements (Sefton 2000). This might include fracturing of sandstone, rock falls and increased water seepage through joints or cracks.

The maximum predicted systematic strains at any of these shelter sites is at Ousedale Creek 3 (52-2-2237), located above Longwall 33 (Table 7). A tensile strain greater than 0.5mm/m, and compressive strains greater than 2mm/m, may be of sufficient magnitude to result in impacts to the sandstone and the sandstone bedrock. It is therefore possible that the predicted tensile strain at this site could be sufficient to result in fracturing of the sandstone bed, thus, creating the possibility of rock instability. BHPBIC has submitted an application to the DECC for a s90 consent for this site for the potential for impacts associated with Longwall 33.

No impacts were reported at this site during the extraction of Longwall 32, and the predicted cumulative strain is so minor (<0.2) that it is unlikely that significant rock instability will occur as a result of the extraction on Longwalls 34 to 36.

The maximum predicted systematic tensile and compressive strains at the remaining five shelter with art sites within the SMP Area are less than the predicted 'sufficient magnitude'. Thus, it is unlikely therefore that these sites would experience any significant, perceptible impacts as a result of extraction of the proposed longwalls (MSEC 2007: 91).

Sites may experience valley related movements being situated within Georges River and Mallaty Creek valleys. However, generally, sandstone shelter sites are not impacted by upsidence or closure movements. Those sites located on the bends of the river / creeks may experience strains resulting from closure movements.

Based on the MSEC (2007) predictions, none of the known Aboriginal archaeological sites within the study area are at significant risk of impact from the proposed mining of Longwalls 34 to 36. Notwithstanding this low risk, BHPBIC will apply to the DECC for s90 consents for these sites for the residual potential for impacts associated with Longwalls 34-36.

Cliffs and Rock Formations associated with Aboriginal Sites

Two significant cliff lines have been identified within the study area, both situated on the Georges River. MSEC (2007) has defined a cliff line as being a 'continuous rock face having a minimum height of 10 metres and a minimum slope of 2 to 1'. Aboriginal archaeological sites 52-2-2234 and 52-2-2243 are associated with cliff line GR-CL01 on an outside bend of the Georges River (MSEC 2007:19).

Table 8 below indicates the maximum predicted values of systematic subsidence, tilt and strain at any time during or after the extraction of the proposed longwalls (MSEC 2007:60).

Cliff	Maximum Predicted Cumulative Subsidence (mm)	Maximum Predicted Cumulative or Travelling Tilt (mm/m)	Maximum Predicted Cumulative or Travelling Tensile Strain (mm/m)	Maximum Predicted Cumulative or Travelling Compressive Strain (mm/m)
GR-CL 01	130	1.7	0.4	0.2
GR-CL 02	30	0.3	0.1	<0.1

Table 8: Maximum predicted subsidence, tilt and strain predictions at the Cliffs within the SMP Area Resulting from the Extraction of Longwalls 29 to 36 (Provided by MSEC 2007).

As the predicted tilt of GR-CL 01 are very small compared with existing grades and therefore, are unlikely to result in impact to this cliff line. Fracturing sandstone has not been previously observed where predicted tensile and compressive strains have been less than 0.5mm/m and 2mm/m, respectively, therefore it is unlikely that the predicted maximum systematic strains at Cliff GR-CL 01 will be of sufficient magnitude to result in fracturing of sandstone.

Cliff GR-CL 01 is however situated directly above the end of Longwall 35 and rock instabilities have been observed in similar cliff lines that were located directly above extracted longwalls. It is also very difficult to assess the likelihood of cliff instabilities based on predicted ground movements, as the stability of a cliff is dependent on a number of other factors, such as natural joints, bedding planes, fractures, tree root jacking, water seepage and rock inclusions, that cannot be quantified (MSEC 2007:61).

Impacts at Appin Longwall 301 and 302, and Dendrobium 1 and 2, where no subsidence predictions were indicated and subsequent impacts occurred along cliff lines have been considered for Cliffs GR-CL 01 and GR-CL 02 (MSEC 2007:62). Based on this comparison,

the potential for cliff instabilities at Cliff GR-CL 01, where two Aboriginal shelter with art sites occur, is considered to be similar to or slightly greater than observed impacts at Appin Longwalls 301 and 302; and significantly less than impacts observed at Dendrobium Longwalls 1 and 2.

The predicted percentage of cliff line at Cliffs GR-CL 01 and GR-CL 02 that will be impacted by subsidence movements is between 1 and 7%. The expected impact however is considered more likely to be at the lower end of this range.

8.3 Historical Archaeological and Heritage Sites

Historic Features

MSEC (2007) have modelled and calculated the potential impacts from mining subsidence movements to the four historic features that have been identified within the SMP Area. Table 9 below summarises these results.

Site Name	Site Type	Maximum Predicted Cumulative Subsidence (mm)	Maximum Predicted Cumulative or Travelling Tilt (mm/m)	Maximum Predicted Cumulative or Travelling Tensile Strain (mm/m)	Maximum Predicted Cumulative or Travelling Compressive Strain (mm/m)
Bridge and Road Remains Site (WH1)	Transport Infrastructure	150	1.0	0.1	<0.1
Grave Site (WH2)	Domestic	530	4.4	0.5	0.2
House Site (WH3)	Building Remains	755	4.5	0.1	0.5
Pub / Cellar Site (WH4)	Buildings Remains	700	3.9	0.3	0.4

Table 9. Subsidence prediction for historical heritage sites (MSEC 2007).

It can be seen from these predictions that none of these structures are likely to be significantly impacted by the proposed longwalls. The prediction from MSEC is that the likelihood of impact for all structures is considered to be negligible.

Heritage Sites

The Upper Canal is situated within the current SMP Area, located at a distance of 290 metres north west of Longwall 35 at its closest point. As it is located outside the predicted 20 mm subsidence contour, it is unlikely to be subjected to any significant subsidence movements. It could however be subject to far-field horizontal movements. As such movements tend to be bodily movements associated with very low levels of strain, it is again unlikely that the canal would be impacted by far-field horizontal movements resulting from extraction of Longwalls 34 to 36 (MSEC 2007:68).

The Canal crosses a number of drainage features, including Leafs Gully and Nepean Creek, and therefore may be subjected to valley related movements and far-field effects (MSEC 2007:21). Two wrought iron aqueducts associated with the Upper Canal are situated at the Leafs Gully and Nepean Creek crossings, just outside the general SMP Area; however, as

they cross these drainage features, they could be subject to valley related movements. Both of these features are between 400 to 500 metres from the end of longwall 35 at their closest points.

Predicted subsidence movements for the Wrought Iron Aqueducts situated on Leafs Gully and Nepean Creek indicate unlikely impacts, as both are located more than 400 m from Longwall 35 (Table 10).

Site Name	Site Type	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Total Upsidence (mm/m)	Maximum Predicted Total Closure (mm/m)
Upper Canal – Leafs Gully Creek Crossing	Infrastructure / Aqueducts	<5	20	25
Upper Canal – Nepean Creek Crossing	Infrastructure / Aqueducts	<5	5	5

Table 10: Maximum Predicted Total Subsidence, Upsidence and Closure Movements at the Aqueducts at Leafs Gully and Nepean Creek crossings.

It should be noted that preventative measures on the Leafs Gully Aqueduct (part of the Upper Canal system) have already been undertaken by the SCA, so that the aqueduct could accommodate the predicted movements resulting from Longwalls 29 to 33.

It is recommended by MSEC (2007:68) however, that the predicted movements of both Aqueducts are reviewed by the SCA in consultation with BHPBIC so necessary mitigation measures can be implemented.

9.0 RECOMMENDATIONS

Ideally heritage management involves conservation of sites through the preservation and conservation of fabric and context. In cases where conservation is not possible or practical, several options for management are available. For archaeological sites management often involves mitigation through the salvage of features or artefacts and retrieval of information through excavation or collection, and interpretation, especially where impact cannot be avoided. The impact assessment presented in the previous section demonstrates that, taking into consideration what we know from previous monitoring programs associated with longwall mines, overall there is a low risk of impact to the majority of archaeological sites within West Cliff Area 5

9.1 Recommendations

Aboriginal archaeological sites

There are nine Aboriginal archaeological sites that are registered on the AHIMS register situated within the current SMP Area.

Aboriginal Recommendations

Based on the subsidence predictions provided by MSEC (2007), it is unlikely that there will be significant impacts to the archaeological sites resulting from the proposed longwall mining.

However, as six of the Aboriginal archaeological shelter with art sites (52-2-2234, 52-2-2237, 52-2-2241, 52-2-2242, 52-2-2243, and 52-2-2244) are located within the SMP Area, a monitoring program will be implemented.

The monitoring program would involve site visits prior to the commencement of extraction of Longwalls 34 to 36, during extraction and 3, 6 and 12 months following the completion of extraction adjacent to the sites

Notwithstanding the low probability of damage to these sites, BHP Billiton Illawarra Coal will apply for consents under s90 of the National Parks and Wildlife Act 1974 *for sites:*

- *52-2-2234*
- *52-2-2241*
- *52-2-2242*
- *52-2-2243*
- *52-2-2244*

An application for a Section 90 consent for site 52-2-2237 has been submitted to the DECC in light of the low probability of damage that may arise from mining Longwall 33.

Ongoing consultation will continue between BHP Billiton Illawarra Coal, the Tharawal Local Aboriginal Land Council, Cubbitch Barta Native Title Claimants, and DECC as required.

A copy of this report will be distributed to the Aboriginal communities for their review and comment on receipt of final comments from BHP Billiton Illawarra Coal. .

Historical archaeological sites

The Upper Canal and its components are listed on the NSW State Heritage Register. The Upper Canal, WH1, WH2, WH3 and WH4 are located within the current SMP Area. Although no impacts were observed to any of the heritage items during and following the extraction of Longwalls 31-33, the following recommendations should be undertaken.

Historical Recommendations

Upper Canal

The existing CMP for the Upper Canal should be followed at all times. The potential for far-field subsidence movements identified by MSEC (2007) should be taken into consideration, and if required, the management plan (CMP) amended accordingly.

Consultation between BHP Billiton Illawarra Coal, MSEC, the Sydney Catchment Authority heritage officer and the NSW Heritage Council / NSW Heritage Office should be an integral component of this process. If required, a Statement of Heritage Impact should be completed prior to the commencement of Longwalls 34-36.

Heritage Features

Prior to mining works occurring in the area detailed recording of sites WH2 – WH4 should be undertaken. This should include photographic recording and plan mapping. Copies of these records should be lodged in a publicly accessible repository.

Although it is unlikely that these sites will be impacted as a result of mining associated within Longwalls 34-36, it is recommended that monitoring of historic road site (WH1) on the Georges River, should occur prior, during and after longwall extraction.

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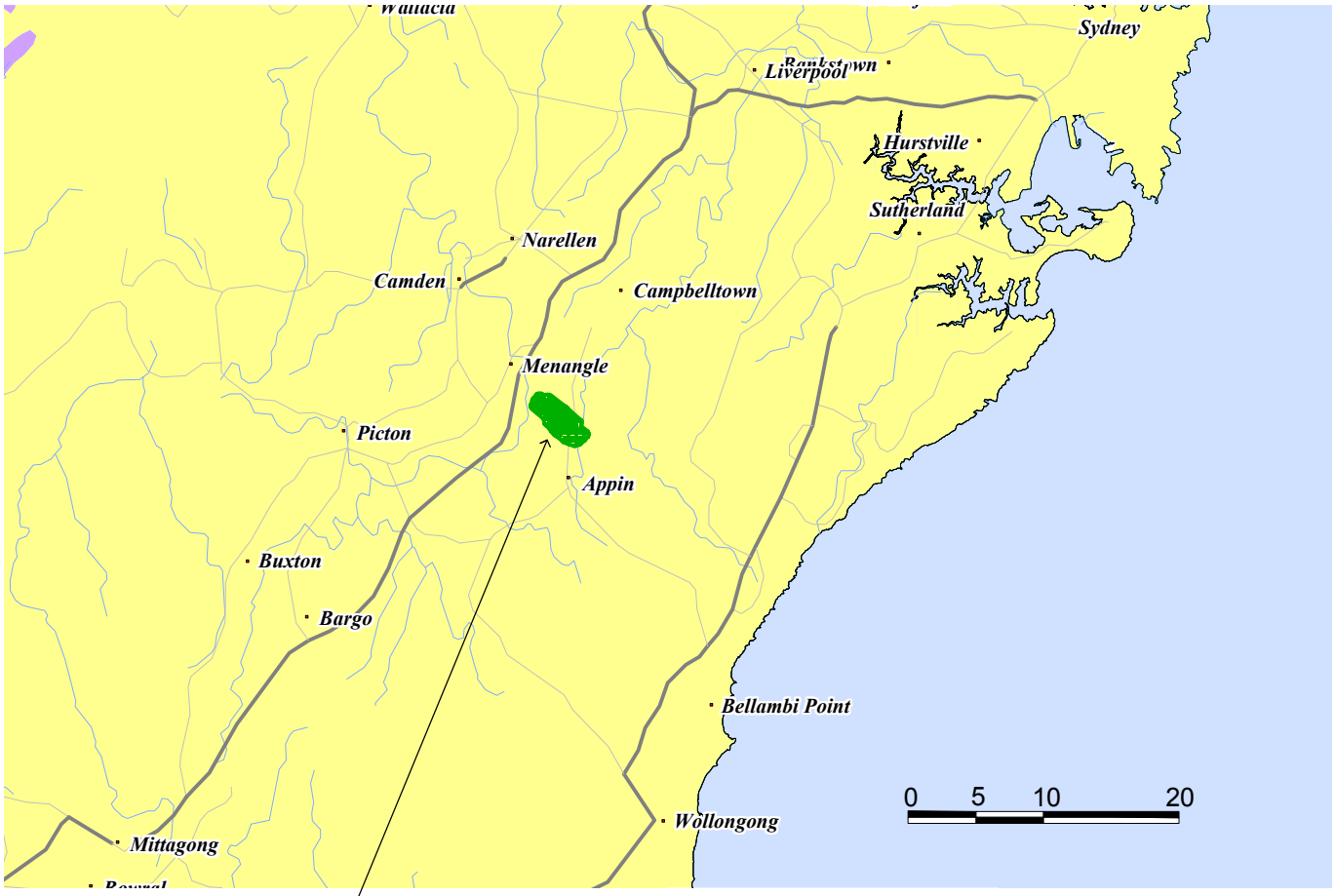
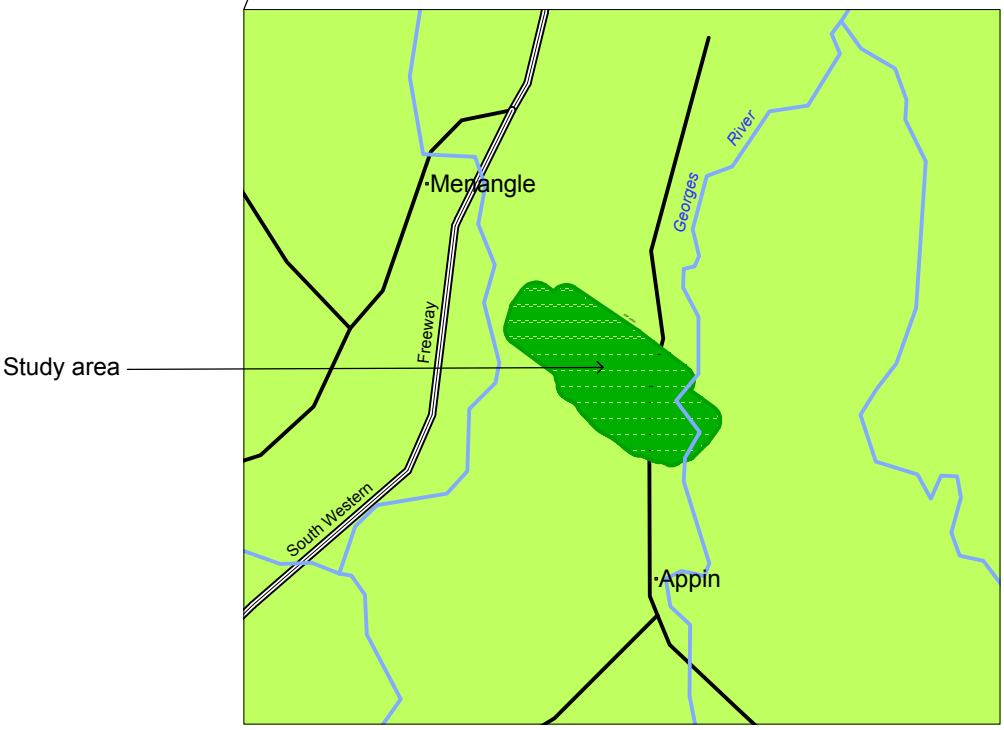
FIGURES





Study area

BIOSIS RESEARCH Pty. Ltd.

8 Tate Street
Wollongong
NEW SOUTH WALES 2500

Figure 1: Location of the Study Area in a regional context.

DATE: 23 November 2007 | Scale: Not to Scale

Checked by: MT | File number: 4658

Location:-...\4000\4600s\4659\Mapping\S4658 F1_Locality.WOR

N W E S

Site types

- Axe Grinding Groove
- Axe Grinding Groove, Shelter with Art
- Axe Grinding Groove, Shelter with Art, Shelter with Deposit
- Midden
- None
- Open Camp Site
- Rock overhang with PAD
- Scarred Tree
- Shelter with Art
- Shelter with Art, Shelter with Deposit
- Shelter with Art, Shelter with PAD
- Shelter with Deposit
- Shelter with PAD
- Shelter with Surface Artefacts
- Historic site
- Historic area
- Upper Canal-Registered Heritage site
- Aquaducts

Key

- Region
- Proposed longwalls (goaf)
- 20mm Subsidence contour
- Cliffs-Georges River

Acknowledgements: DECC

52-2-2239 20 20 45-2 52-2-2240 52-2-2235 52-2-2265 52-2-0270 52-2-0021 52-2-2237 52-2-2242 52-2-2238 52-2-2250 52-2-0278 52-2-0283 52-2-0419 52-2-2244 52-2-2096 52-2-1213 52-2-2095 52-2-2094 52-2-1214 52-2-2099 52-2-2098 52-2-2097 52-2-1127 52-2-0421 52-2-2243 52-2-2241 52-2-1202 52-2-2234 WH1 WH3 WH4 WH2 52-2-2266 52-2-1213 AA7-07 52-2-1922 52-2-1921 52-2-1681 52-2-1680 52-2-1682 52-2-2284 52-2-2236 52-2-2059 52-2-2101 52-2-2282 52-2-2283 HB1 52-2-1878 52-2-1924 SEE INSET

INSET

52-2-2104 52-2-2066 SG11 52-2-2113 52-2-2264 52-2-2063 52-2-2105 52-2-2064 52-2-2041 52-2-2106 52-2-2034

0 150 300 450 metres

BIOSIS RESEARCH Pty. Ltd.

15 - 17 Henrietta Street
Chippendale
NEW SOUTH WALES 2008

Figure 2: AHIMS within the Study Area

DATE: 21 December 2007
Checked by: MT
File number: S4658
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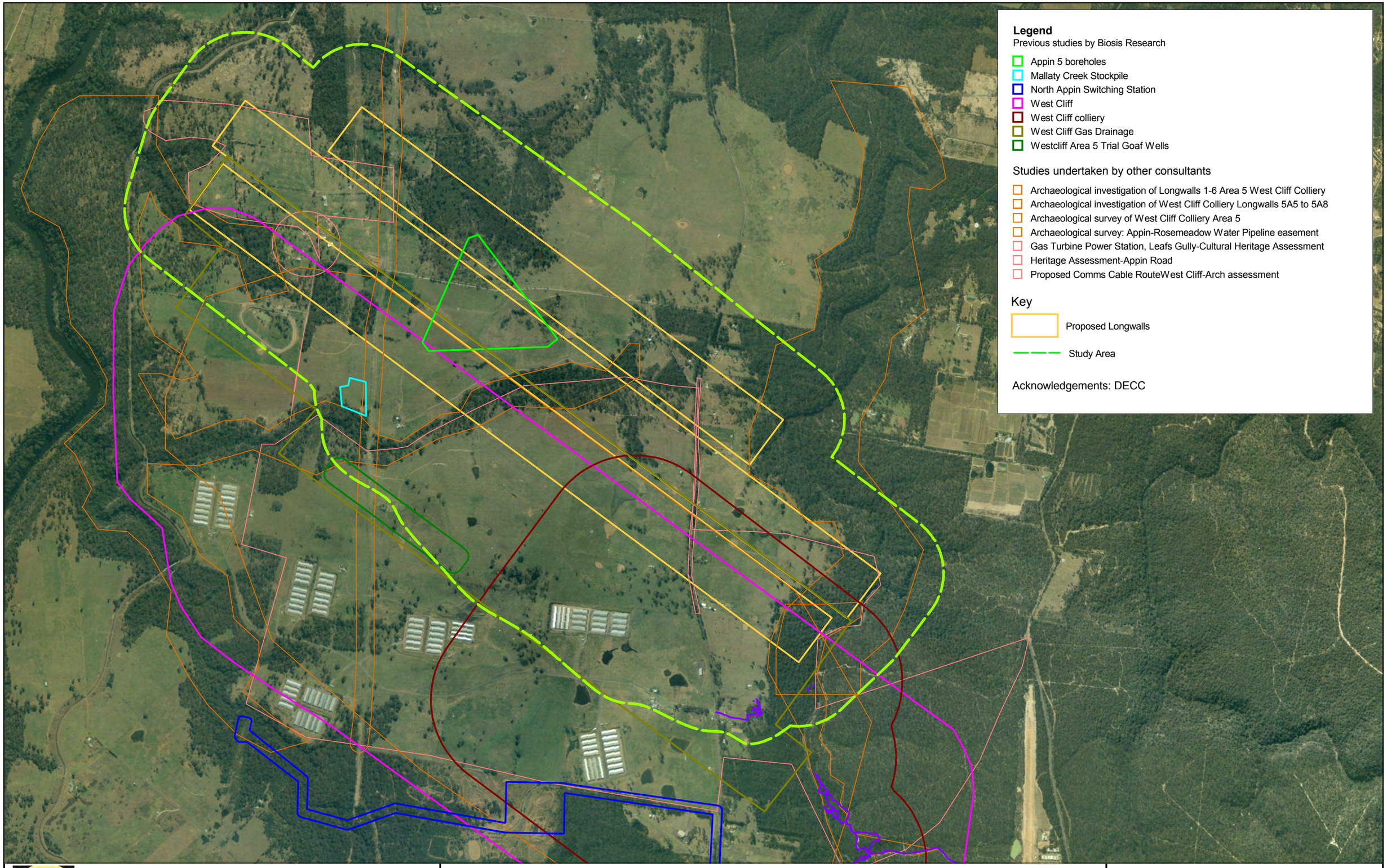
Scale: 0 0.25 0.5 0.75 1.0 1.25 kilometres

N W E S

Figure 2: AHIMS within the Study Area



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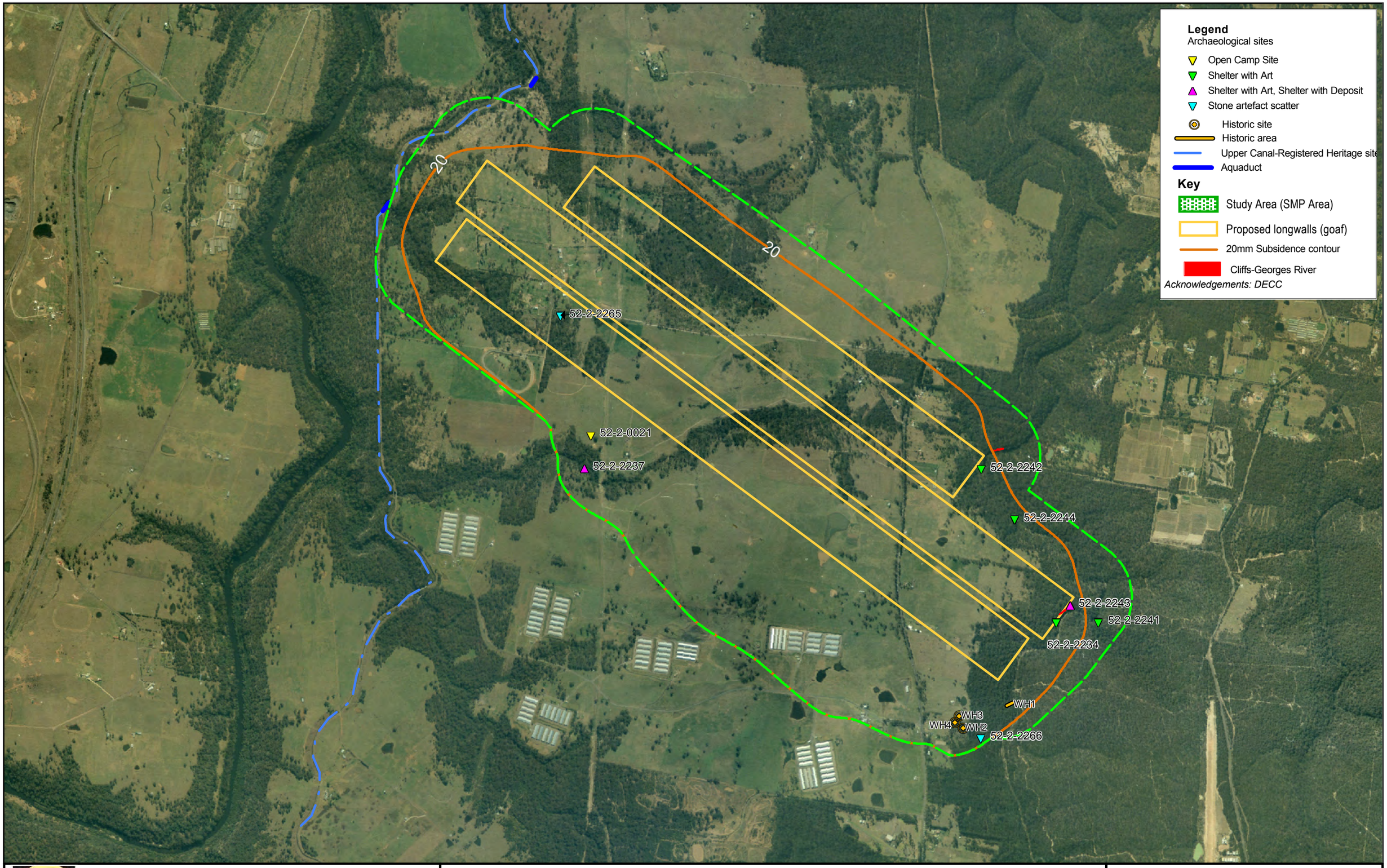
8 Tate Street
Wollongong
NEW SOUTH WALES 2500

Figure 3 : Previous archaeological surveys within the study area

DATE: 29 November 2007
Checked by: MT
File number: S4658
Location:-..\4000\4600s\4658\4658 Mapping\S4658 F3 Previous surveys.WOR

Scale: 0 0.25 0.5 1 kilometres

Figure 3 : Previous archaeological surveys within the study area



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8 Tate Street
Wollongong
NEW SOUTH WALES 2500

Figure 4: All recorded aboriginal and historical archaeological sites within the Study Area

Figure 4: All recorded aboriginal and historical archaeological sites within the Study Area

DATE: 4 January 2008
Checked by: MT
File number: S4658
Location:-..4000\4600s\4658\Mapping\S4658 AHIMS.WOR

Scale: 0 0.2 0.4 0.6 0.8 1.0 kilometres

N W E S

APPENDICES

APPENDIX 1:

1.0 ABORIGINAL COMMUNITY COMMENT

TO BE INCORPORATED WHEN RECEIVED.

APPENDIX 2:

2.0 ASSESSMENT OF SIGNIFICANCE

2.1 Significance Assessment Process

Heritage assessment criteria in NSW fall broadly within the significance values outlined in the Australia ICOMOS Burra Charter (Australia ICOMOS 1999). This approach to heritage has been adopted by cultural heritage managers and government agencies as the set of guidelines for best practice heritage management in Australia. These values include:

- **historical** significance (evolution and association) refers to historic values and encompasses the history of aesthetics, science and society, and therefore to a large extent underlies all of the terms set out in this section. A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the settings are substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of subsequent treatment.

- **aesthetic** significance (Scenic/architectural qualities, creative accomplishment) refers to the sensory, scenic, architectural and creative aspects of the place. It is often closely linked with social values and may include consideration of form, scale, colour, texture, and material of the fabric or landscape, and the smell and sounds associated with the place and its use.

- **social** significance (contemporary community esteem) refers to the spiritual, traditional, historical or contemporary associations and attachment that the place or area has for the present-day community. Places of social significance have associations with contemporary community identity. These places can have associations with tragic or warmly remembered experiences, periods or events. Communities can experience a sense of loss should a place of social significance be damaged or destroyed. These aspects of heritage significance can only be determined through consultative processes with local communities.

- **scientific** significance (Archaeological, industrial, educational, research potential and scientific significance values) refers to the importance of a landscape, area, place or object because of its archaeological and/or other technical aspects. Assessment of scientific value is often based on the likely research potential of the area, place or object and will consider the importance of the data involved, its rarity, quality or representativeness, and the degree to which it may contribute further substantial information.

The significance of Aboriginal and historic sites and places will be assessed on the basis of the significance values outlined above. As well as the ICOMOS Burra Charter significance values guidelines, various government agencies have developed formal criteria and guidelines that have application when assessing the significance of heritage places within NSW. Of

primary interest are guidelines prepared by the Commonwealth Department of Environment and Heritage (DEH) and the NSW Department of Environment and Conservation (DEC) and Heritage Office and. The relevant sections of these guidelines are presented below.

Aboriginal Sites – Assessment of Significance

The following Aboriginal significance assessment is based on Part 1 of the *DEC Guidelines for Aboriginal Heritage Impact Assessment* (1997). These guidelines state that an area may contain evidence and associations which demonstrate one or any combination of the ICOMOS Burra Charter significance values outlined above in reference to Aboriginal heritage. Reference to each of the values will be made when evaluating Aboriginal significance for sites and places.

In addition to the previously outlined heritage values, the *DEC Guidelines* also specify the importance of considering cultural landscapes when determining and assessing Aboriginal heritage values. The principle behind a cultural landscape is that 'the significance of individual features is derived from their inter-relatedness within the cultural landscape'. This means that sites or places cannot be 'assessed in isolation' but must be considered as parts of the wider cultural landscape. Hence the site or place will possibly have values derived from its association with other sites and places. By investigating the associations between sites, places, and (for example) natural resources in the cultural landscape the stories behind the features can be told. The context of the cultural landscape can unlock 'better understanding of the cultural meaning and importance' of sites and places.

Although other values may be considered – such as educational or tourism values – the two principal values that are likely to be addressed in a consideration of Aboriginal sites and places are the cultural/social significance to Aboriginal people and their archaeological or scientific significance to archaeologists. The former is discussed in greater depth below, as it is more comprehensively addressed in the Guidelines for Aboriginal Impact Assessment. However we note here that it is best practice for archaeologists when undertaking significance assessments to keep in mind that scientific assessments are part of a larger picture.

The determinations of Aboriginal significance for sites and places will then be expressed as *statements of significance* that preface a concise discussion of the contributing factors to Aboriginal cultural heritage significance. Nomination of the level of value—high, moderate, low or not applicable—for each relevant category will also be proposed and presented in a summary table.

Aboriginal community or cultural values

The NSW DECC recognises that 'Aboriginal community are the primary determinants of the significance of their heritage' (NSW DEC 2004). Biosis Research recognises that our role in the cultural heritage assessment process is to provide specialist skills, particularly in regard to archaeological and heritage management expertise. These specialist skills can be articulated

and enhanced through consultation with the Aboriginal community, with the aim of providing a comprehensive assessment of cultural heritage significance.

The heritage assessment criteria outlined above that relate to community or cultural values include social, historic and aesthetic value. Social and aesthetic values are often closely related. Social value refers to the spiritual, traditional, historical or contemporary associations and attachment that the place or area has for the present-day Aboriginal community. Aesthetic values related to Aboriginal sites and places that may contain particular sensory, scenic, architectural and creative values and meaning to Aboriginal people. Historic value refers to the associations of a place with a person, event, phase or activity of importance to the history of an Aboriginal community. Gaining a sufficient understanding of this aspect of significance will often require the collection of oral histories and archival or documentary research, as well as field documentation. Places of post-contact Aboriginal history have generally been poorly recognised in investigations of Aboriginal heritage, and the Aboriginal involvement and contribution to important regional historical themes is often missing from accepted historical narratives.

These aspects of heritage significance can only be determined through consultative processes with one or more Aboriginal communities. In terms of Aboriginal communities, heritage places – including those that are otherwise defined as 'archaeological sites' – will always attract differing values. These may include custodianship obligations, education, family or ancestral links, identity, and symbolic representation. History and traditions are important: this generation has an obligation to future generations to retain certain things as they are currently seen and understood. This includes retaining alternative understandings to those that come through scientific assessments. Heritage places are often more complex than is identified through the scientific determination of value. Cultural and social values can be complex and rich - the past is a vital component of cultural identity. Feelings of belonging and identity are reinforced by knowledge of the existence of a past, and this is further reinforced and maintained in the protection of cultural heritage.

Statement of Cultural Significance

All Aboriginal cultural heritage sites located in the study area are considered to be of cultural significance to the Tharawal Local Aboriginal Land Council and the Cubbitch Barta Native Title Claimants Aboriginal Corporation, and it is important that comment on the area is provided directly by members of these Aboriginal communities. The sites are evidence of past Aboriginal occupation and use of the area, and are the main source of information about the Aboriginal past. In addition, any recorded (and unrecorded) pre-contact sites are of cultural significance because they are rare or, at least, uncommon site-types. In particular, many sites in the greater Sydney region have been destroyed as a result of land clearance and land-use practices in the historic period.

Aboriginal (Scientific) Significance

Archaeological significance (also called scientific significance) refers to the value of archaeological objects or sites as they relate to research questions that are of importance to the archaeological community, including indigenous communities, heritage managers and academic archaeologists. Generally the value of this type of significance will be determined on the basis of the potential for sites and objects to provide information regarding the past life-ways of people (Burke and Smith 2004: 249, NPWS 1997). For this reason, the NSW NPWS summarises the situation as 'while various criteria for archaeological significance assessment have been advanced over the years, most of them fall under the heading of archaeological research potential' (NPWS 1997: 26). The NPWS criteria for archaeological significance assessment are based largely on the Register of the National Estate Criteria, and under the heading of 'research potential' include the following aspects and definitions (NPWS 1997):

General site considerations, including factors such as:

- *Site intactness or integrity:* This includes the state of preservation of archaeological objects, as well as the stratigraphic integrity of the site, the taphonomic processes acting on the site, the impact of past artefact collections made at the site.

- *The connectedness* of the site to other sites – when considered as part of a larger assemblage or landscape the site may have greater research potential than if it was simply considered in isolation.

- *Chronological potential* refers to the potential of a site to provide a dateable framework extending back into the past. The potential antiquity of a site is also an important consideration, as older sites are relatively less common than younger sites. In many cases stratified, dateable artefact bearing deposits are sufficiently rare to be a very valuable resource.

Representativeness

- *Representativeness* refers to the ability of a site or object to serve as a representative example of sites in the same class. This aspect of value is only meaningful when considered in conjunction with a conservation goal, and must be determined against the archaeological record at various scales of consideration - local, regional and continental for example. It takes into account site and object variability, connectedness and a consideration of what is already, and likely to be, conserved. Burke and Smith (2004: 247) define representativeness as 'an assessment of whether or not a place is a good example of its type, illustrating clearly the attributes of its significance.'

Rarity

- *Rarity* is, of course, closely related to representativeness (if a site is rare, it is likely to have high representative value), and will include a consideration of those issues

discussed under general site considerations. In many ways, the determination of rarity is a summation of exceptional research potential, or a representative of a small class of sites or objects. Burke and Smith (2004: 247) further describe rarity as 'an assessment of whether the place represents a rare, endangered or unusual aspect of our history or cultural environment that has few parallels elsewhere.'

In addition to the research potential related value factors, the NSW NPWS (1997: 32) also discuss *Educational Potential* and *Aesthetic Significance*, as items that may be included in scientific significance. The NPWS general advice is that archaeologists should give careful consideration prior to attempting to determine educational and aesthetic values (NPWS 1997: 32). We make no attempt to determine educational potential of sites under scientific assessment, but do consider educational value as a contributing factor that may be included in an assessment of social significance by the Aboriginal community.

Aesthetic values

There is a diverse yet accessible literature regarding identifying aesthetic values and determining aesthetic significance (Burke and Smith 2004: 248-9, Kerr 1996: 15-16, Pearson and Sullivan 1999: 134-8). It is generally agreed that aesthetic values are an important part of cultural heritage significance, however they are dependent on an individual's sensory response, which means determining aesthetic value is fraught with difficulty, and should be applied on a case-by-case basis as it is not always a value applicable to archaeological sites (Burke and Smith 2004: 248). However, when dealing with shelter and rock art sites aesthetic values and landscape context are an important consideration. The question 'does the place have a relationship between its parts and the setting which reinforces the quality of both', while originally proposed in an architectural context (Kerr 1996: 15), is relevant also for rock art and shelter sites in a bushland setting where there is often an important relationship between the cultural site and natural environment.

2.2 Historic Sites – Assessment of Significance

The State Heritage Register, which was established by the amendments to the NSW *Heritage Act* in 1999, has a separate set of significance assessment criteria broadly based on those of the Australia ICOMOS Burra Charter (1999).

To be assessed for listing on the State Heritage Register an item will need to meet one or more of the following criteria:

CRITERION	DESCRIPTION	CATEGORY
A	An item is important in the course, or pattern, of NSW's cultural or natural history;	Nature of
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;	Nature of

CRITERION	DESCRIPTION	CATEGORY
C	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW;	Nature of
D	An item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons;	Nature of
E	An item has the potential to yield information that will contribute to an understanding of NSW's cultural and natural history;	Nature of
F	An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history;	Comparative
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.	Comparative

Table 11 : Criteria for the assessment of historic cultural heritage

Amendments to the *Heritage Act* clarify and strengthen responsibility for the management of heritage items at the Local and State level. Consequently, items can be assessed as having **Local** or **State** level significance. Items should also be assigned a grading, in order to better explain its place within a cultural landscape. Criteria for grading an item or place are discussed below.

An item cannot be excluded from listing on the State Heritage Register on the basis that items with similar characteristics have already been listed. These criteria can be applied to items of State and Local significance.

These assessment criteria are useful in considering a wide range of heritage items, and may be applied to sites with items of standing heritage as well as areas with the potential to contain archaeological deposits.

Grading of significance

The heritage guidelines on assessing significance also include a set of gradings of significance. These are used to identify if loss of integrity or condition diminishes significance.

GRADING	JUSTIFICATION	STATUS
Exceptional	Rare or outstanding element directly contributing to an item's local and State significance.	Fulfils criteria for local or State listing.
High	High degree of original fabric. Demonstrates a key element of the item's significance. Alterations do not detract from the significance.	Fulfils criteria for local or State listing.

GRADING	*JUSTIFICATION*	*STATUS*
Moderate	Altered or modified elements. Elements with little heritage value, but which contribute to the overall significance of the item.	Fulfils criteria for local or State listing.
Little	Alterations may detract from the overall significance but its role, function, design or fabric can still be interpreted.	Does not fulfil criteria for local or State listing.
Intrusive / Nil	Damaging to the item's heritage significance. Difficult to interpret.	Does not fulfil criteria for local or State listing.

Table 12: NSW Heritage Office grading of heritage significance

An assessment of significance is based on the attributed value of an item or place, while the grading also considers the current condition. The grading system works both ways. An item may be inherently significant at a State level, yet modifications and alterations have detracted from the significance, resulting in an assessment of Low State significance. Conversely, an item that is highly significant at the Local level may not fill the criteria for State significance. The context of items may affect the grading as well. Several items with Low Local significance at individual levels, when considered as a group, may be assessed as of Moderate or High Local significance.

The basis for these assessments is determined on a case-by-case scenario and is outlined in the following significance assessments.

APPENDIX 3:

3.0 LEGISLATION

COMMONWEALTH LEGISLATION

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

In January 2004 the Commonwealth *Australian Heritage Commission Act 1975* was repealed and in its place amendments to the EPBC Act were made. The amendments were contained in three new pieces of Commonwealth Heritage Legislation. The three new Acts are the:

1. Environment and Heritage Legislation Amendment Act (No. 1) 2003 which:

   (a) amends the Environment Protection and Biodiversity Conservation Act 1999 to include 'national heritage' as a new matter of National Environmental Significance and protects listed places to the fullest extent under the Constitution

   (b) establishes the National Heritage List

   (c) establishes the Commonwealth Heritage List

2. Australian Heritage Council Act 2003 which establishes a new heritage advisory body to the Minister for the Environment and Heritage, the Australian Heritage Council, and retains the Register of the National Estate.

3. Australian Heritage Council (Consequential and Transitional Provisions) Act 2003 which repeals the Australian Heritage Commission Act, amends various Acts as a consequence of this repeal and allows for the transition to the new heritage system.

Any place that has been nominated and assessed as having cultural heritage significance at a national level can be added to the National Heritage List.

Under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) an action requires approval from the Federal Environment Minister if the action will, or is likely to, have a significant impact on a matter of national environmental significance. Matters of national environmental significance relating to cultural heritage are:

- World Heritage Places, and
- National Heritage Places.

An action includes a project, development, undertaking, activity, or series of activities.

Actions that are likely to have a significant impact on the environment of Commonwealth land (even if taken outside Commonwealth land), and actions taken by the Commonwealth that are likely to have a significant impact on the environment anywhere in the world, may also require approval under the EPBC Act.

NATIVE TITLE ACT 1993

The Commonwealth Native Title Act establishes the principles and mechanisms for the preservation of Native Title for Aboriginal people.

Under Subdivision P of the Act, *Right to negotiate*, native title claimants can negotiate about some proposed developments over land and waters (known as 'Future Acts') if they have the right to negotiate. Claimants gain the right to negotiate if their native title claimant application satisfies the registration test conditions.

The right to negotiate applies over some proposed developments or activities that may affect native title. These are known as future acts under the Native Title Act 1993. Native title claimants only have the right to negotiate over certain types of future acts, such as mining. Activities such as exploration and prospecting on the land do not usually attract the right to negotiate.

The right to negotiate is not a right to stop projects going ahead — it is a right to have a say about how the development takes place. In some situations, the right to negotiate does not apply. In these circumstances, claimants may have the right to be notified, to be consulted, to object and to be heard by an independent umpire.

The right to negotiate is triggered when a government issues a notice to say that it intends to allow certain things to happen on land, such as granting a mining lease. This notice is called a 'section 29 notice.

People who claim to hold native title in the area, but have not yet made a native title claimant application, have three months from the date given in the section 29 notice to file a claim if they want to have a say about the proposed development. To get the right to negotiate, the claim must be registered within a month after that.

If the right to negotiate applies, the government, the developer and the registered native title parties must negotiate 'in good faith' about the effect of the proposed development on the registered native title rights and interests of the claimants.

The parties can ask the National Native Title Tribunal to mediate during the negotiations.

If the negotiations do not result in an agreement the parties can ask the Tribunal (no sooner than six months after the notification date) to decide whether or not the future act should go ahead, or on what conditions it should go ahead.

The National Native Title Tribunal administers the future act processes under the Commonwealth legislation. The Tribunal's role includes mediating between parties, conducting inquiries and making decisions (called 'future act determinations') where parties can't reach agreements.

When the Tribunal receives a future act determination application, it must conduct an inquiry (an arbitration) in order to determine whether the future act can be done and if so whether any conditions should be imposed.

A member of the Tribunal (or a panel of three members) will be appointed to conduct the inquiry, and will initially hold a preliminary conference and set directions for the parties to provide submissions and evidence. Members who have mediated a particular matter are not usually appointed as inquiry members. Inquiry members conduct hearings, receive submissions and evidence from the parties and take into account matters set out in section 39 of the Native Title Act such as:

- the effect of the future act on the enjoyment by the native title party of their registered native title rights and interests; their way of life, culture and traditions; the development of their social, cultural and economic structures; their freedom of access to the land and freedom to conduct ceremonies and other cultural activities; and the effect of the future act on any area or site of particular (special) significance to the native title party;
- the interests, proposals, opinions or wishes of the native title party;
- the economic or other significance of the future act;
- the public interest; and
- the presence of any existing non-native title rights and interests and use of the land by other persons (for instance, pastoralists).

ABORIGINAL AND TORRES STRAIT ISLANDER HERITAGE PROTECTION ACT 1984

The Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act* 1984 provides protection for Aboriginal cultural property. Whereas the State Act provides legal protection for all the physical evidence of past Aboriginal occupation, the Commonwealth Act deals with Aboriginal cultural property in a wider sense. Such cultural property includes any places, objects and folklore that ‘are of particular significance to Aboriginals in accordance with Aboriginal tradition’. There is no cut-off date and the Act may apply to contemporary Aboriginal cultural property as well as ancient sites.

PROTECTION OF MOVABLE CULTURAL HERITAGE ACT 1986

Australia's movable cultural heritage is protected at both Commonwealth and State levels. This web site only provides information on the Commonwealth laws.

In 1970 the United Nations Educational, Scientific and Cultural Organisation (UNESCO) adopted the UNESCO Convention on the Means of Prohibiting the Illicit Import, Export and Transfer of Ownership of Cultural Property. Australia ratified the convention by passing the *Protection of Movable Cultural Heritage Act 1986* (the Act), giving the 1970 Convention force in Australian law.

The Act regulates the export of Australia's significant cultural heritage objects. It is not intended to restrict normal and legitimate trade in cultural property and does not affect an individual's right to own or sell within Australia.

It implements a system of export permits for certain heritage objects defined by the Act as 'Australian protected objects'. Australian protected objects are objects which form part of the movable cultural heritage of Australia and which meet the criteria established under the National Cultural Heritage Control List. The Control List is located in the Regulations to the Act, and divides Australian protected objects into two classes:

- Class A objects which may not be exported
- Class B objects which may be exported if granted a permit under the Act.

A person wishing to export a Class B object is required to apply for a permit in writing. Applications are processed in accordance with the legislative process established under section 10 of the Act.

Certificates of Exemption, granted under section 12 of the Act, allow Australian protected objects that are currently overseas to be imported into Australia and subsequently re-exported. This includes Class A objects.

The Act also includes provisions that allow Australia to respond to an official request by a foreign government to return movable cultural heritage objects that have been illegally exported from their country of origin.

The *Protection of Movable Cultural Heritage Act 1986* is administered by the Minister for the Environment and Heritage. This responsibility was transferred from the Minister for Communication, Information Technology and the Arts in November 2001.

The Movable Cultural Heritage Unit in the Department of the Environment and Heritage provides the Secretariat to the National Cultural Heritage Committee

STATE LEGISLATION

NATIONAL PARKS AND WILDLIFE ACT 1974

The *National Parks and Wildlife Act 1974* provides for the protection of Aboriginal objects (sites, relics and cultural material) and Aboriginal places. Under the Act (S. 5), an Aboriginal object is defined as:

> *any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains.*

This includes individual artefacts, scatters of stone artefacts, rock art sites, ancient camp sites, human burials, scarred trees, and ruins and archaeological deposits associated with Aboriginal missions or reserves.

Aboriginal places (areas of cultural significance to the Aboriginal Community declared by the Minister) are protected under Section 84 of the Act.

Aboriginal objects (any material evidence of the Aboriginal occupation of NSW) are protected under Sections 86, 87 and 90 of the Act. Section 86 of the Act identifies that a person, other than the Director-General or a person authorised by the Director-General in that behalf, who:

> *(a) disturbs or excavates any land, or causes any land to be disturbed or excavated, for the purpose of discovering an Aboriginal object*

is guilty of an offence under the NPW Act.

The *National Parks and Wildlife Act* requires that a permit from the Director General be obtained before archaeological fieldwork involving disturbance to an Aboriginal site is carried out. Consent is granted under section 87 and 90 of the Act. Queries and applications to excavate or disturb an Aboriginal archaeological site for purposes of archaeological fieldwork, should directed to the relevant Planning and Aboriginal Section Manager at the appropriate Environment Protection and Regulation Branch office. For this study the relevant branch office is at Sydney.

Section 91 of the Act requires the mandatory reporting of the discovery of Aboriginal objects, and establishes a mechanism for interim protection orders that may be used to protect objects. Identified Aboriginal objects and sites are registered with the NSW Department of Environment and Conservation (DEC) on the Aboriginal Heritage Information Management System (AHIMS). DEC administers *the National Parks and Wildlife Act 1974*.

HERITAGE ACT 1977

The *Heritage Act 1977* details statutory responsibilities for historic buildings and gardens, historic places and objects, historical archaeological sites, and historic shipwrecks. The Act is administered by the Heritage Council of New South Wales, through the NSW Heritage Office.

The aim of the Act is to conserve the 'environmental heritage' of the state, which includes items such as buildings, works, relics, moveable objects or precincts significant for historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. 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:*
>
> *(a) which relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and*
>
> *(b) which is 50 or more years old.*

An excavation permit is required for any works, excavations or activities, associated with an archaeological site. Excavation permits are issued by the Heritage Council of New South Wales in accordance with sections 60 or 140 of the *Heritage Act*.

It is an offence to disturb or excavate land to discover, expose or move a relic without obtaining a permit from the NSW Heritage Council.

> *139 Excavation permit required in certain cases*
>
> *(1) A person must not disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit.*
>
> *(2) A person must not disturb or excavate any land on which the person has discovered or exposed a relic except in accordance with an excavation permit.*

Excavation permits are usually issued subject to a range of conditions that will relate to matters such as reporting requirements and artefact cataloguing, storage and curation. A permit may be required from the Heritage Council of NSW for works or activities associated with a registered place or object.

General queries about site issues and permit applications can be made to the archaeological officers at the Heritage Office. The contact details are:

NSW Heritage Office

3 Marist Place

PARRAMATTA NSW 2150

Ph: (02) 9873 8500

Fax: (02) 9873 8599

Consultation and discussion with the NSW Heritage Office should begin well before lodging an application for a permit to disturb or destroy a historical archaeological site.

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The *NSW Environmental Planning and Assessment Act* will have relevance for all development projects because it requires that environmental impacts are considered in land-use planning and decision making. The definition of 'environment impacts' includes impacts on the cultural heritage of the project area. The Act has three relevant parts: Part III, which governs the preparation of planning instruments; Part IV, which relates to development where consent is required under an environmental planning instrument (EPI); and Part V, which relates to activity where development consent is not required but some other government approval assessments are needed.

Under the Act, local government authorities and The Department of Infrastructure, Planning and Natural Resources (formerly Planning NSW) prepare local and regional environmental planning instruments (LEPs and REPs) to give statutory force to planning controls. These may incorporate specific provisions for conserving and managing archaeological sites.

Integrated Development Assessment (IDA) was introduced under the *Environmental Planning and Assessment Act* so that all matters affecting a development application would be considered by the consent authority in an integrated way.

Integrated Development is one which requires development consent as well as one or more approvals from different government agencies. Such agencies may include NSW DEC or the NSW Heritage Council. If a development is likely to impact a heritage item, the consent authority must refer it, to NSW DEC (for Indigenous objects) or the NSW Heritage Council (for sites listed on the State Heritage Register) prior to approval determination.

The Local Government Act 1993

Under the State Local Government Act, councils can prepare local approvals policies that set out specific matters for consideration in relation to applications to demolish, build or undertake works. Archaeological sites could be considerations under such policies.