M1 Pacific Motorway widening and replacement, Tuggerah to Doyalson: Aboriginal Archaeological Survey Report

Prepared by Australian Museum Business Services
for SMEC Australia Pty Ltd

Final Report

April 2014

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Executive summary

Australian Museum Business Services (AMBS) has been commissioned by SMEC Australia Pty Ltd (SMEC), on behalf of Roads and Maritime Services (Roads and Maritime), to prepare an Aboriginal archaeological survey report for the proposed widening of the M1 Pacific Motorway between Tuggerah and Doyalson, including ancillary areas.

This report has been prepared in accordance with legislative requirements and heritage best practice. Aboriginal consultation has been undertaken in accordance with Stage 2 of the *Roads and Maritime Services Procedure for Aboriginal Cultural Heritage Consultation & Investigation.*

An archaeological survey of the study area was undertaken on 1-2 May 2013 by AMBS Project Officers Ngaire Richards and Ronan Mc Eleney, Roads and Maritime Aboriginal Cultural Heritage Officer Stephen Knight, and Darkinjung Local Aboriginal Land Council Project Officer Sharon Hodgetts.

No Aboriginal sites were identified in the study area. The recent history of land use, high levels of ground surface disturbance, as well as environmental factors including soil landscapes that have high to extreme soil erosion susceptibility, and localised areas that are seasonally or permanently waterlogged, suggest that the study area does not have potential to retain any in situ or stratified subsurface archaeological deposits. As such, no further Aboriginal heritage assessment or community consultation is required prior to the proposed development. However, should any suspected Aboriginal artefacts or archaeological features be uncovered during the proposed activity, all work should immediately cease in the vicinity of the discovery, and the finds managed in accordance with the Roads and Maritime *Standard Management Procedure - Unexpected Archaeological Finds* (2012a).

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1 Introduction

1.1 Preamble

Australian Museum Business Services (AMBS) has been commissioned by SMEC Australia Pty Ltd (SMEC), on behalf of Roads and Maritime Services (Roads and Maritime), to prepare an Aboriginal archaeological survey report and a historic heritage impact assessment (HIA) for the proposed M1 Pacific Motorway widening and replacement, Tuggerah to Doyalson, including ancillary areas (the proposal). This report will form part of the Review of Environmental Effects (REF) prepared by SMEC under Part 5 of the Environmental Planning & Assessment Act 1979 (EP&A Act).

AMBS is preparing a Historic Heritage Impact Assessment for the proposal concurrently.

1.2 Study Area & Proposed Development

Roads and Maritime propose to replace and widen around 12.1 kilometres of the Pacific Motorway (or M1 Pacific Motorway) to six lanes between Wyong Road, Tuggerah, and the Doyalson Link Road, Kiar.

This study has been prepared as a technical document to support the Review of Environmental Factors (REF) for the proposed replacement and widening of the M1 Pacific Motorway. The proposal would involve the provision of two additional lanes (one northbound and one southbound) on the M1 Pacific Motorway by pavement widening, asphalt overlays and new line-marking. It would generally involve the following:

- Replacement of the existing pavement through full removal and reconstruction. This comprises about two kilometres of flexible (asphalt) pavement and about nine kilometres of rigid (concrete) pavement.
- Upgrades to the existing Warnervale Interchange (Sparks Road) including a new northbound G-type entry ramp, reconfiguration of intersections and approaches, and a new pedestrian overbridge at Sparks Road.
- Upgrades to the existing Doyalson Link Road Interchange including a modified northbound off ramp, new southbound off ramp, and new Doyalson link Road motorway overpass and northbound on ramp.
- Provision of two additional lanes (one each northbound and southbound) on each of the six twin motorway bridges by new line-marking.
- Ancillary facilities to support construction activities including stockpiling, storage, concrete batching and crushing.

The full description of the proposal is provided in Section 3 of the Review of Environmental Factors that this study supports. Figure 1.1 provides an overview of the proposal and Figure 1.2 shows the proposed ancillary sites.

1.3 Methodology

This Aboriginal Archaeological Survey Report is broadly consistent with the principles of the Burra Charter (*The Australia ICOMOS charter for the conservation of places of cultural significance*). The assessment of Aboriginal heritage significance has been undertaken in accordance with the requirements of the Office of Environment & Heritage, Department of Premier & Cabinet (OEH; formerly the Department of Environment, Climate Change & Water [DECCW]) guidelines as specified in the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010), and the requirements of Stage 2 of the *Roads and Maritime Services procedure for Aboriginal cultural heritage consultation and investigation* (Roads and Maritime 2011).

The key heritage requirements for this project are:

- Identification of any Aboriginal heritage sites present within the study area.
- Assessment of the Aboriginal heritage values of the study area.
- Provision of recommendations for the management of Aboriginal heritage resources in the study area.

To fulfil the requirements of the project, the following tasks were undertaken:

- Consultation with the local Aboriginal community, as per Stage 2 of the *Roads and Maritime Services procedure for Aboriginal cultural heritage consultation and investigation* (Roads and Maritime 2011).
- Search and review of the OEH Aboriginal Heritage Information Management System (AHIMS) database, to determine the location and nature of any Aboriginal heritage sites recorded within, or in the vicinity of, the study area.
- Review of relevant previous archaeological reports specific to the area, to determine the extent of past Aboriginal archaeological research in the region.
- Review of relevant contextual environmental information and previous land use history.
- Field survey with local Aboriginal community representatives, to allow identification and assessment of Aboriginal heritage values present in the study area.
- Preparation of a report describing the results of the background research, the extent and significance of heritage items recorded in the study area, and management recommendations and mitigation measures for any Aboriginal heritage resources, including constraints and opportunities.

1.4 Authorship and acknowledgements

This report has been prepared by AMBS Project Officer Ngaire Richards. AMBS Project Officer Jenna Weston prepared the background sections of the report. AMBS Senior Project Manager Jennie Lindbergh reviewed the report for quality and consistency.

The authors acknowledge the assistance of Peter Fawcett (Environment Manager, NSW, SMEC Australia Pty Ltd), Jai Reddy (Project Development Manager, Hunter Region, Roads and Maritime), Stephen Knight (Aboriginal Cultural Heritage Officer, Environment Branch Infrastructure Development, Roads and Maritime) and Sharon Hodgetts (Project Officer, Darkinjung Local Aboriginal Land Council).

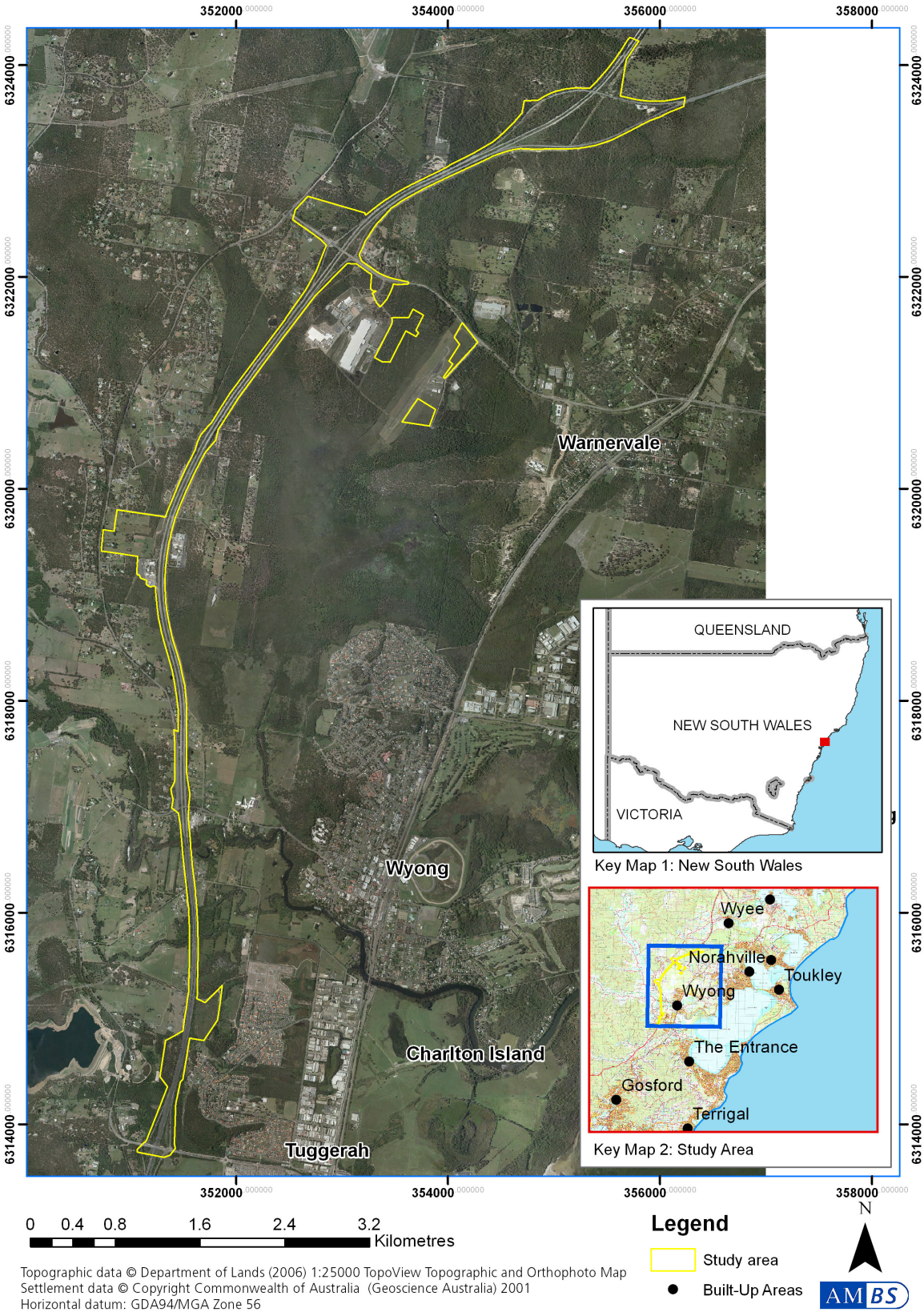

Figure 1.1 Location of the study area.

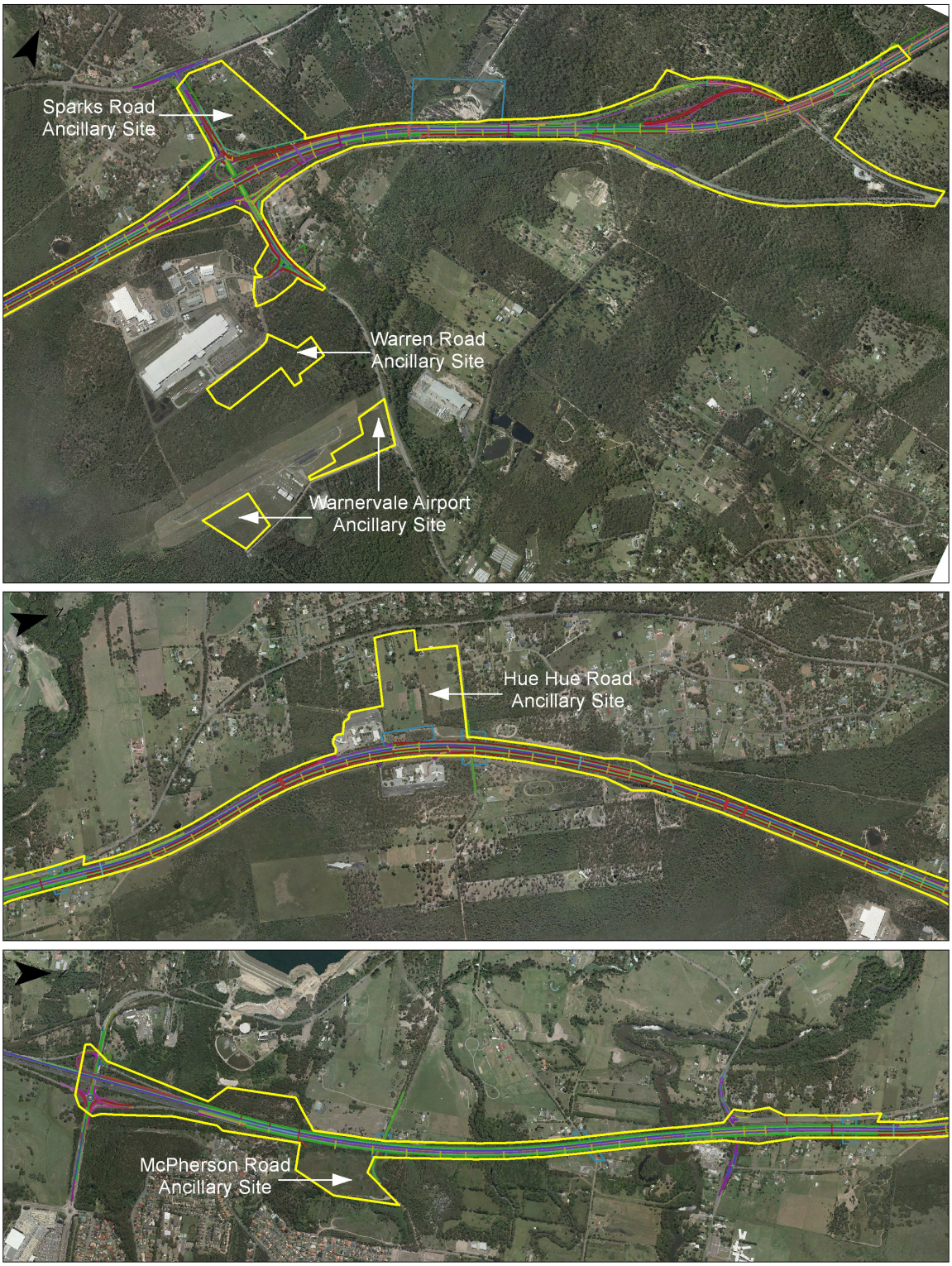

Figure 1.2 M1 Pacific Motorway widening concept design (21 March 2013).

2 Heritage Context

2.1 Preamble

The conservation and management of heritage items, places, and archaeological sites takes place in accordance with relevant Commonwealth, State or local government legislation. Non-statutory heritage lists and registers, ethical charters, conservation policies, and community attitudes and expectations can also have an impact on the management, use, and development of heritage items. The relevant statutory and non-statutory heritage listings for the study area are summarised below.

2.2 *Environment Protection & Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework for the protection and management of places of national environmental significance. Several heritage lists are addressed by the EPBC Act, including the National Heritage List (NHL) and Commonwealth Heritage List (CHL). The NHL protects places that have outstanding value to the nation. The CHL protects items and places owned or managed by Commonwealth agencies. The Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) is responsible for the implementation of national policy, programs and legislation to protect and conserve Australia's environment and heritage and to promote Australian arts and culture. Approval from the Minister is required for controlled actions which will have a significant impact on items and places included on the NHL or CHL.

There are no Aboriginal heritage items listed on the NHL or CHL within the study area or in its vicinity.

2.3 *National Parks & Wildlife Act 1974* (Amended 2010) and National Parks & Wildlife Amendment Regulation 2010

Under the provisions of the *National Parks & Wildlife Act* 1974 (NPW Act), the Director-General of the National Parks and Wildlife Service (NPWS; now OEH) is responsible for the care, control and management of all national parks, historic sites, nature reserves, state conservation areas, karst conservation reserves and regional parks. The Director-General is also responsible, under this legislation, for the protection and care of native fauna and flora, and Aboriginal places and objects throughout NSW.

All Aboriginal Objects are protected regardless of their significance or land tenure under the NPW Act. Aboriginal Objects can include pre-contact features such as scarred trees, middens and open campsites, as well as physical evidence of post-contact use of the area such as Aboriginal built fencing and fringe camps. The NPW Act also protects Aboriginal Places, which are defined as 'is or was of special significance with respect to Aboriginal culture'. Aboriginal Places can only be declared by the Minister administering the NPW Act.

Under Section 90 of the Act, it is an offence for a person to destroy, deface, damage or desecrate an Aboriginal Object or Aboriginal Place without the prior issue of an Aboriginal Heritage Impact Permit (AHIP). The Act requires a person to take reasonable precautions and due diligence to avoid impacts on Aboriginal Objects. AHIPs may only be obtained from the Environmental Protection and Regulation Division (EPRD) of OEH.

The National Parks and Wildlife Amendment Regulation 2010 commenced on 1 October 2010. This Regulation excludes activities carried out in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* from the definition of harm in the Act. That is, test excavations may be carried out in accordance with this Code of Practice, without requiring an AHIP.

The Regulation also specifies Aboriginal community consultation requirements (*Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*). In addition, the Regulation adopts a Due Diligence Code of Practice which specifies activities that are low impact, providing a defence to the strict liability offence of harming an Aboriginal object.

Part of the regulatory framework for the implementation of the NPW Act is the Aboriginal Heritage Information Management System (AHIMS), maintained by OEH. AHIMS includes a database of Aboriginal heritage sites, items, places and other objects that have been reported to the OEH. Also available through AHIMS are site cards, which describe Aboriginal sites registered in the database, as well as Aboriginal heritage assessment reports, which contribute to assessments of scientific significance for Aboriginal sites. The AHIMS is not a comprehensive list of all Aboriginal heritage sites in NSW, rather it reflects information which has been reported to OEH. As such, site co-ordinates in the database vary in accuracy depending on the method used to record their location. Heritage consultants are obliged to report Aboriginal sites identified during field investigations to OEH, regardless of land tenure, or whether such sites are likely to be impacted by a proposed development. The results of a site search for the local area are presented in Section 5.2.1.

2.4 *Heritage Act 1977*

The NSW *Heritage Act* 1977 (Heritage Act) provides protection for heritage places, buildings, works, relics, moveable objects, precincts and archaeological sites that are important to the people of NSW. These include items of Aboriginal and non-Aboriginal heritage significance. Where these items have particular importance to the state of NSW, they are listed on the State Heritage Register (SHR).

Sections 56 to 69 of Part 4 address the requirements for items and places listed on the SHR, or which are the subject of an Interim Heritage Order (IHO). Works which include demolition, damage or alteration of a state heritage item or place require the approval of the Heritage Council or its delegates. There are no Aboriginal heritage items or places within the study area, or its vicinity, listed on the SHR.

2.4.1 Roads and Maritime Services Section 170 Register

Section 170 of the Heritage Act requires government instrumentalities to maintain a Heritage and Conservation Register (Section 170 Register). This Register provides a list of assets which may have State or local heritage significance, including:

(i) heritage items under environmental planning instruments,
(ii) items subject to interim heritage orders,
(iii) items listed on the State Heritage Register,
(iv) items identified by the government instrumentality as having State heritage significance.

There are no Aboriginal heritage items listed on the Roads and Maritime Section 170 Register within the study area or in its vicinity.

2.5 *Environmental Planning & Assessment Act 1979*

The EP&A Act is the main act regulating land use planning and development in NSW. The EP&A Act controls the making of environmental planning instruments (EPIs). Two types of EPIs can be made: Local Environmental Plans (LEPs), covering LGAs; and State Environment Planning Policies (SEPPs), covering areas of State or regional environmental planning significance. LEPs and SEPPs commonly identify and have provisions for the protection of local heritage items and heritage conservation areas. The study area is in Wyong LGA.

Under Section 111 of the Act, Roads and Maritime as proponent and determining authority for the proposal:

must examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity.

Clause 228(2)(e) of the *Environmental Planning and Assessment Regulation 2000* states that, for the purposes of Part 5 of the EP&A Act, the factors to be taken into account when consideration is being given to the likely impact of an activity on the environment include:

any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations.

2.5.1 State Environmental Planning Policy (Infrastructure) 2007

The State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) includes provisions for the development of roads and traffic infrastructure and facilities. However, in accordance with *Part 1 - Preliminary, Note* of the Infrastructure SEPP, these provisions do not affect requirements for an approval, licence or permit from OEH under the NPW Act. Thus, assessment and management of Aboriginal heritage is required.

Clause 94(2)(c) 'Development permitted without consent-general' permits development in connection with a road or road infrastructure facilities if it is for the purpose of alterations or additions to an existing road (such as widening, duplication or reconstruction of lanes, changing the alignment or strengthening of the road). However, Clause 14 'Consultation with councils – development with impacts on local heritage' requires that a public authority should consult with the local Council where the development:

(a) is likely to have an impact that is not minor or inconsequential on a local heritage item (other than a local heritage item that is also a State heritage item) or a heritage conservation area.

Clause 5 'Interpretation-general' defines a local heritage item as *a place, building, work, relic, tree, archaeological site or Aboriginal object that is identified as a heritage item (or by a similar description) in a local or regional environmental plan*.

2.5.2 Wyong Local Environmental Plan 1991

Clauses 32-37 and 118 of the Wyong LEP 1991 provide for the protection of heritage buildings, places, works and trees, heritage conservation areas, and archaeological relics, including Aboriginal objects. No Aboriginal objects are listed on Schedule 1 'Heritage Items' of the Wyong LEP.

No Aboriginal heritage items have been identified within the study area on an EPI. As such, Roads and Maritime is not required to consult with Wyong Shire Council about this project in regard to impacts on Aboriginal heritage.

2.6 Non-statutory registers

2.6.1 Register of the National Estate

The Register of the National Estate (RNE) was originally established under Section 22 of the *Australian Heritage Commission Act 1975* (AHC Act). Since the establishment of the NHL and CHL, there is now a considerable level of overlap between the RNE and heritage lists at the national, state and territory, and local government levels. From February 2012, all references to the RNE have been removed from the EPBC Act and the AHC Act. The RNE is now being maintained on a non-statutory basis as a publicly available archive.

The listings for heritage items in the vicinity of the study area on the RNE do not include any Aboriginal heritage values.

2.6.2 National Trust of Australia (NSW)

The National Trust of Australia is a private, not-for-profit organisation committed to conserving Australia's heritage. Listing with the National Trust of Australia does not have statutory authority; however, it does have a role in raising public awareness of heritage issues.

There are no Aboriginal heritage items listed on the National Trust Register within the study area or in its vicinity.

3 Aboriginal consultation

Aboriginal community consultation is an integral part of the assessment of Aboriginal cultural heritage significance. Consultation was undertaken in accordance with Stage 2 of the *Roads and Maritime Services procedure for Aboriginal cultural heritage consultation and investigation* (PACHCI; Roads and Maritime 2011).

Initial consultation to identify interested local Aboriginal parties was undertaken by Roads and Maritime, identifying the Darkinjung Local Aboriginal Land Council (DLALC).

DLALC was invited to participate in the field survey, in accordance with Stage 2 of the PACHCI.

Sharon Hodgetts, DLALC Project Officer, and Stephen Knight, Roads and Maritime Aboriginal Cultural Heritage Officer, participated in the fieldwork on 1-2 May 2013. Information provided by the fieldwork participants during the field survey has been integrated into the assessment, where appropriate.

The results of the survey and the proposed recommendations were discussed with Ms Hodgetts in the field, and no objections were raised. DLALC was also invited by Roads and Maritime to prepare a cultural heritage survey report advising on Aboriginal cultural heritage issues that may arise as a result of the proposal, in accordance with Stage 2 of the PACHCI. The report from DLALC is attached to this report in Appendix B.

4 Environmental context

An understanding of environmental factors within the local landscape provides a context for past human occupation and history of an area. The analysis of environmental factors contributes to the development of the predictive modelling of archaeological sites. Analysis is also required to contextualise archaeological material and to interpret patterns of past human behaviour. In particular, the nature of the local landscape including topography, geology, soils, hydrology and vegetation are factors which affect patterns of past human occupation. Current land use practices have the potential to affect the visibility of archaeological material; they may obscure, or expose archaeological sites. In addition, previous disturbances may have also exposed archaeological material, such as excavation for dams or other ground disturbance. It is important that such factors are also considered in making assessments of archaeological resources in an area and understanding the distribution of observed sites.

4.1.1 Geology, soils, topography and vegetation

The study area is underlain by sandstone, claystone and shale of the Gosford Formation, which is part of the Narrabeen Group which was formed in the Triassic (Sydney 1:250,000 Geological Map Sheet S156-5 1965). In the region this group is typically overlain by an unconformity of sand, silt, clay and gravel laid down during the Tertiary, with alluvium along the Wyong River (Sydney 1:250,000 Geological Map Sheet S156-5 1965).

The study area extends through several soil landscapes: Erina, Woodburys Bridge, Gorokan, Wyong and Yarramalong (Figure 4.1). The Erina, Gorokan, Wyong and Yarramalong landscapes do not generally result in stone outcroppings suitable as surfaces for art (such as engraving and drawing/painting), sharpening stone axes/tools or artefact manufacture, or as shelters for camping. As such, rock engravings/art sites, axe grinding grooves, shelter and quarry sites are highly unlikely to be present throughout the majority of the study area.

The erosional Erina Soil Landscape comprises undulating to rolling rises and low hills, and rounded narrow crests with moderately inclined slopes (local relief >60m; slope gradients <25 per cent). Vegetation is predominantly extensively cleared tall open-forest, with open heathland in exposed coastal areas. Soils are moderately deep to deep (100->200cm) yellow podzolics on fine-grained bedrock with yellow podzolics in poorly drained areas; moderately deep to deep (50->150cm) yellow podzolics and yellow earths on coarse-grained parent material with yellow earths on footslopes and deep (>300cm) structured loams and yellow earths along drainage lines. Limitations of the soil include localised mass movement, high soil erosion and localised foundation hazards, localised high run-on, seasonal waterlogging of footslopes, and strongly acid soils of low fertility. Outcrops of Narrabeen sandstone are rare, but when exposed it is generally highly weathered and friable (Murphy 1993:52).

The erosional Gorokan Soil Landscape comprises undulating low hills and rises on lithic sandstones of the Tuggerah Formation (local relief <30m; slope gradients <15 per cent), with broad crests and ridges, long gently inclined slopes and broad drainage lines. Vegetation is predominantly partially cleared low open-forest. Soils are moderately deep (50-150cm) soloths and yellow podzolics on ridges and crests; soloths, yellow and grey-brown podzolics on slopes; and gleyed podzolics along drainage lines. Limitations of the soil include very high soil erosion and localised foundation hazards; seasonal waterlogging; and hardsetting, strongly acid, low fertility, plastic, impermeable soils. Outcrops of Narrabeen sandstone are absent from this soil landscape (Murphy 1993:56).

The residual Woodburys Bridge Soil Landscape comprises gently undulating rises to rolling low hills (local relief 30-80m; slope gradients <25 per cent). Sandstone capping on the flat broad crests of steeper hills is common, which may result in stone outcroppings suitable as surfaces for art (such as

engraving and drawing/painting), sharpening stone axes/tools, or as shelters for camping; in the few small areas of Woodburys Bridge soils within the study area. Vegetation is predominantly cleared tall open-forest. Soils are deep (>150cm) red podzolics with some soloths in poorly drained areas on claystone bedrock, and shallow to moderately deep (50-150cm) yellow podzolics on sandstone bedrock. Limitations of the soil include extreme erosion and high foundation hazards, localised seasonal waterlogging, acid soils of very low fertility, low wet bearing strengths and high erodibility (Murphy 1993:31).

The alluvial Wyong Soil Landscape comprises broad poorly drained deltaic floodplains and alluvial flats of Quaternary sediments, including meander scrolls, oxbows and swamps (local relief <10m; slope gradients <3 per cent). Vegetation is predominantly extensively cleared open-forest. Soils are deep (>200cm) yellow and brown podzolics and soloths, with some humus podzols around lake edges. Limitations of the soil include flooding, seasonal waterlogging, foundation hazard, localised permanent waterlogging and stream bank erosion, localised acid sulphate potential, and strongly acid, poorly drained impermeable soils of very low fertility with saline subsoils (Murphy 1993:81).

The alluvial Yarramalong Soil Landscape comprises level to gently undulating dissected alluvial plains on Quaternary sediments in the Watagan Mountains and Erina Hills, including meander scrolls, terraces, oxbows and backswamps (local relief <10m; slope gradients <5 per cent). Vegetation is predominantly extensively cleared tall open-forest. Soils are deep (>200cm) alluvial soils and siliceous sands in upper reaches; deep (>150cm) alluvial soils and red earths along levee banks; deep (>200cm) yellow and brown podzolics along the backplain; deep (>200cm) alluvial soils and yellow earths on terraces. Limitations of the soil include flooding, foundation hazard, seasonal waterlogging, stream bank erosion and low fertility (Murphy 1993:84).

4.1.2 Hydrology and drainage

The study area traverses numerous water sources, the major one being the Wyong River. One of the ancillary areas also extends to the major water source of Jilliby Jilliby Creek, near its confluence with the Wyong River. The study area also traverses second-order Mardi Creek, and third-order Deep Buttonderry and Wallarah Creeks (with some of the latter's first-order tributaries also extending into the Doyalson end of the study area). Tuggerah Lake is located over 3.5 km to the east of the study area, and is estuarine. Although hydrology and drainage patterns change over time, the current hydrological scheme suggests that water resources would have been available on a permanent basis within the study area and its vicinity. However, the Wyong River at its crossing of the motorway would likely have still been estuarine (there is a weir immediately to the east of the motorway, which is used to separate salt and fresh water in the river; Scott 1999:21). Thus, although this hydrological scheme would have likely provided good water resources for seasonal or long-term encampments of Aboriginal people, it is more likely that occupation would have been focussed around Tuggerah Lake and the coast, or around fresh water resources further inland.

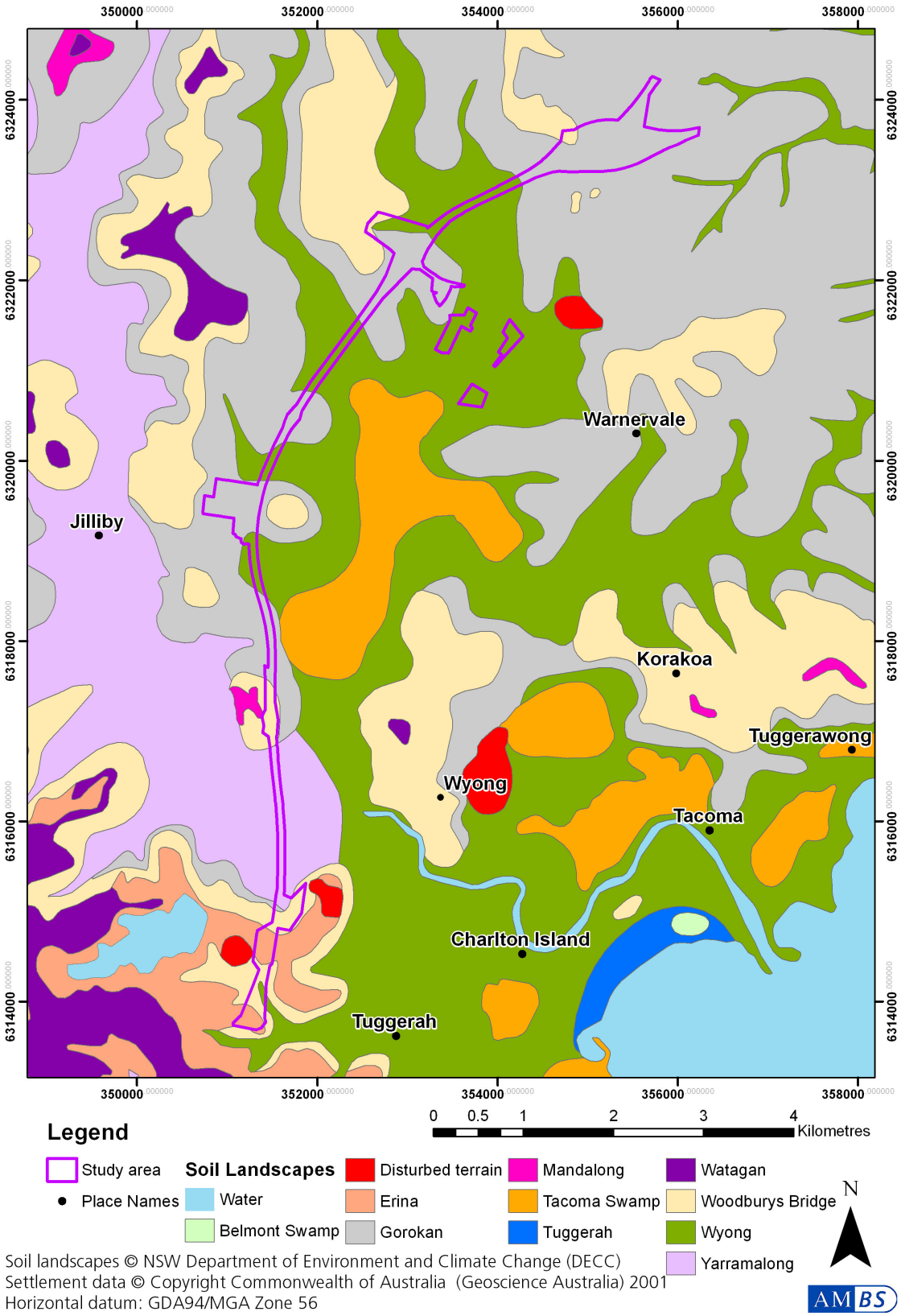

Figure 4.1 Soils within the study area and its vicinity.

4.1.3 Land use and disturbance

The study area and surrounding region were sparsely populated in the first decades following European settlement. For much of the nineteenth century, the Brisbane Water district was accessible only by water, using the north branch of Broken Bay, the Hawkesbury River, or a few difficult harbours along the coast. Overland travel was hampered by the hilly nature of the countryside, and the need to cross the Hawkesbury River (Strom 1982:12). Public access to the Gosford/Wyong region improved with the completion of the rail line between Sydney and Newcastle in 1889, which became known as the Great Northern Railway. The coming of the railway led to intensive regional economic development, including the establishment of Wyong township and new land uses including agriculture, dairying and recreation, as well as bolstering the timber and fishing industries (Strom 1982:18, 21).

The area also became accessible by motor vehicle following the opening of the Pacific Highway, a coastal route linking Sydney to Newcastle via Gosford. Although a rough alignment for the Pacific Highway had been marked out by the Main Roads Board (MRB), precursor to Roads and Maritime, by the beginning of the twentieth century, the MRB did not begin to connect the roads between the river valleys of the north coast of New South Wales until the 1930s (HLA-Envirosciences Pty Limited 2007:10; Kass 2006:46; Navin Officer 2004:18-19).

Planning for the F3 Sydney to Newcastle Freeway (now called the M1 Pacific Motorway) began in the 1950s. It was intended to provide *a road of freeway standard*, and superseded the Pacific Highway as the main road corridor linking Sydney, the Central Coast and Newcastle (Roads and Maritime 2012b). The first section of the freeway, from the Hawkesbury River to Mount White, opened in December 1965. The section between Kangy Angy and Wallarah Creek, of which the study area is a part, opened in the mid-1980s (Roads and Maritime 2012b; Kass 2006:50).

The section of the motorway that runs between Tuggerah and Doyalson is bordered by the suburbs of Mardi, Tuggerah, Wyong, Watanobbi, Alison, Jilliby, Halloran and Kiar. As the population of the Central Coast has grown, agriculture has declined in favour of residential and industrial land use; however, larger properties still remain, particularly to the west of the M1.

The majority of the study area has been disturbed by the construction of the motorway, a small mining subsidence district, a motorway service centre (Figure 4.2), the former Mardi landfill (Figure 4.3), and residential/rural (Figure 4.4) and industrial developments (Figure 4.5). As a consequence, vegetation within the study area is predominantly regrowth. This disturbance is likely to have impacted on the integrity of Aboriginal archaeological deposits. If trees were modified (scarred or carved) by Aboriginal people in the past these have now been removed.

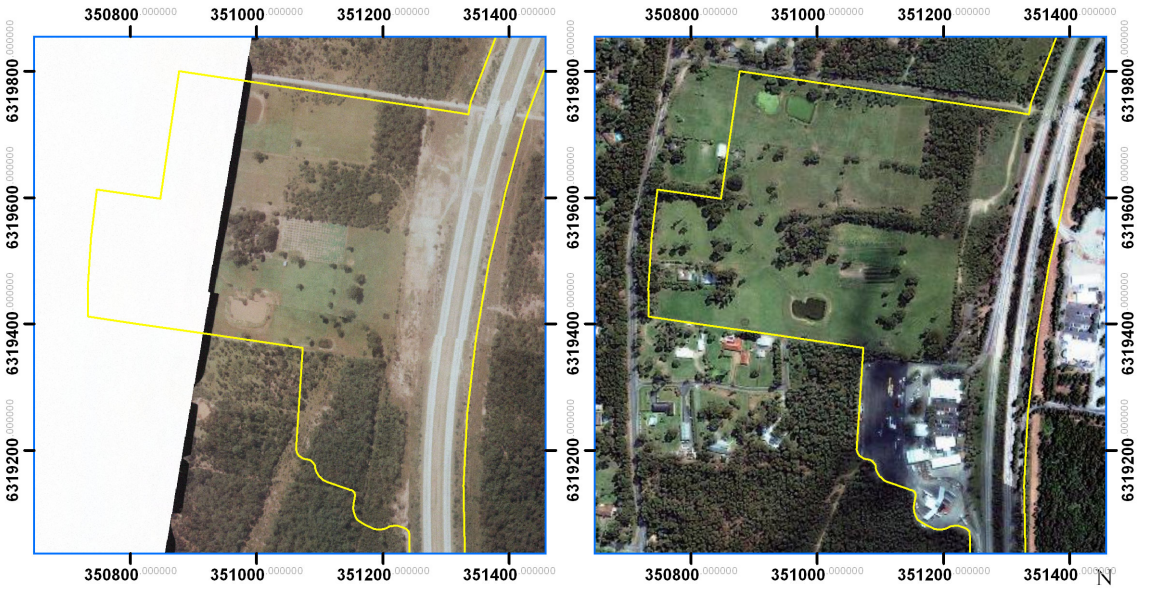

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Figure 4.2 Disturbance within the Hue Hue Road Ancillary Site, arising from vegetation clearance for rural land use, construction of the M1 and motorway service centre. Left: 1980s, Right: 2013.

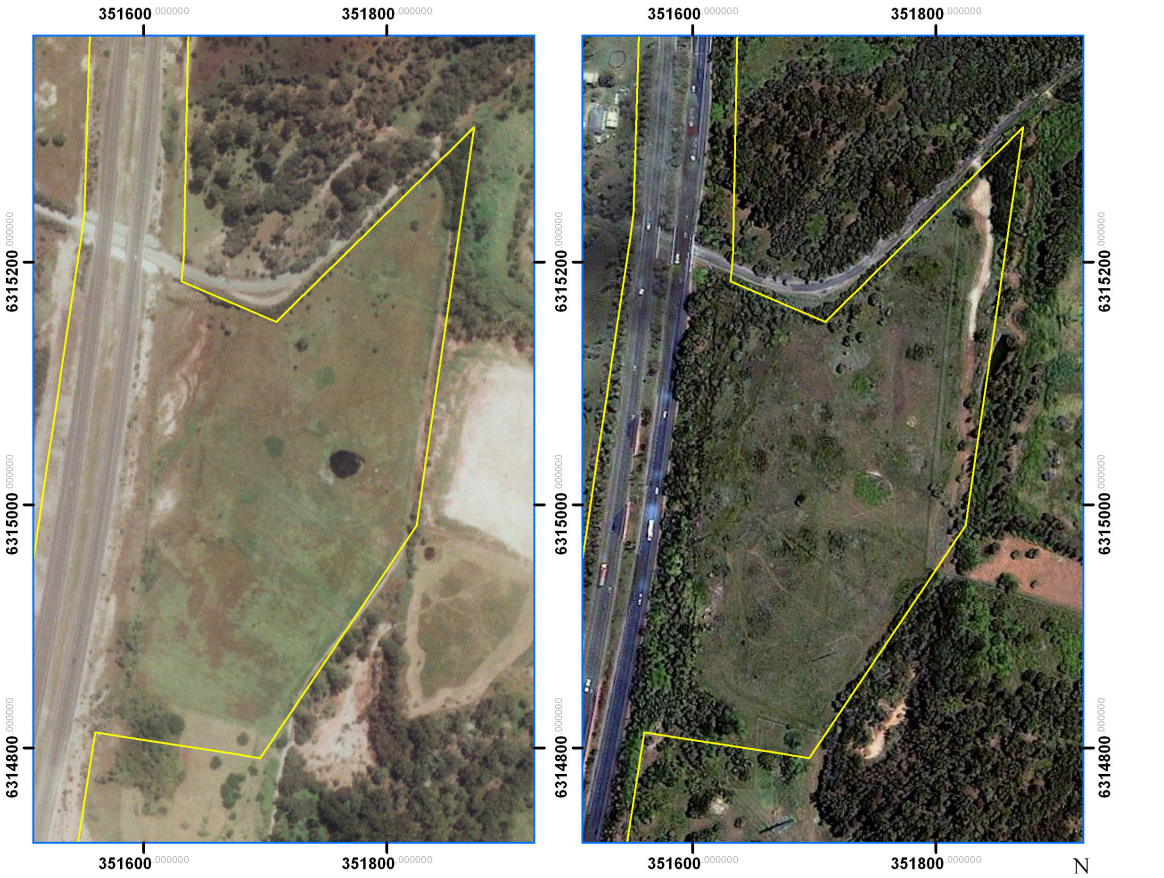

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Figure 4.3 Disturbance at the McPherson Road Ancillary Site (adjacent to the former Mardi landfill site). Left: 1980s, Right: 2013.

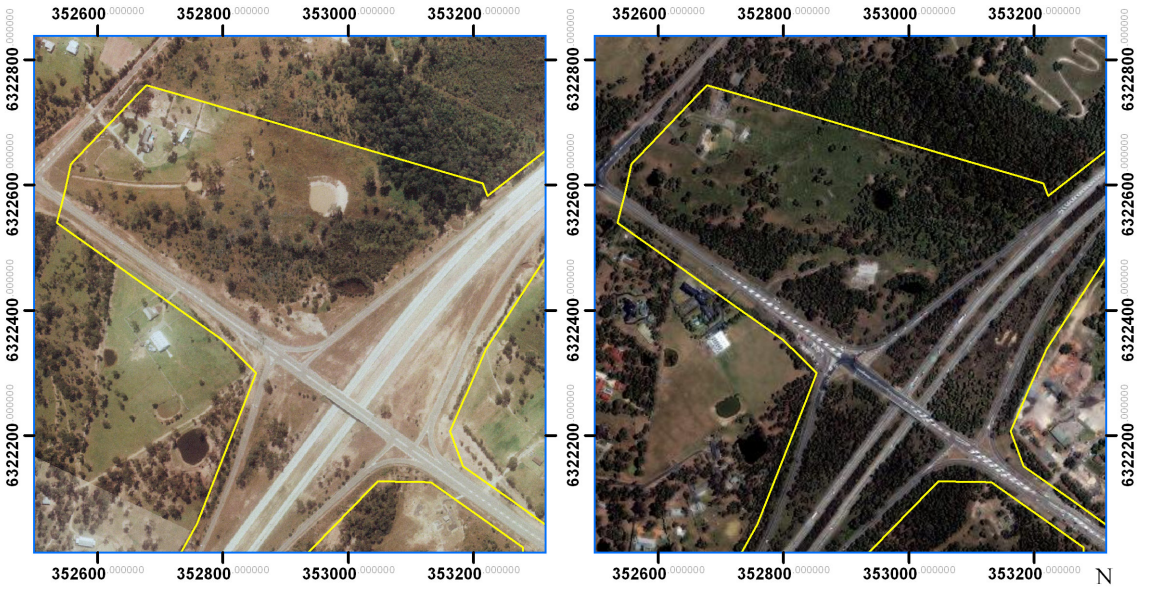

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Figure 4.4 Disturbance at the Sparks Road Ancillary Site, arising from rural land use and construction of the M1. Left: 1980s, Right: 2013.

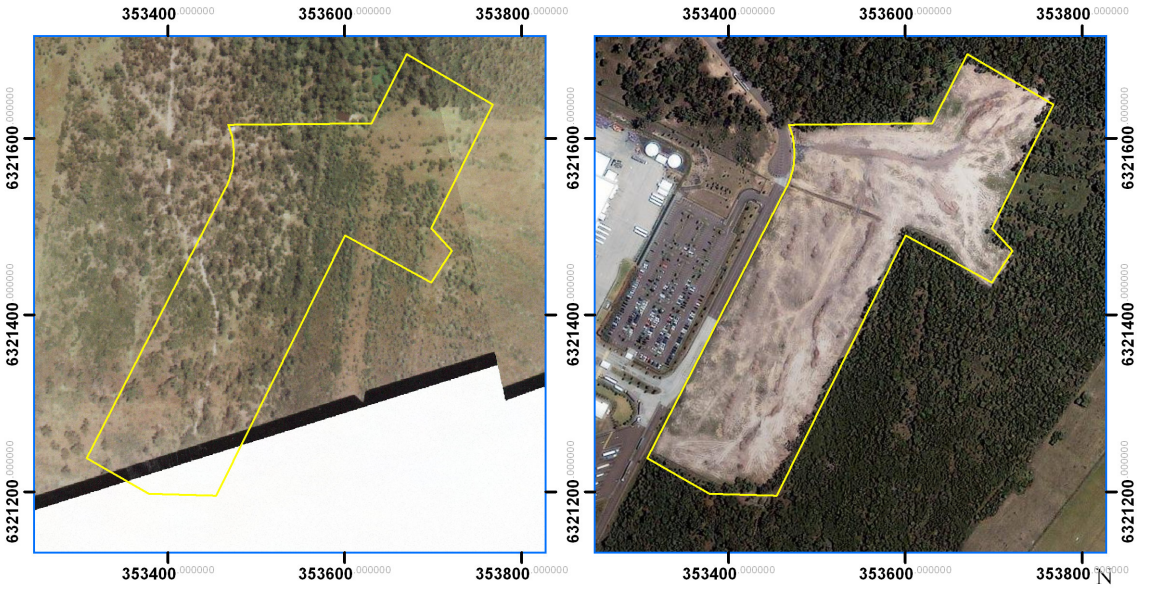

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Figure 4.5 Disturbance at the Warren Road Ancillary Site, arising from land clearance for a proposed industrial subdivision within the Wyong Employment Zone. Left: 1980s, Right: 2013.

5 Aboriginal heritage context

This chapter describes the nature of the known Aboriginal archaeology of the study area, based upon a review of relevant archaeological reports and publications, and a search and review of previously recorded sites in the OEH AHIMS. This review and discussion allows for the development of a predictive model for potential Aboriginal sites within the study area, and establishes context for a comparative significance assessment. Summary descriptions of site types are provided in Table 5.1 below.

Table 5.1 Summary descriptions of Aboriginal site types referred to in this report.

Site Type	Details
Open camp sites/ stone artefact scatters/ isolated finds	Open camp sites represent past Aboriginal subsistence and stone knapping activities, and include archaeological remains such as stone artefacts and hearths. This site type usually appears as surface scatters of stone artefacts in areas where vegetation is limited and ground surface visibility increases. Such scatters of artefacts are also often exposed by erosion, agricultural events such as ploughing, and the creation of informal, unsealed vehicle access tracks and walking paths. These types of sites are often located on dry, relatively flat land along or adjacent to rivers and creeks. Camp sites containing surface or subsurface deposit from repeated or continued occupation are more likely to occur on elevated ground near the most permanent, reliable water sources. Flat, open areas associated with creeks and their resource-rich surrounds would have offered ideal camping areas to the Aboriginal inhabitants of the local area. Isolated finds may represent a single item discard event, or be the result of limited stone knapping activity. The presence of such isolated artefacts may indicate the presence of a more extensive, in situ buried archaeological deposit, or a larger deposit obscured by low ground visibility. Isolated artefacts are likely to be located on landforms associated with past Aboriginal activities, such as ridgelines that would have provided ease of movement through the area, and level areas with access to water, particularly creeks and rivers.
Scarred trees	Tree bark was utilised by Aboriginal people for various purposes, including the construction of shelters (huts), canoes, paddles, shields, baskets and bowls, fishing lines, cloaks, torches and bedding, as well as being beaten into fibre for string bags or ornaments. The removal of bark exposes the heart wood of the tree, resulting in a scar. Over time the outer bark of the tree grows across the scar (overgrowth), producing a bulging protrusion around the edges of the scar. Trees may also have been scarred in order to gain access to food resources (eg cutting toe-holds so as to climb the tree and catch possums or birds), or to mark locations such as tribal territories. The locations of scarred trees often reflect historical clearance of vegetation rather than the actual pattern of scarred trees. Unless the tree is over 150 years old, scarring is not likely to be of Aboriginal cultural origin; therefore, these sites most often occur in areas with mature, remnant native vegetation.
Axe grinding grooves	Grinding grooves are the physical evidence of tool making or food processing activities undertaken by Aboriginal people. The manual rubbing of stones against each other creates grooves in the rock, which are usually found on flat areas of soft rock such as sandstone, in areas of creek beds and other water sources. They are often associated with rock pools in creek beds and on platforms to enable the wet-grinding technique.
Quarries	Aboriginal quarry sites are sources of raw materials, primarily for the manufacture of stone tools, but also for ochre procurement. They are only found where raw materials (stone or ochre) occur within the landscape, and where these have been exploited in the past. Such sites are often associated with stone artefact scatters and stone knapping areas. Loose or surface exposures of stone or cobbles may be coarsely flaked for removal of portable cores. Raw materials can be sourced to these sites and provide evidence for Aboriginal movement and/or exchange.
Rock engravings	Rock engravings are a type of Aboriginal art, and are often located on high vantage points along ridge lines at the headwaters of creeks, but can be located on any suitable fine grained stone surface.
Shelter sites with art (engraving, painting or drawing) or occupation deposit	These are art or occupation sites located in areas where suitable rock outcrops and surfaces occur, where weathering has resulted in suitable overhangs or recesses in boulder outcrops or cliff-lines.

Middens	Shell middens result from Aboriginal exploitation and consumption of shellfish, in marine, estuarine or freshwater contexts. Middens may also include faunal remains such as fish or mammal bone, stone artefacts, hearths, charcoal and occasionally, burials. They are usually located on elevated dry ground close to the aquatic environment from which the shellfish has been exploited and where fresh water resources are available. Deeper, more compacted, midden sites are often found in areas containing the greatest diversity of resources, such as river estuaries and coastal lagoons.
Bora/ceremonial	Aboriginal ceremonial sites are locations that have spiritual or ceremonial values to Aboriginal people. Aboriginal ceremonial sites may comprise natural landforms and, in some cases, will also have archaeological material. Bora grounds are a ceremonial site type, usually consisting of a cleared area around one or more raised earth circles, and often comprised two circles of different sizes, connected by a pathway, and accompanied by ground drawings or mouldings of people, animals or deities, and geometrically carved designs on the surrounding trees. Unfortunately, the raised earth features are easily destroyed by agricultural and pastoral activities, vegetation growth and exposure to weather.
Stone arrangements	Stone arrangements usually consist of geometric arrangements of portable stone on prominent rock outcrops, such as vantage points along escarpments where other key landmarks are visible. Some stone arrangements also include circles and pathways. They are thought to be ceremonial in nature, and may have also sometimes been used for corroborees (dances), fights or judicial meetings. Stone arrangements are often isolated from known camp site areas.
Natural mythological (ritual) sites	These types of sites are usually identified by the local Aboriginal community as locations of cultural significance, and they may not necessarily contain material evidence of Aboriginal associations with the place.
Carved trees	Carved trees generally marked areas for ceremonial purposes, or the locations of graves.
Burial sites	Aboriginal burial of the dead often took place relatively close to camp site locations. This is due to the fact that most people tended to die in or close to camp (unless killed in warfare or hunting accidents), and it is difficult to move a body long distances. Soft, sandy soils on, or close to, rivers and creeks allowed for easier movement of earth for burial; and burials may also occur within rockshelters or middens. Aboriginal burial sites may be marked by stone cairns, carved trees or a natural landmark. Burial sites may also be identified through historic records, or oral histories.
Contact/ historical sites	These types of sites are most likely to occur in locations of Aboriginal and settler interaction, such as on the edge of pastoral properties or towns. Artefacts located at such sites may involve the use of introduced materials such as glass or ceramics by Aboriginal people, or be sites of Aboriginal occupation in the historical period.

5.1 Regional Aboriginal archaeological context

According to the linguist John Fraser, the study area was part of Kuringgai (Guringai) territory, which ran along the New South Wales coast from the Hawkesbury to the Macleay River (Fraser 1858:ix). The anthropologist Norman Tindale suggested that Fraser had 'arbitrarily' applied the name Kurringai to what was actually a series of tribes. Tindale's 1974 map of Aboriginal tribal boundaries identifies this area with the Darkinjung language group, based largely on linguistic evidence published between 1847 and 1946 (Tindale 2011). However, the boundaries are approximations, and probably varied over time.

Aboriginal occupation of the Sydney region, of which the study area is a part, is likely to have spanned at least 20,000 years, although dates of more than 40,000 years have been claimed for artefacts found in gravels of the Cranebrook Terrace on the Nepean River (Nanson *et al.* 1987; Stockton 1993; Stockton & Holland 1974). Late Pleistocene occupation sites have been identified on the fringes of the Sydney basin and from rock shelter sites in adjoining areas. Dates obtained from these sites were 14,700 BP at Shaws Creek in the Blue Mountain foothills (Kohen *et al.* 1984), c.20,000 BP at Burrill Lake on the South Coast (Lampert 1971), and c.11,000 BP at Loggers Shelter in Mangrove Creek (Attenbrow 1981, 2004). The majority of sites in the Sydney region, however, date to within the last 3,000 to 5,000 years, with many researchers proposing that occupation intensity increased from this

period (Kohen 1986; McDonald 1994; McDonald & Rich 1993). This increase in sites may reflect an intensity of occupation which was influenced by rising sea levels, which stabilised approximately 6,500 years ago. Older occupation sites along the now submerged coastline would have been flooded, with subsequent occupation concentrating on and utilising resources along the current coastlines and in the changing ecological systems of the hinterland (Attenbrow 2010:55-56).

The name Tuggerah may have come from an Aboriginal word for 'cold', while Wyong may be Aboriginal for 'yam'. Mardi is said to be an Aboriginal name for 'stone knife', and Jilliby means 'where two creeks meet' (Wyong Shire Library Service 2008).

5.2 Local archaeological context

5.2.1 Registered Aboriginal sites

An extensive search of the AHIMS database was undertaken on 26 February 2013 (AHIMS ID 93527), and updated on 24 April 2014 (AHIMS ID 132415). Eighty three registered Aboriginal sites, as well as one Aboriginal Place (Tuggerah Lakes Resting Place), are identified within approximately 3 km of the study area. The search results are presented in Figure 5.1 and summarised in Table 5.2.

Table 5.2 Summary of Aboriginal sites previously recorded near the study area (data obtained from updated AHIMS search [ID: 132415] on 24/4/2014).

Site Type	Number	Percentage (to 2 decimal places)
Open Camp Site	28	33.73%
Isolated Find	18	21.69%
Axe Grinding Grooves	14	16.87%
Midden	4	4.82%
Not an Aboriginal Site	3	3.61%
Scarred Tree	3	3.61%
Bora/Ceremonial	2	2.41%
Shelter with Art	2	2.41%
Potential Archaeological Deposit (PAD), Open Camp Site	2	2.41%
Quarry	1	1.20%
Shelter with Deposit	1	1.20%
Shelter with Art and Deposit	1	1.20%
Restricted Site	1	1.20%
Stone Arrangement	1	1.20%
Axe Grinding Groove, Open Camp Site	1	1.20%
Axe Grinding Groove, Shelter with Art	1	1.20%
Grand Total	**83**	**100.00%**

No Aboriginal sites are registered within the study area. The registered site closest to the study area is an open camp site which plots approximately 14m west of the study area, near the Tuggerah entrance to the motorway (AHIMS #45-3-1108; see Figure 5.2). The site card for this site identifies that it is located further to the north-west, rather than adjacent to the motorway (Figure 5.3); it also notes that the artefacts were collected.

The next nearest sites are an open camp site and an isolated find located c.155-160m east of the study area, south of Sparks Road (AHIMS #45-3-3448 and #45-3-3382; see Figure 5.4). Site #45-3-3448 is the location where artefacts from the surrounding isolated find sites (including #45-3-3382), and artefacts recovered from an associated archaeological excavation of the area, were reburied.

The most common sites previously recorded in the local area are stone artefact sites, either open campsites or isolated finds; and axe grinding grooves. A small number of middens, scarred trees, shelter sites, PADs, bora/ceremonial sites, and a quarry and stone arrangement are also present. Sites

tend to cluster in areas that have been subject to previous archaeological survey, and along creeks and lakes.

One restricted site has been recorded, which means the site information, including the map coordinates and site description, is considered sensitive by the Aboriginal community and is only available to authorised people (OEH 2012:4-5). However, this site is not located within, or in close proximity to, the current study area.

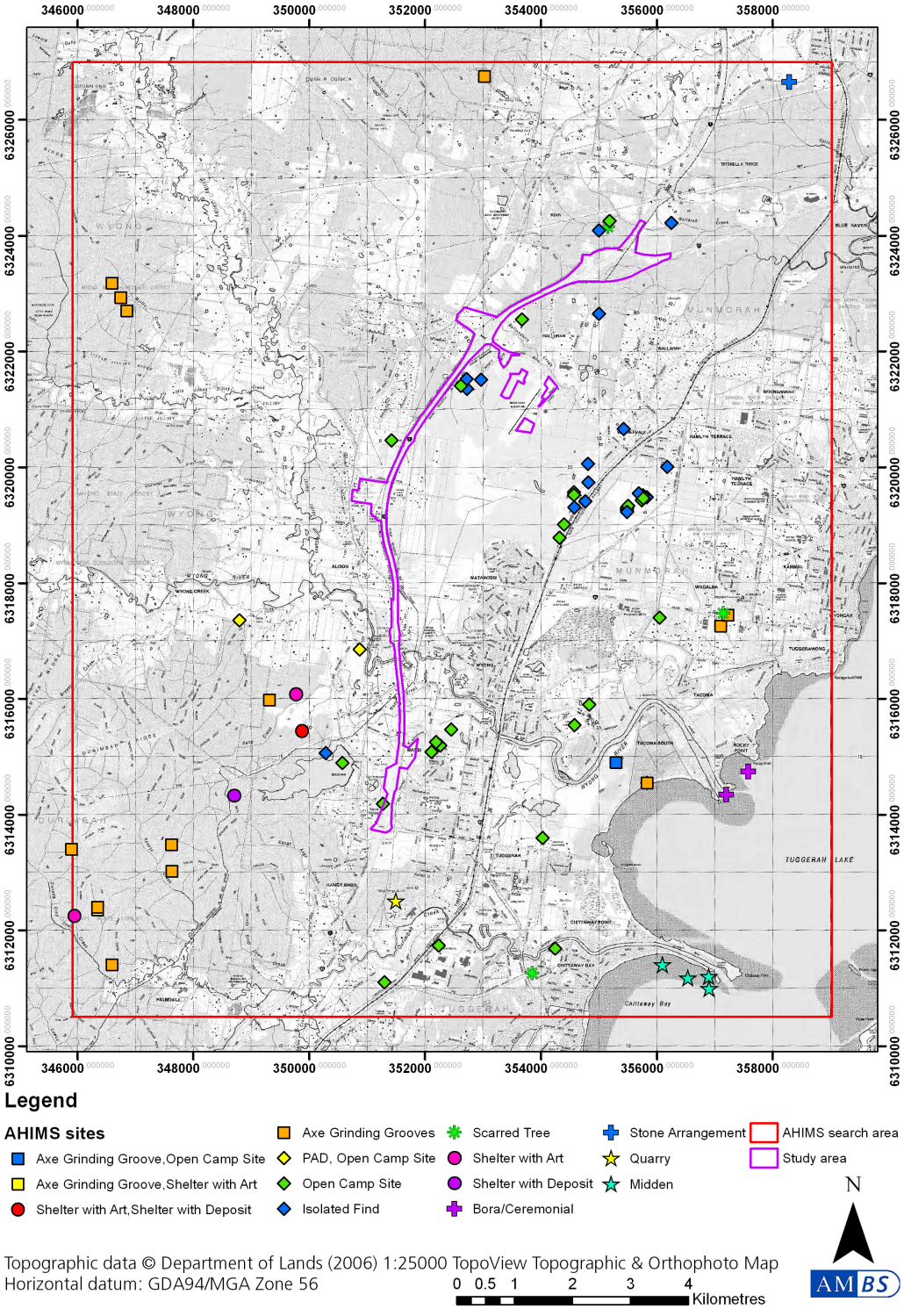
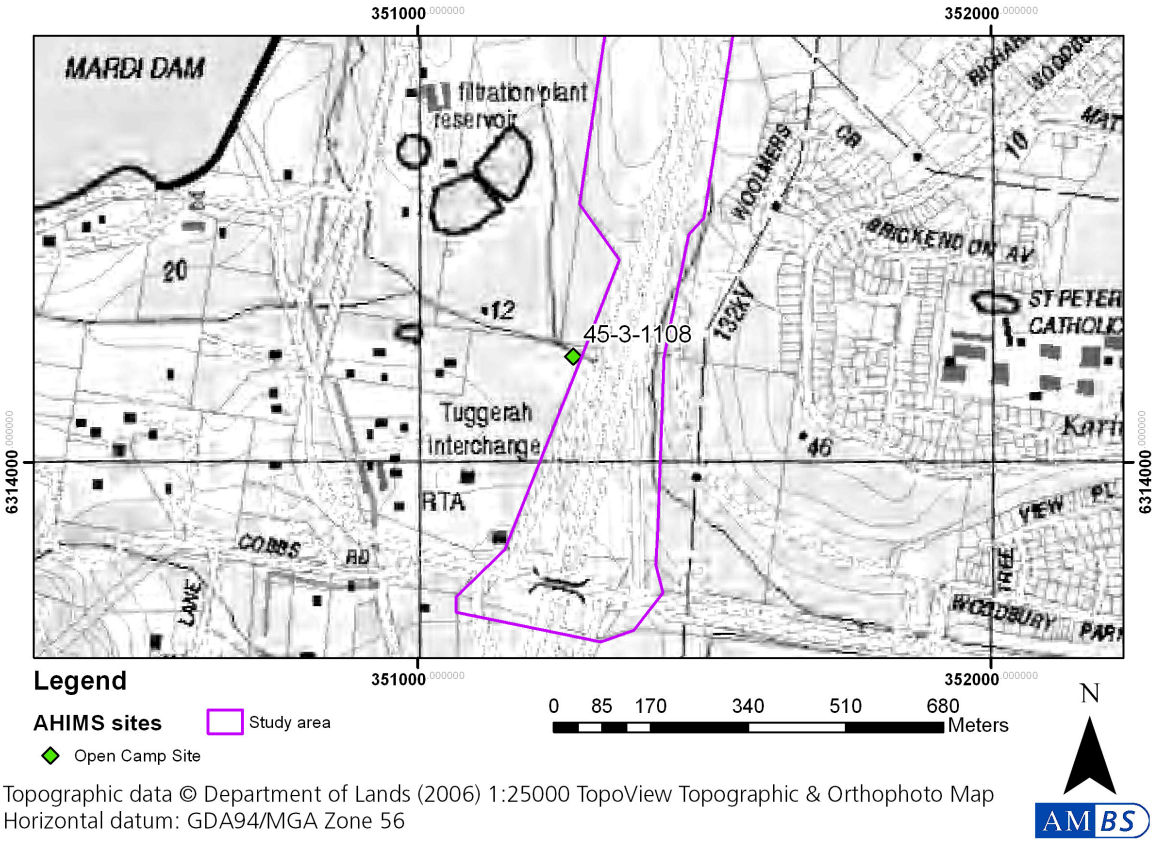


Figure 5.1 AHIMS sites in the vicinity of the study area (data obtained from updated AHIMS search [ID: 132415] on 24/4/2014).



Topographic data © Department of Lands (2006) 1:25000 TopoView Topographic & Orthophoto Map
Horizontal datum: GDA94/MGA Zone 56

Figure 5.2 AHIMS sites in closest vicinity to the south of the study area.

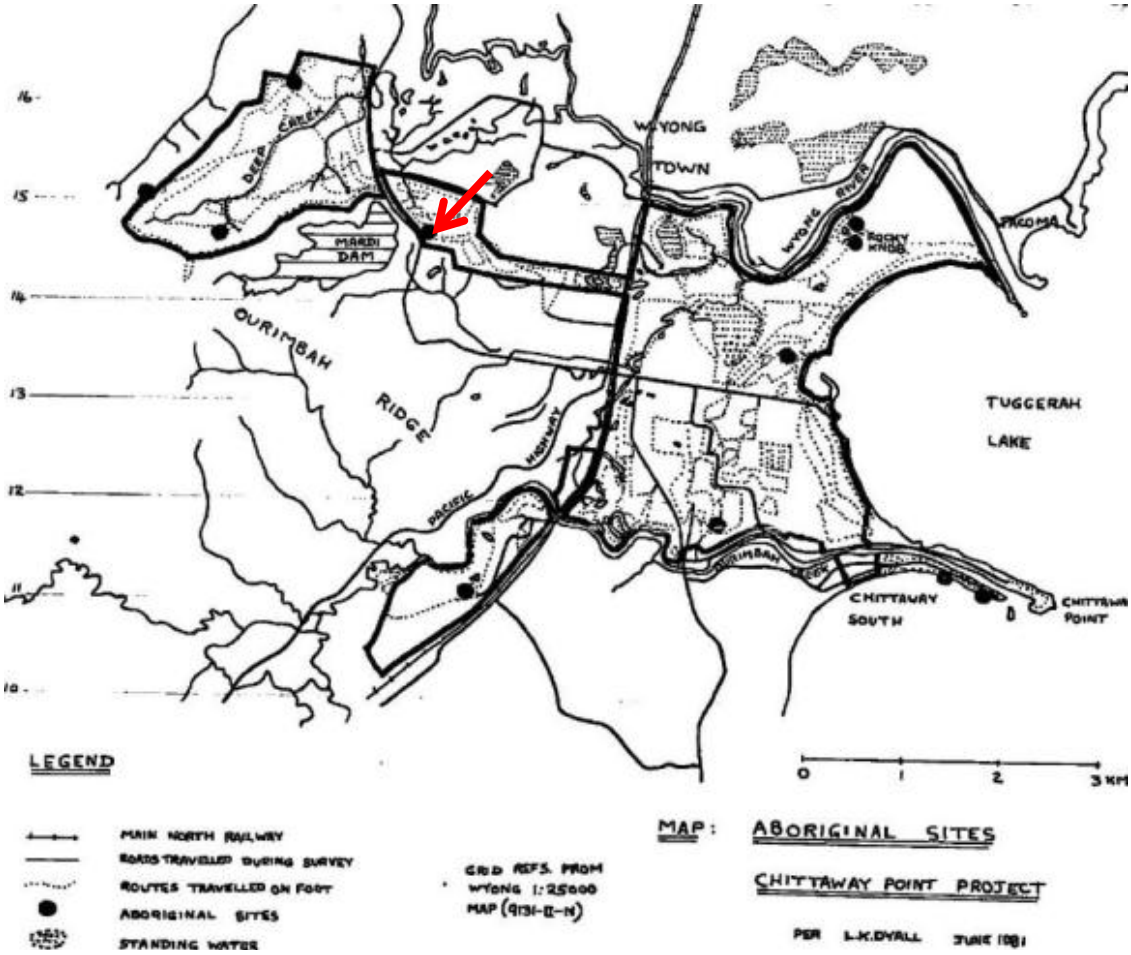


Figure 5.3 Location of site #45-3-1108 (arrowed in red). Source: Site card for associated site #45-3-1099.

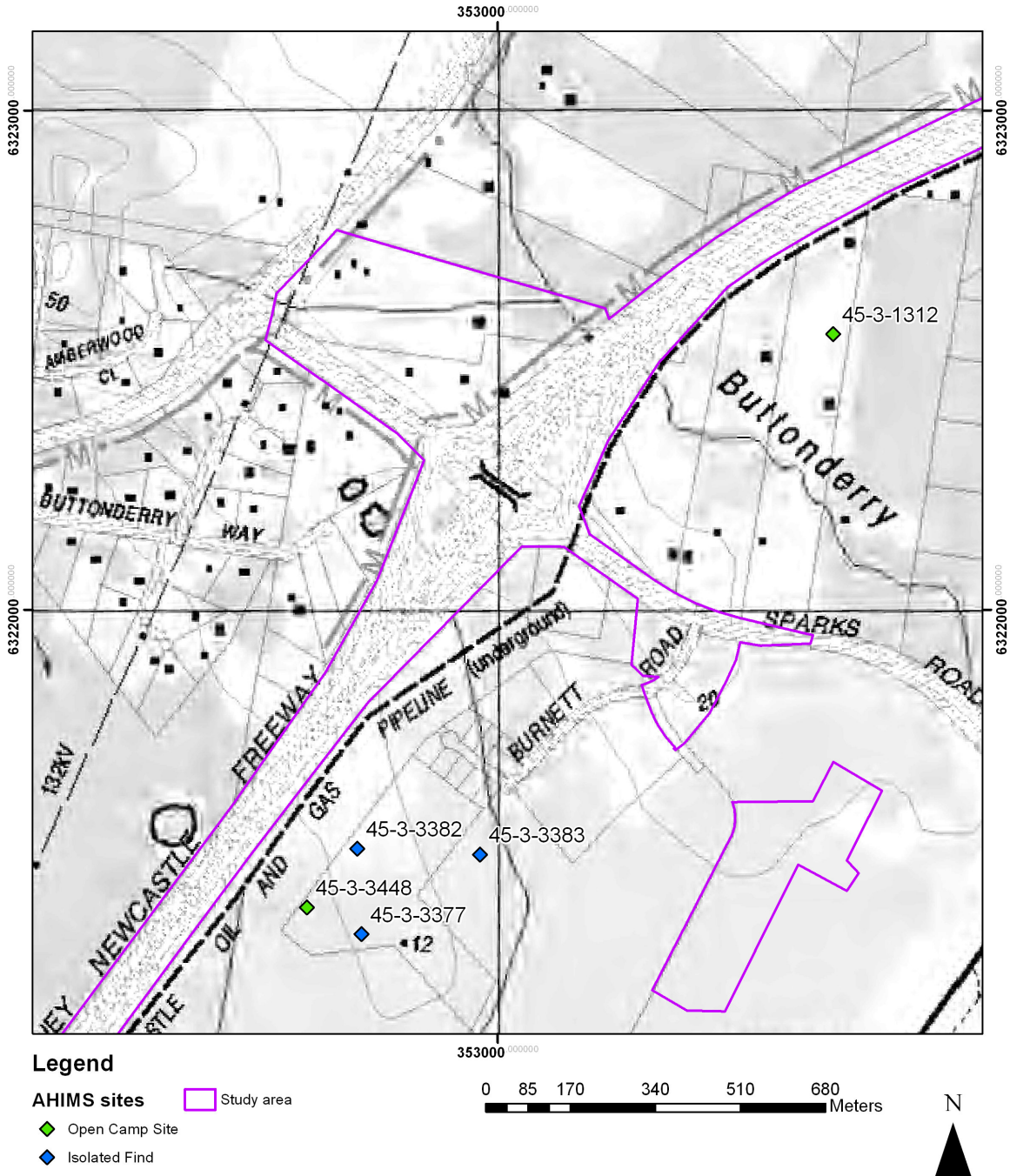


Figure 5.4 AHIMS sites in closest vicinity to the north of the study area.

Aboriginal place

The OEH website identifies that the Tuggerah Lakes area is of significance to the local Aboriginal community because of its traditional usage. The area was used for gathering wild resources and is also known locally as a traditional meeting place. The area was a place for learning and education and has a great aesthetic and spiritual presence for local Aboriginal people. Further, the Tuggerah Lakes Resting Place Aboriginal Place is an Aboriginal reburial site where ancestral remains have been returned to Country. Mapping information on the OEH website identifies that the Tuggerah Lakes Resting Place is located entirely within Tuggerah Nature Reserve, and so would not be impacted by the proposal (http://www.environment.nsw.gov.au/aboriginalplaces/TuggerahLakesRestingPlace.htm).

5.2.2 Previous archaeological investigations

A number of archaeological investigations have been undertaken in the general vicinity of the study area, the majority of which are summarised in Appendix A. Most of the studies have been linear surveys in response to proposed infrastructure projects, or surveys of small areas proposed for residential/commercial development.

Of particular relevance to the current project is Lough's (1981) survey of the proposed F3 freeway between Wallarah Creek and Wallsend (it does not appear that the section of the motorway between Ourimbah and Doyalson interchange was assessed). In closest proximity to the current study area, Lough identified an isolated scraper of volcanic stone in the gutter of Mountain Road (now Kiar Ridge Road) on the centreline (site M-W-5; Figure 5.5), which was possibly brought into the area with fill for the road; and a small chert chip to the north of the current study area (site M-W-4; Figure 5.6).

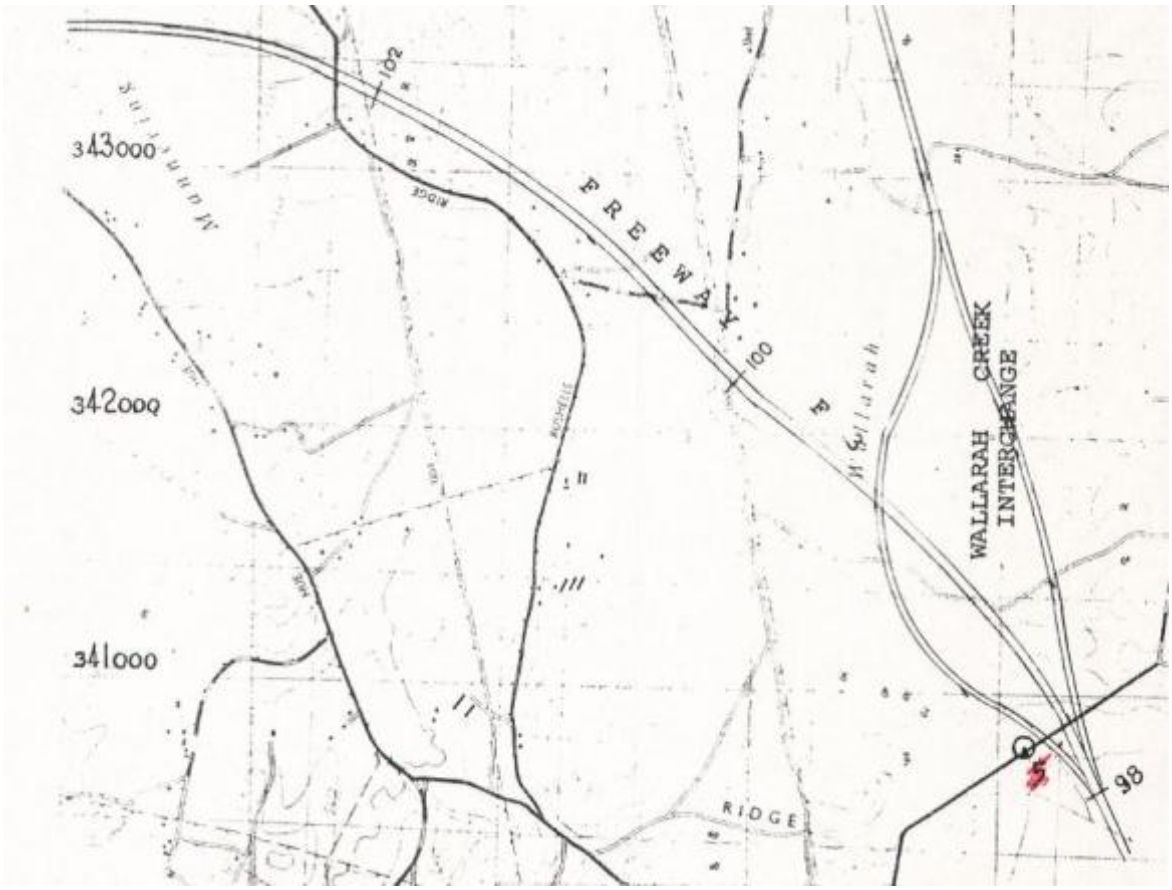


Figure 5.5 Location of site M-W-5 (Lough 1981:Drawing No.521).

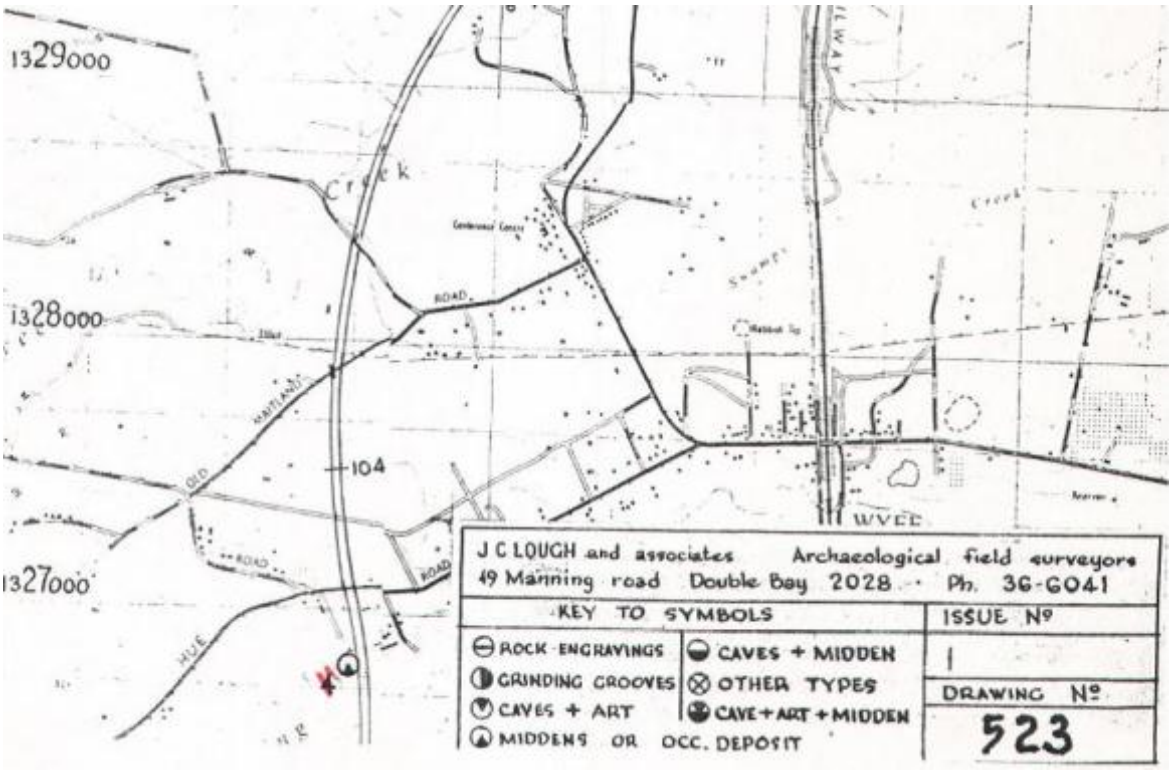


Figure 5.6 Location of site M-W-4 (Lough 1981:Drawing No.523).

Also of relevance to the current project is Silcox's (1997) survey of land adjacent to the motorway, which identified five isolated artefacts. One indurated mudstone broken flake (site W1) was located on the northern bank of Buttonderry Creek, near the western boundary of Silcox's study area, in the corridor of the pipeline and telecommunications cable adjacent to the motorway. One silcrete broken flake (site W2) was located on the southern bank of Buttonderry Creek, c.70m east of W1. One silcrete flaked piece (site W3) was located in the northern corner of Silcox's study area, at the junction of two unsurfaced vehicle tracks, adjacent to the motorway interchange (Figure 5.7). A fine-grained basic broken flake (site W4) was identified c.70m northeast of W3 on the same unsurfaced vehicle track, adjacent to the motorway interchange (Figure 5.7). Silcox identified an area of archaeological potential on the footslopes and low rises along the margins of wetlands, and recommended that further investigation and possibly excavation should be undertaken if impact was to occur in this area. None of these sites have been registered on the AHIMS. Appleton (2005) mapped three of the sites within his Wyong Employment Zone study area based on Silcox's maps (Figure 5.8), but Appleton was unable to confirm the location of these isolated finds during field survey. This is perhaps unsurprising, given the length of time between the two assessments, and the difficulty in locating single, small artefacts in the same places as exposure and erosion changes with time. Silcox and Appleton's maps show site W1, W3 and W4 adjacent to the current study area, at the Doyalson interchange.

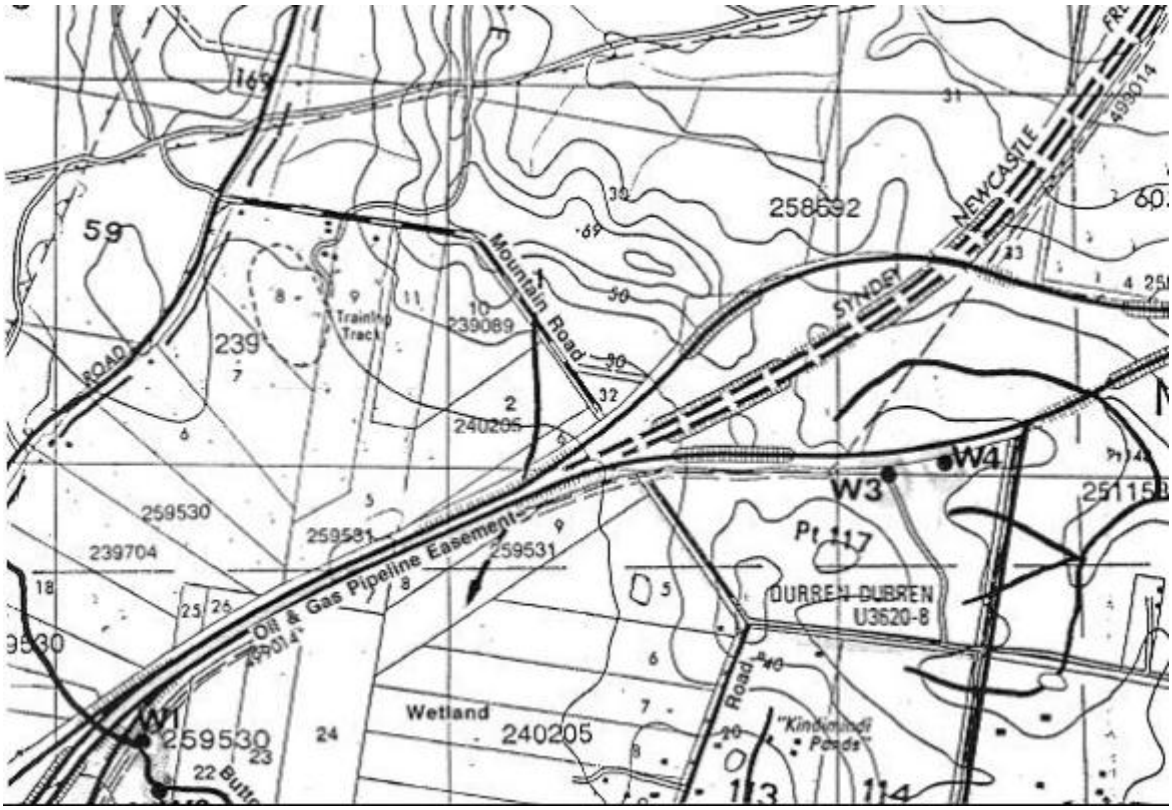


Figure 5.7 Sites W1-W4, recorded by Silcox (1997:Figure 3).

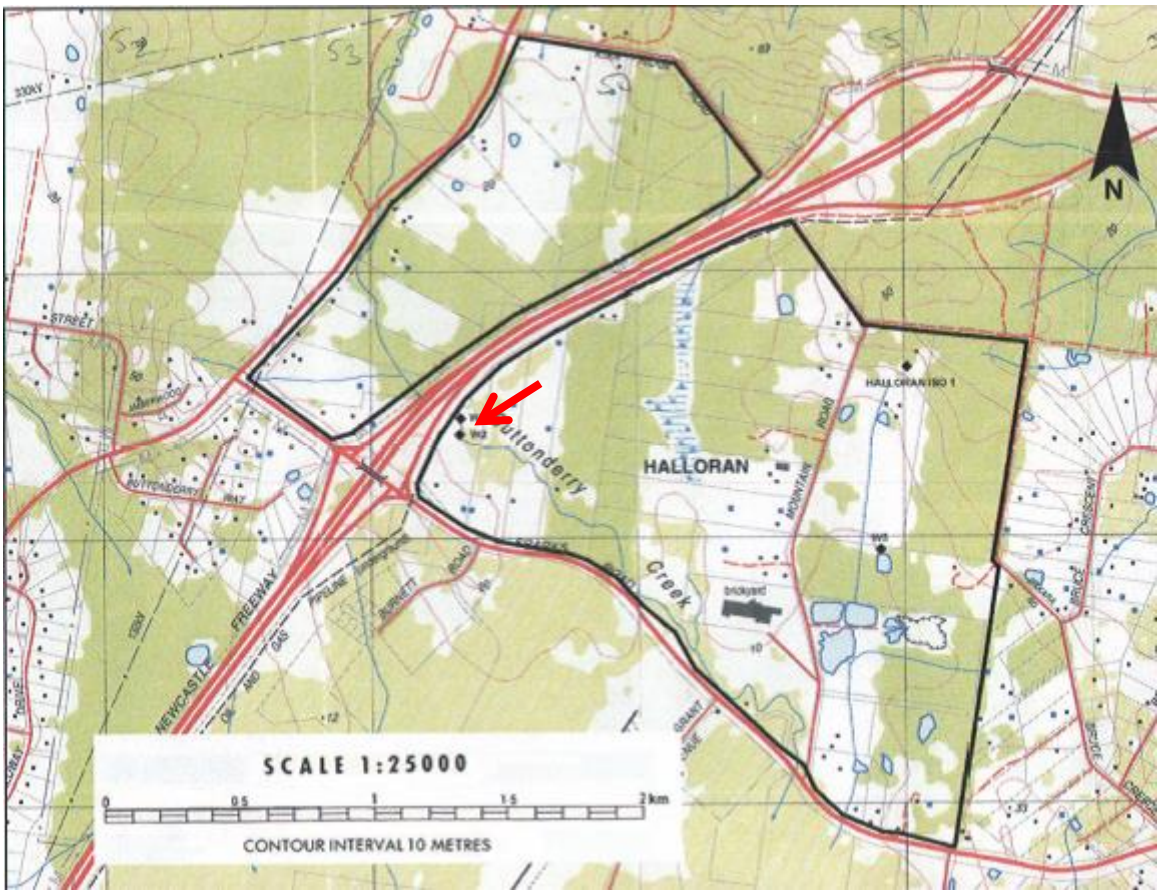


Figure 5.8 Sites identified within the Wyong Employment Zone; red arrow points to W1 and W2 (Appleton 2005:Figure 1).

Two regional reports that are relevant to the current study area are a systematic survey of Aboriginal sites in the Gosford/Wyong region by Vinnicombe (1980), and an Aboriginal heritage planning study for the Wyong Shire LGA by Dallas, Menses and Rola-Wojciechowski (1987). Vinnicombe surveyed three different environmental zones; the coastal and estuarine bays and inlets of the Brisbane Water and Bouddi Peninsula, the tidal riverine region of Lower Mangrove Creek, and the inland headwaters of the Hawkesbury River catchment at Upper Mangrove Creek. She proposed the following general trends in site distribution (Vinnicombe 1980):

- Open middens occur on sand, alluvium or sandstone. They are usually found in protected positions near fresh water sources, often at the junction of hillslopes and valley floors.
- Open camp sites are difficult to detect outside of eroded or disturbed contexts, but could occur anywhere on relatively flat ground near water.
- Rock shelter sites usually occur in exposed Hawkesbury sandstone on steep valley slopes. They occur to a lesser extent on the Gosford (Terrigal) Formation. There is a preference for north or north westerly facing shelters.
- Grinding grooves usually occur on Hawkesbury sandstone creek beds at the heads of valleys, above waterfalls, and around rock pools and aquifers.
- Rock engraving sites usually occur on ridges and plateaus of Hawkesbury sandstone. They can also be found at sea level, on rock platforms or on rocks near unusual natural features.

Dallas *et al.* (1987) identified that there were relatively few sites along inland creeks west of Tuggerah Lake, but considered that this was likely the result of modern disturbance; they identified that less disturbance would have occurred in the foothills and plateaus, and so this was where sites were likely to remain. Further, it was considered that large camp sites were less likely to occur on the low-lying, swampy, flood-prone areas between Tuggerah Lake and the sandstone hills and plateaus to the west (including the current study area), because of the frequent presence of standing water and mosquitoes; instead, the most likely archaeological evidence in this area would be low-density deposits in the form of small camp sites or isolated finds. Although the area would have offered important resources, it was considered that the sandstone lower hillslopes and plateaus would have been more preferable for camping when people moved away from the rich resources of the coast and coastal lakes, and thus result in higher-density archaeological deposit (see also Therin 2001:10). Dallas *et al.* (1987) concluded that the majority of the Wyong LGA should be surveyed before any future development; however, survey was not considered to be required for areas of previous development and disturbance, including the F3, other roads and pipelines, and residential/urban development.

Supporting this predictive model are numerous surveys in the general area that have failed to located sites (or have identified only small numbers of low-density sites) or areas of archaeological potential, due to low-lying swampy landforms or previous disturbance (Appleton 2004a, 2004b, 2005, 2006; Bonhomme & Koettig 1984; Brayshaw 1998a, 1998b, 1999; Churcher 2006; Comber & Rich 1990; Corkill & Edgar 2001; Dallas 1984, 1986; Dean-Jones 1990; Dibden & Navin 2002; Djekic 1981; Higgs & McDonald 2008; Koettig & Smith 1984; Kuskie 1992, 1993; Paton 1998; Ross 1980; Steele 2002; Therin 2000). Further, identified sites or areas of archaeological potential, particularly on elevated areas above creeks or swamps/wetlands, that have been excavated in the vicinity have often found no, or only small numbers of, artefacts (Barry 2009; Cekalovic & O'Brien 2010; Heritage Concepts 2008; Kayandal Archaeological Services 2009; Therin 2006). Although the majority of these excavations were undertaken using mechanical equipment, which is not as rigorous an archaeological technique as manual excavation by hand, they still suggest that Aboriginal occupation of the area was more sporadic than along the coast and coastal lakes.

In contrast to the above discussion, a salvage excavation approximately 550m east of the study area at Mardi was undertaken by Therin. Although the report appears not to have been published (and is not

available in the AHIMS database), the results are referred to in Therin (2006:10). The salvage comprised 41 mechanically excavated 1m^2 pits and two 20m^2 open area manual excavations. Density ranged from 2-65 artefacts/m^2, with high concentrations recovered from the Wyong River floodplain and the base of the hill on the edge of the floodplain; around 1,100 and 3,000 artefacts were recovered from the open area excavations in these respective areas. Deposits at the base of the hill went to approximately 80cm deep. These excavations suggest that the archaeological potential of this area has been underestimated, and that characterising archaeological sites solely by the presence of visible surface stone artefacts appears to be somewhat problematic. Thus, it would seem to be important to use test excavation to establish the nature and density of archaeological material in the area. Further, the detection of sites is often influenced by factors such as previous land-use and disturbance, which exposes surface artefacts.

5.2.3 Summary

The review of previous reports and site cards in the AHIMS database has identified the locations of several sites which are either plotted incorrectly in the AHIMS (Figure 5.9), or which have not been registered in the AHIMS (Figure 5.10). Four isolated finds (W1, W3, W4 and M-W-5) appear to be just outside of the boundary of the proposed Doyalson interchange works.

5.3 Aboriginal heritage site prediction modelling

On the basis of a review of previous archaeological studies and the archaeological sites registered in the region, the following conclusions can be drawn regarding the potential presence and location of Aboriginal heritage sites within the landscape of the study area:

- The sites most likely to be present in the study area, given its distance from the coast and estuarine lakes, are small stone artefact sites. These are the most common site type occurring in this type of landscape (ie non-coastal/estuarine) in the area, and comprise predominantly small surface and associated low-density subsurface scatters of stone artefacts. While found in all environmental contexts, larger and denser sites tend to be found on elevated, well-drained land near freshwater sources or other resources, as well as ridgelines and other areas that offer movement routes. However, any such sites within the study area are likely to have been significantly disturbed (and hence not in situ) by the construction of the road, houses, driveways and other development. Given the extent of disturbance arising from the construction of the motorway in the 1980s, it is unlikely that any stone artefact sites will be present in the central median. More intact sites are most likely to be located in the ancillary areas outside of the original motorway construction area.
- According to maps by Silcox (1997) and Lough (1981), isolated finds W1, W3, W4 and M-W-5 appear to be adjacent to the study area, although no site co-ordinates were provided. However, it is unlikely that their location can be confirmed due to the difficulty in relocating single, small artefacts, particularly given the length of time since they were recorded, and attendant changes in surface visibility and the effects of erosional processes on ground exposure.
- Stone artefact density will be greater in closer proximity to major water resources such as Wyong Creek and the other creeks in the area; however, the regional evidence suggests that these sites may still be fairly low-density.

The following site types have previously been recorded within the local region, but have a moderate to low likelihood of being present within the current study area:

- Middens are predominantly associated with the coast and estuarine resources such as lakes. Therefore, it is unlikely that midden material will be found within the study area.
- The lack of suitable stone outcrops indicates that rockshelter, quarry sites, engravings and axe grinding grooves are highly unlikely to be found in the study area.

- The early clearance of mature native trees in combination with more recent urban development suggests that the potential for Aboriginal scarred or otherwise modified trees to be found in the study area is low.
- Burials and ceremonial sites (including stone arrangements) are unlikely to be present in the area given the disturbance caused by early pastoralism and horticulture, and the construction of the road and adjacent houses.

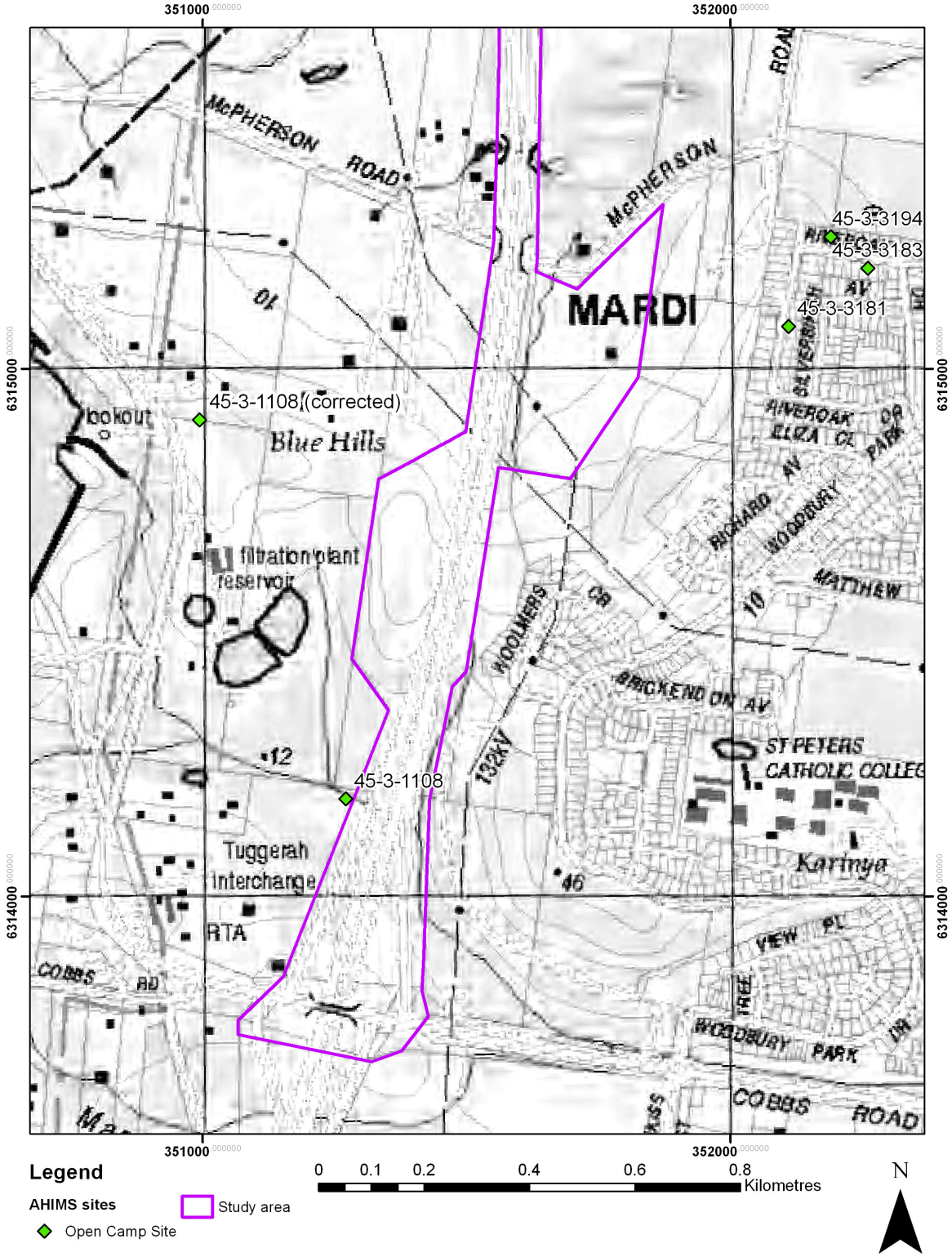


Figure 5.9 Correct location of site 45-3-1108, compared to registered AHIMS location.

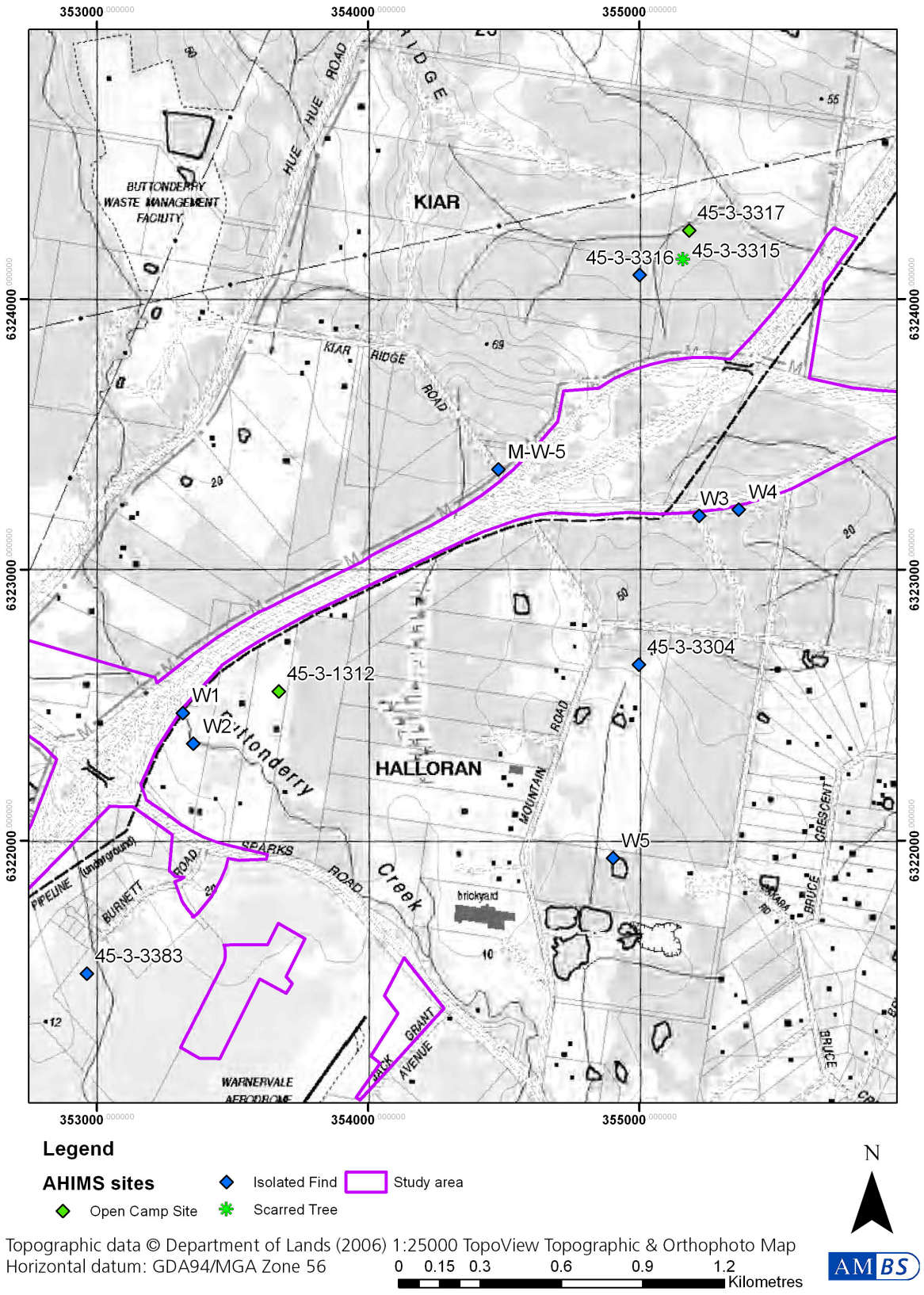


Figure 5.10 Location of sites identified within the study area or its near vicinity, not previously registered on the AHIMS.

6 Field survey

6.1.1 Survey methodology

A cultural heritage survey and assessment of the study area was undertaken on 1-2 May 2013 by AMBS archaeologists Ngaire Richards and Ronan Mc Eleney, accompanied by DLALC representative Sharon Hodgetts and Roads and Maritime representative Steven Knight. The fieldwork methodology and proposed development were discussed with the participants, and topographic maps and aerial photographs were made available to guide the survey. For safety reasons, no pedestrian access to any part of the paved motorway areas was permitted, including the central median strip, shoulder and breakdown bays. Entry to private properties and road reserves was through defined access points. The survey was undertaken on foot, with personnel transported between access points by vehicle.

The aims of the survey were to inspect the study area for any Aboriginal sites, and to identify the potential for archaeologically sensitive areas to be present. Photographs of the study area were taken using Fuji FinePix HS20EXR and Canon PowerShot S100 digital cameras. During the survey, notes were made regarding the environmental setting and details of ground disturbance within the study area.

Survey coverage data was gathered during the archaeological field survey to allow quantification of ground exposure and visibility, as adverse observation conditions can affect the detection of Aboriginal sites and material. This data does not reflect the extent of the area that was physically surveyed, but represents an estimate of the area of ground surface examined, and presents an estimate of the effectiveness of the survey, given environmental conditions and ground visibility. A track log of the survey, recorded using a Garmin Oregon 300 handheld GPS unit, is provided in Figure 6.1 and Figure 6.2, and survey coverage data is presented in accordance with the OEH guidelines in Table 6.1 and Table 6.2.

The pedestrian survey focussed on areas of ground exposure in the proposed ancillary areas, particularly areas of ground exposure along unsurfaced vehicle tracks and areas where stock had congregated near paddock gates. A distance of 2-5m was generally maintained between survey personnel; however, transect spacing varied depending on the topography and density of vegetation coverage. The area covered was considered adequate for the purposes of this heritage assessment.

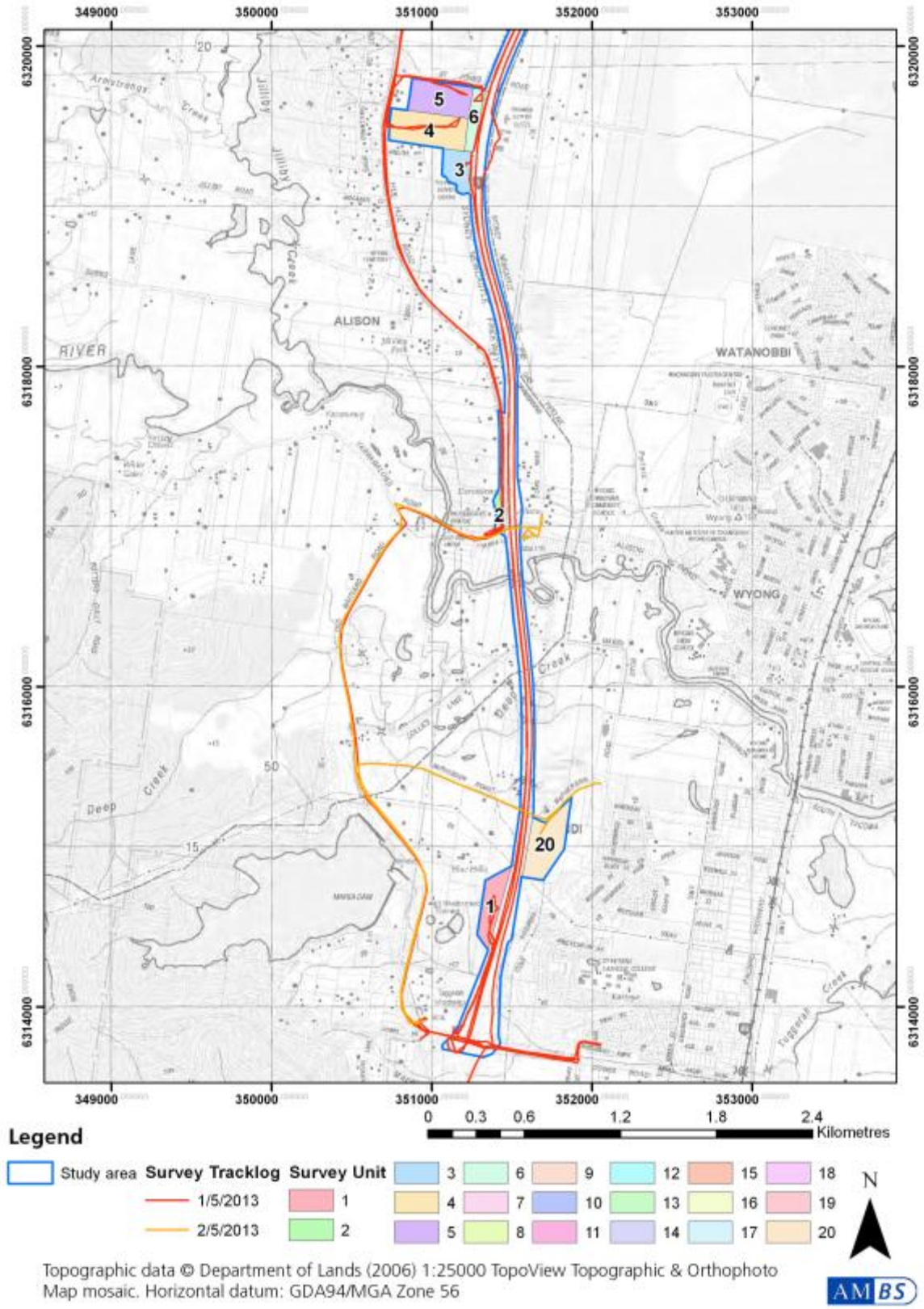


Figure 6.1 Survey Units and tracklog recorded during survey (south).

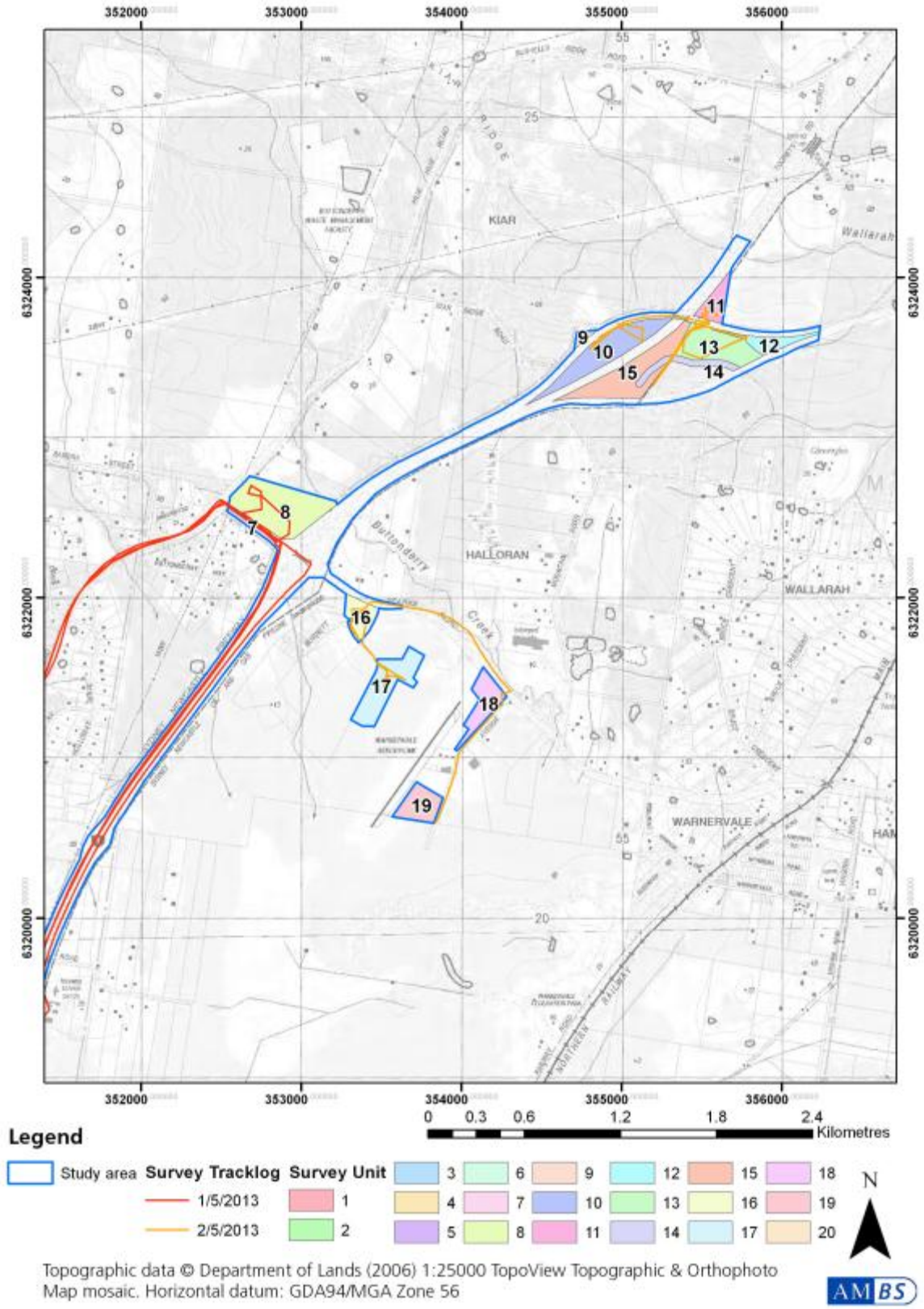


Figure 6.2 Survey Units and tracklog recorded during survey (north).

Table 6.1 Survey coverage table.

Survey Unit	Landform	Description	Soil Landscape	Survey Unit Area (m^2)	Area Surveyed (m^2)	Visibility	Exposure	Effective coverage (to nearest m^2)	Effective coverage (%)	Transect Photograph
1	Slope	Vegetation regrowth, leaf litter. Road reserve west of M1, Mardi	Erina	50,937	2,468	0%	0%	0	0%	
2	Slope	Grassed verge, open concrete channel, underground optical fibre cables. Road reserve, corner of Hue Hue Road and Alison Road, Wyong	Woodburys Bridge	11,017	360	0%	0%	0	0%	

Survey Unit	Landform	Description	Soil Landscape	Survey Unit Area (m^2)	Area Surveyed (m^2)	Visibility	Exposure	Effective coverage (to nearest m^2)	Effective coverage (%)	Transect Photograph
3	Flat	Motorway service centre/truck stop, car park, grassed verge. West of M1, Alison. Part of the Hue Hue Road Ancillary Site.	Wyong/ Gorokan	41,437	303	0%	0%	0	0%	
4	Slope	Cultivation areas, grassed paddocks, man-made dam, dwelling. 275 Hue Hue Road, Jilliby. Part of the Hue Hue Road Ancillary Site.	Gorokan	98,322	1,882	<10%	10%	2	<1%	

Survey Unit	Landform	Description	Soil Landscape	Survey Unit Area (m^2)	Area Surveyed (m^2)	Visibility	Exposure	Effective coverage (to nearest m^2)	Effective coverage (%)	Transect Photograph
5	Slope	Grassed paddocks with horses, man-made dams, *Melaleuca* sp. scrub. Lot 1 DP882547, Jilliby. Part of the Hue Hue Road Ancillary Site.	Gorokan	77,638	6,860	10%	10%	69	1%	
6	Flat	Grassed electricity easement, unsealed vehicle access tracks, former concrete batching site. Lot 41 DP814963, Jilliby. Part of the Hue Hue Road Ancillary Site.	Gorokan	26,439	753	60%	10%	45	6%	

Survey Unit	Landform	Description	Soil Landscape	Survey Unit Area (m^2)	Area Surveyed (m^2)	Visibility	Exposure	Effective coverage (to nearest m^2)	Effective coverage (%)	Transect Photograph
7	Flat	Bitumen car park. Corner Doyalson Interchange off-ramp and Sparks Road	Gorokan	8,842	404	0%	0%	0	0%	
8	Slope	Exotic plantings, foundations of former dwelling and outbuildings, man-made dams, grassed former paddocks, dense vegetation. 617 Hue Hue Road and 225 Sparks Road, Jilliby. Sparks Road Ancillary Site.	Gorokan/ Wyong	147,903	2,046	<10%	10%	2	<1%	

Survey Unit	Landform	Description	Soil Landscape	Survey Unit Area (m^2)	Area Surveyed (m^2)	Visibility	Exposure	Effective coverage (to nearest m^2)	Effective coverage (%)	Transect Photograph
9	Slope	Steeply sloping grassed road verge, scattered trees and shrubs. North of Doyalson Link Road (eastbound)	Woodburys Bridge	7,159	0	0%	0%	0	0%	
10	Slope	Dense vegetation regrowth, leaf litter, culvert, open concrete channel. Between M1 and Doyalson Link Road (eastbound)	Gorokan	104,963	1,854	<10%	10%	6	<1%	

Survey Unit	Landform	Description	Soil Landscape	Survey Unit Area (m^2)	Area Surveyed (m^2)	Visibility	Exposure	Effective coverage (to nearest m^2)	Effective coverage (%)	Transect Photograph
11	Slope	Subsurface optic fibre cable, grassed gas easement, minor sandstone exposures, scattered vegetation regrowth, dumped construction materials. Lot 33 DP258692, Bushells Ridge	Gorokan	32,038	1,013	<10%	20%	2	<1%	
12	Flat	Sealed access track, Roads and Maritime stockpile. Between Doyalson Link Road (eastbound and westbound), Bushells Ridge/Wallarah	Gorokan	30,590	980	0%	0%	0	0%	

Survey Unit	Landform	Description	Soil Landscape	Survey Unit Area (m^2)	Area Surveyed (m^2)	Visibility	Exposure	Effective coverage (to nearest m^2)	Effective coverage (%)	Transect Photograph
13	Slope	Dense vegetation, grassed gas easement. Between Doyalson Link Road (eastbound and westbound), Bushells Ridge/Wallarah	Gorokan	85,580	670	<10%	10%	1	<1%	
14	Open Depression	Vegetation along first-order creek, grassed gas easement. Between Doyalson Link Road (eastbound and westbound), Bushells Ridge/Wallarah	Gorokan	28,008	250	<10%	10%	0	<1%	

Survey Unit	Landform	Description	Soil Landscape	Survey Unit Area (m^2)	Area Surveyed (m^2)	Visibility	Exposure	Effective coverage (to nearest m^2)	Effective coverage (%)	Transect Photograph
15	Flat	Swampy area with dense vegetation, *Melaleuca* sp. scrub. Between Doyalson Link Road (eastbound and westbound), Bushells Ridge/Wallarah	Gorokan	108,607	324	0%	0%	0	0%	
16	Slope	Scattered trees, grass. Adjacent to intersection of Burnett Road and Sparks Road, Warnervale	Gorokan	37,953	761	10%	10%	8	1%	

Survey Unit	Landform	Description	Soil Landscape	Survey Unit Area (m^2)	Area Surveyed (m^2)	Visibility	Exposure	Effective coverage (to nearest m^2)	Effective coverage (%)	Transect Photograph
17	Open Depression	Land cleared for proposed industrial subdivision within Wyong Employment Zone, vegetation and topsoil removed. East of regional distribution centre, Warnervale. Warren Road Ancillary Site.	Wyong	89,343	5,340	10%	10%	53	1%	
18	Flat	Grassed field. North-east of Warnervale aerodrome, Sparks Road. Part of Warnervale Airport Ancillary Site.	Wyong	52,175	104	0%	0%	0	0%	

Survey Unit	Landform	Description	Soil Landscape	Survey Unit Area (m^2)	Area Surveyed (m^2)	Visibility	Exposure	Effective coverage (to nearest m^2)	Effective coverage (%)	Transect Photograph
19	Open Depression	Swampy, grassed area. South of Warnervale aerodrome, Jack Grant Avenue. Part of Warnervale Airport Ancillary Site.	Wyong	47,182	0	0%	0%	0	0%	
20	Slope	Tall grasses, blackberry thicket, adjacent to former landfill site. McPherson Road, Mardi. McPherson Road Ancillary Site.	Woodburys Bridge/ Yarramalong/ Gorokan	84,215	700	0%	0%	0	0%	

Table 6.2 Landform summary for sampled areas.

Landform	Landform survey area (m^2)	Area effectively surveyed (to nearest m^2)	% of landform effectively surveyed	Number of sites	Number of artefacts or features
Slope	18,614	88	<1%	0	N/A
Flat	2,868	45	2	0	N/A
Open Depression	5,590	54	1	0	N/A

6.1.2 Survey results

No Aboriginal sites were identified during the survey. The study area has been subject to high levels of ground disturbance arising from the development of the M1 Motorway (road verges, Survey Unit 6), commercial and industrial development (Survey Units 3 and 17), the installation of subsurface gas and telecommunications infrastructure including high pressure mains and optic fibre cables (Survey Units 2, 11, 13 and 14; Figure 6.3), waste disposal (Survey Unit 20), and vegetation clearance for rural and agricultural land use (Survey Units 4, 5, and 8).

Figure 6.3 View south-west along underground high pressure gas main, Survey Unit 13.

Much of the land to either side of the motorway was densely vegetated, and consequently had no ground surface visibility (Survey Units 1, 8, 13, 14, 15, 16, and 20; Figure 6.4-Figure 6.5). The vegetation is predominantly regrowth following land clearance, and no trees of an age suitable to bear evidence of Aboriginal cultural scarring were observed within the study area. Small sandstone exposures were noted in Survey Units 10 and 11; however, they are highly weathered and no Aboriginal grinding grooves or engravings were present (Figure 6.6-Figure 6.7).

Figure 6.4 View west, Survey Unit 1.

Figure 6.5 View north-west, Survey Unit 8.

Figure 6.6 Sandstone exposure, Survey Unit 10.

Figure 6.7 Sandstone exposure, Survey Unit 11.

The steeply sloping grassed road verge to the north of Doyalson Link Road (eastbound) was not traversed, as it was considered that the incline would not have been a suitable location for a camp site and as such, evidence of Aboriginal occupation was unlikely to be present (Survey Unit 9). Rather, the median was surveyed (Survey Unit 10), and the verge was viewed from the southern side of the road (Figure 6.8). The proposed Warnervale Airport Ancillary Sites were also not traversed, as they were vegetated with grasses (including swamp grasses), and consequently had no ground surface visibility; however, they were inspected from Sparks Road (Survey Unit 18; Figure 6.9) and Jack Grant Avenue (Survey Unit 19).

Figure 6.8 View across Doyalson Link Road (eastbound) to Survey Unit 9.

Figure 6.9 View south to Warnervale Aerodrome from Sparks Road, Survey Unit 18.

Given the lack of ground surface visibility during the survey, an estimate of archaeological potential for the study area has been made. Based on the results of previous Aboriginal heritage investigations which have identified low numbers of Aboriginal artefacts in the vicinity of the current study area, previous ground disturbance, and limitations of the underlying soil landscapes, it is not considered that there is any potential for in situ or stratified archaeological deposits to remain in the study area.

Soil landscapes that have high to extreme soil erosion susceptibility, and localised areas that are seasonally or permanently waterlogged (where the watertable is at or near the ground surface), are considered to be environmental factors limiting the potential for stratified archaeological deposits to be present (Table 6.3). While the swampy lowlands to the west of Tuggerah Lake would have been a key resource zone for Aboriginal people, those parts of the study area with easily saturated and poorly-drained soils are unlikely to have been attractive as camp sites.

Table 6.3 Soil landscape limitations (after Murphy 1993; see also Section 4.1.1)

Soil Landscape	Soil Erosion Susceptibility	Waterlogging	Survey Unit/s
Erina	high	seasonal (localised)	1
Gorokan	very high	seasonal (localised)	3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 20
Woodburys Bridge	extreme	seasonal (localised)	2, 9, 20
Wyong	stream bank (localised)	seasonal/ permanent (localised)	3, 8, 17, 18, 19
Yarramalong	stream bank (localised)	seasonal/ permanent (localised)	20

Further, during the survey, no specific Aboriginal cultural issues or sensitivities were identified by Ms Sharon Hodgetts or Mr Stephen Knight.

7 Assessment of heritage significance

7.1 Aboriginal heritage significance

A primary step in the process of Aboriginal cultural heritage management is the assessment of significance. Heritage significance relating to Aboriginal sites, objects and places in NSW is assessed in accordance with the criteria defined in the OEH guidelines, and cultural significance is identified by Aboriginal communities. The 2010 *OEH Code of Practice for Aboriginal Investigation of Aboriginal Objects in New South Wales*, states that archaeological values should be identified and their significance assessed using criteria reflecting best practice assessment processes as set out in the Burra Charter.

The criteria for assessing Aboriginal heritage significance are derived from the Burra Charter criteria of aesthetic, historic, scientific, social or spiritual value, for assessing cultural significance for past, present and future generations (Article 1.2). OEH guidelines for assessing significance as defined in the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011b:10) reflect the Burra Charter criteria, and require consideration of the following aspects of heritage sites:

- *Research Potential: does the evidence suggest any potential to contribute to an understanding of the area and/or region and/or state's natural and cultural history?*
- *Representativeness: how much variability (outside and/or inside the subject area) exists, what is already conserved, how much connectivity is there?*
- *Rarity: is the subject area important in demonstrating a distinctive way of life, custom process, land-use, function or design no longer practiced? Is it in danger of being lost or of exceptional interest?*
- *Education potential: does the subject area contain teaching sites or sites that might have teaching potential?*

Not all sites are equally significant and not all are worthy of equal consideration and management. The significance of a site is not fixed for all time; what is considered as significant at the time of assessment may change as similar items are located, more research is undertaken and community values change. This does not lessen the value of the heritage approach, but enriches both the process and the long-term outcomes for future generations as the nature of what is conserved and why also changes over time (Pearson and Sullivan 1995:7).

7.1.1 Assessment against criteria

This assessment of heritage values against the OEH heritage assessment criteria is informed by the results of the environmental and heritage context, the predictive model for Aboriginal sites in the region, and the results of the Aboriginal heritage field survey. Aboriginal heritage sites are considered to be of heritage significance if they meet one or more of the following criteria:

Does the subject area have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons? – social value

This criterion concerns the value(s) of a site or feature to a particular community or cultural group, in this case the local Aboriginal community. Aspects of social significance are relevant to sites, items and landscapes that are important, or have become important, to the local Aboriginal community. This importance involves both traditional links with specific areas as well as an overall concern by Aboriginal people for sites and landscapes generally and their future protection. Assessments of social value can only be made by the relevant Aboriginal communities.

The cultural heritage survey report prepared by DLALC identified the Central Coast region of NSW, of which the study area is a part, as 'an area with a high Aboriginal Cultural Heritage value. This is

because of the surrounding, mountains, lakes, creeks, coastline and associated woodland and wetland habitats. These environments and ecological zones provided the local Aboriginal population with many foods and other natural resources' (see Appendix B).

However, no Aboriginal sites or areas of archaeological potential were identified in the study area. Further, no specific cultural significances were identified in the study area by DLALC.

Is the subject area important to the cultural or natural history of the local area and/or region and/or state? – historic value

No Aboriginal sites or areas of archaeological potential were identified in the study area. Therefore, the requirements for historic value under this criterion are not met.

Does the subject area have potential to yield information that will contribute to an understanding of the cultural or natural history of the local area and/or region and/or state? – scientific (archaeological) value

No Aboriginal sites or areas of archaeological potential were identified in the study area. Therefore, the requirements for scientific (archaeological) value under this criterion are not met.

Is the subject area important in demonstrating aesthetic characteristics in the local area and/or region and/or state? – aesthetic value

No Aboriginal sites or areas of archaeological potential were identified in the study area. Therefore, the requirements for aesthetic value under this criterion are not met.

7.1.2 Summary statement of significance

No Aboriginal sites or areas of archaeological potential were identified in the study area. As such, assessment against the OEH heritage assessment criteria found that the study area is not considered to have historic, scientific (archaeological), or aesthetic value. Although the Central Coast region was identified as having social value to the local Aboriginal community, DLALC did not identify any further specific cultural significance attached to the study area.

7.2 Assessment of Aboriginal Heritage Impact

There are no Aboriginal heritage constraints on the proposed widening of the M1 Pacific Motorway between Tuggerah and Doyalson.

8 Conclusions

No Aboriginal sites were identified within the study area. Given the recent land use history and high level of disturbance observed within the study area, as well as environmental factors including soil landscapes that have high to extreme soil erosion susceptibility, and localised areas that are seasonally or permanently waterlogged, it is considered unlikely that any in situ or stratified subsurface archaeological deposits remain within the study area.

The DLALC cultural heritage survey report identified the study area as having social value to the local Aboriginal community, due to the surrounding landforms and ecological zones of the Central Coast region, which would have provided the local Aboriginal population with food and other natural resources. DLALC recommended that a DLALC sites officer should be engaged to monitor construction works on the Hue Hue Road, Sparks Road, and Warnervale Airport ancillary sites, and on the median between the M1 and Doyalson Link Road (eastbound), and the Doyalson Link Road (eastbound and westbound) (see Appendix B). However, AMBS does not consider such monitoring to be warranted, given the lack of archaeological potential due to previous ground surface disturbance and environmental conditions within these parts of the study area. As such, no further Aboriginal heritage assessment or community consultation is required prior to the proposed development.

Recommendation 1

There are no Aboriginal heritage constraints on the proposed development. No further Aboriginal heritage assessment or community consultation is required.

Recommendation 2

Should any suspected Aboriginal artefacts or archaeological features be uncovered during the proposed activity, all work should immediately cease in the vicinity of the discovery, and the finds managed in accordance with the Roads and Maritime 'Standard Management Procedure - Unexpected Archaeological Finds' (2012a).

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Appendix A

Summary table of previous local Aboriginal heritage investigations

Reference	Location	Type of investigation	Findings	Distance from study area
Ross (1980)	Tuggerah to Sterland	Archaeological survey: Proposed transmission line	Survey of proposed tower locations (160-888m apart) failed to identify any sites, but it was considered that there would have been potential for sites at creek crossings. 5 shelters with PAD located near Canada Drop Down Creek; not within construction area so excavation not warranted.	Includes part of current study area
Lough (1981)	F3 from Wallarah Creek Interchange to Wallsend	Archaeological survey: Proposed freeway	15 sites identified: 6 artefact scatters, 6 isolated finds & 3 axe grinding grooves. Artefacts mostly comprised chert, with some porphyry, volcanic & quartz. Considered the area to be of negligible archaeological significance.	Includes part of current study area
Dallas *et al.* (1987)	Wyong Shire LGA	Desktop study for future planning	Identified that the majority of the LGA should be surveyed prior to any future development; survey not considered required for areas of previous development and disturbance (including the F3, other roads and pipelines, and residential/urban development).	Includes current study area
Comber & Rich (1990)	F3, Wyong/Jilliby	Archaeological survey: Proposed freeway service centre	No sites identified. No archaeological potential due to previous disturbance, and presence of low swampy ground.	Includes part of current study area
Kuskie (1992, 1993)	Wyong to Maitland	Archaeological assessment: Proposed fibre optic cable	Route between Wyong and Seahampton is located within an existing pipeline easement and so is previously disturbed. 1 previously recorded site in the Wyong area (#45-3-1312) not located within pipeline route.	Includes part of current study area
Paton (1998)	Tuggerah to Munmorah	Archaeological assessment: Proposed power line	No sites identified, but areas of archaeological sensitivity recommended to be monitored.	Includes part of current study area
Appleton (2005)	Halloran/Warnervale	Archaeological assessment: Proposed Wyong Employment Zone	1 isolated silcrete flake identified on upper slope of ridge in highly disturbed area (#45-3-3304). Location of 3 previously recorded isolated finds (W1, W2 and W5; Silcox 1997) unable to be confirmed. No areas of archaeological potential identified. Recommended that sites could be destroyed.	Includes parts of current study area
Benton, Churcher & Cameron (2009)	Tooheys Road, Hue Hue Road and Jilliby Road, Wyong	Archaeological assessment: Proposed coal facilities	No sites identified in Tooheys Road area, but 2 areas of archaeological potential identified, along Wallarah and Spring Creeks; test excavation recommended prior to impact. 1 scarred tree (#45-3-3315), 1 artefact scatter (#45-3-3317) & 1 isolated find (#45-3-3316) identified along Wallarah Creek in the Hue Hue Road area in Kiar. Artefacts included flaked chert/indurated mudstone, silcrete & siltstone, including 1 bipolar core. Area of archaeological potential identified along Wallarah Creek & its major tributaries. Recommended that sites & area of potential be conserved.	Includes part of current study area (Tooheys Road)

Reference	Location	Type of investigation	Findings	Distance from study area
Dallas (1986)	Hue Hue Road, Jilliby	Archaeological survey: Proposed rezoning	Artefact scatter (3 flakes of mudstone, silcrete & chert) identified on slope above creek (#45-3-0815). Previous disturbance by dairy use suggested lack of archaeological potential. Recommended that site could be destroyed.	Immediately adjacent to study area (west)
Dean-Jones (1986)	Between Pacific Highway and F3, Tuggerah	Archaeological survey: Proposed land release	1 quarry (#45-3-0816) of quartz sandstone, 3 isolated finds (quartz sandstone core, chert flaked piece & quartz scraper) & 5 shelters with PAD identified. Quarry not to be impacted.	Immediately adjacent to study area (east)
Silcox (1997)	Warnervale	Archaeological survey: Proposed rezoning	5 isolated finds (flaked silcrete, indurated mudstone & fine-grained basic stone, on the banks of Buttonderry Creek, dirt vehicle tracks next to the motorway, and a dam near wetlands). Area of archaeological potential identified on footslopes & low rises along margins of wetlands; further investigation and possibly excavation recommended if impact to occur in this area.	Immediately adjacent to study area (south-east – Doyalson end)
Higgs & McDonald (2008)	Burnet Road, Warnerrvale	Archaeological survey: Proposed brewery	1 previously recorded & 1 new isolated find (silicified tuff/chart broken flake & silcrete flaked piece) located. No archaeological potential due to previous disturbance.	c.150m east
Barry (2009)	Burnet Road, Warnerrvale	Archaeological excavation: Proposed brewery	Excavation undertaken to fulfil a condition of consent of the development. 8 surface artefacts & 8 artefacts recovered from 17 mechanically excavated 1m^2 pits (flaked silcrete, fine-grained siliceous, chert, chalcedony, tuff & volcanic artefacts, including 1 broken scraper & 1 core fragment). Identified extensive disturbance; recommended that no further excavation was required in the impact areas, but would be if any conservation areas (which appeared to have more intact soil) were to be impacted, to determine whether they were similarly disturbed.	c.150m east
Haglund (1985)	Mardi to Mangrove Creek	Desktop assessment: Proposed water supply scheme	Known artefact site at Mangrove Creek; test excavation and collection recommended. Survey of study area recommended.	c.200m east (Tuggerah end)
Therin (2000)	Mardi	Archaeological assessment: Proposed Woodbury Park Estate	Identified 2 scatters (#45-3-3181 comprised 7 flaked mudstone, quartz & fine-grained siliceous artefacts, including 1 core, seemingly brought in with gravel fill; #45-3-3184 comprised 1 mudstone & 1 quartz flake) & 2 isolated finds (mudstone & silcrete broken flakes). Area of low-density archaeological potential identified, but not recommended for test excavation as not enough information was likely to be gained. Recommended that sites could be destroyed.	c.200m east

Reference	Location	Type of investigation	Findings	Distance from study area
Therin (2006)	Between Wyong River and Mardi Dam, Mardi	Archaeological assessment: Proposed pipeline	1 isolated silcrete flake found on bank of dam (#45-3-3312); not within impact area. Area of archaeological potential identified between Wyong River and Old Maitland Road; salvage excavation recommended prior to impact. [NB: Mechanical excavation of 5m-interval transects apparently identified less than 10 artefacts; Kuskie 2009:28.]	c.400 west
Kuskie (2009)	Mardi to Mangrove Creek	Archaeological assessment: Proposed pipeline	1 previously identified artefact & PAD within impact area, & 3 new sites identified (1 shelter with art & PAD, & 1 artefact scatter & 1 isolated find comprising 3 tuff flakes). Artefact scatter (on Mardi Dam), and shelter (closer to Yarrmalong than Mardi), not to be impacted. Isolated find (#45-3-3392, near Yarrmalong Road, Wyong Creek) considered to be associated with PAD; excavation recommended.	c.400 west (Mardi)
Cekalovic & O'Brien (2010)	Mardi to Mangrove Creek	Archaeological test excavation: Proposed pipeline	Mechanical excavation of #45-3-3312 (2 artefacts recovered), #45-3-3392 (25 artefacts recovered) and #45-3-3228 (no artefacts recovered). Artefacts comprised flaked fine-grained siliceous, silcrete, porphyry, chert, rhyolite & quartz porphyry. Confirmed slopes above creeks contain camp sites, but these were low-density.	c.500 west
Therin (2001)	Mardi	Archaeological assessment: Proposed Woodbury Park Estate	No sites identified, but sections of area are well-drained and elevated above Deep Creek and the Wyong River. Considered that camping would have occurred, and relatively undisturbed alluvial deposits may be present. Geormorphological testing recommended to confirm this prediction; if confirmed, small test excavation recommended in south-east corner of property.	c.550m east
Steele (2002)	Old Maitland Road, Mardi	Archaeological survey: Proposed residential development	2 previously recorded sites (1 axe grinding groove site & 1 shelter with art & deposit) not to be impacted. Remainder of study area considered to have low archaeological potential due to presence of low-lying swampy ground. Monitoring recommended for areas of slightly elevated land.	c.750m west
Koettig & Smith (1984)	Old Maitland Road, Kangy Angy/Tuggerah	Archaeological survey: Proposed reservoir sites	No sites identified. No archaeological potential due to previous disturbance, and steepness of slope.	c.800m south-west (Tuggerah end)

Reference	Location	Type of investigation	Findings	Distance from study area
Barber (1992)	Enterprise Drive, Wyong	Archaeological survey: Proposed rezoning	Location of 2 previously recorded artefact sites unable to be confirmed, due to ground cover. 1 artefact site comprising 20 flaked chert, silcrete, quartz, chalcedony & volcanic stone artefacts (including 1 backed blade & 2 cores) identified near Berkeley Road. Areas of archaeological potential included alluvial (creek) and swamp margins. Recommended that sites could be destroyed, and areas of archaeological potential should be monitored if impacted.	c.1.2 km south-east (Tuggerah end)
Appleton (2006)	Sparks Road, Warnervale	Archaeological survey: Proposed rezoning	No sites identified. No archaeological potential due to flood-prone nature of area.	c.1.3 km east
Anderson & Farina (2008)	Bryant Road, Tuggerah	Archaeological survey: Proposed bus interchange and carpark	No sites identified. Area of archaeological potential identified in relatively undisturbed area north of Bryant Drive; recommended test excavation.	c.1.3 km east (Tuggerah end)
Kayandal Archaeological Services (2009)	Bryant Road, Tuggerah	Archaeological test excavation: Proposed bus interchange and carpark	No artefacts recovered from 10 $1m^2$ pits manually excavated.	c.1.3 km east (Tuggerah end)
Dallas (1984)	Charmhaven, Mannering Park & Wyong South	Archaeological survey: Proposed sewerage treatment works sites & pipeline routes	2 scarred trees & 1 artefact site (7 flaked chert, mudstone & quartz artefacts, including 1 backed blade) identified on south bank of Wallarah Creek) identified at Charmhaven. Conservation of 1 tree and artefact site recommended. Location of possible scarred tree at Mannering Park not confirmed; possibly destroyed in bushfire. Artefact site (siltstone flake & mudstone flaked piece) identified adjacent to gravel road; considered to be have been imported with fill. Recommended that this site could be destroyed.	c.1.8 km east (Doyalson end)
Silcox (1999)	Sparks Road, Warnervale	Archaeological assessment: Proposed educational facility	Identified 1 artefact scatter (5 flaked mudstone, silcrete & fine-grained basic artefacts on ridge crest), 2 isolated finds (silcrete & mudstone flaked artefacts on slope and ridge crest) & area of archaeological sensitivity on lower slopes at northwest edge of area. Recommended that scatter be conserved if possible; otherwise sites could be destroyed. Recommended test excavation of archaeologically sensitive area, if impact to occur.	c.1.8 km east
Dibden & Navin (2002)	Pollock Avenue, Wyong	Archaeological assessment: Proposed managed resort facility	2 artefact sites identified (1 scatter with 2 flaked tuff artefacts; 1 scatter with 14 flaked tuff, volcanic, silcrete & chert artefacts, including 3 cores), considered likely to have been introduced with fill. Low archaeological potential due to majority of area being on wetlands and fill. Recommended that sites could be destroyed, with collection of artefacts by DLALC.	c.2.3 km east

Reference	Location	Type of investigation	Findings	Distance from study area
Appleton (2009)	Warnervale	Archaeological assessment: Proposed land use strategy	10 isolated finds & 8 artefact scatters comprising flaked metasedimentary stone, mudstone, chert, quartz, silcrete, volcanic tuff, petrified wood, basalt, cellinite and igneous stone, predominantly located on ridges. Recommended that an Aboriginal heritage management plan be prepared, and that sites be salvaged prior to any impact.	c.2.5 km east
Gorman (1998)	Enterprise Drive, Berkeley Vale	Archaeological survey: Proposed rezoning	No sites identified, but potential for artefact scatters was noted, as there had been relatively little previous disturbance.	c.2.6 km south-east (Tuggerah end)
Djekic & Happ (1978)	Charmhaven, Mannering Park, Bird Island Creek and Gwandalan	Archaeological survey: Proposed sewerage treatment work sites	1 possible scarred tree at Mannering Park, 1 midden identified at Gwandalan. Conservation recommended.	c.2.7 km east (Doyalson end)
Djekic (1981)	Tuggerah to Ourimbah	Archaeological survey: Proposed transmission line	1 isolated silcrete/chert flake (south of Ourimbah Creek) and 1 shelter with PAD (west of Bangalow Creek) identified. Roof fall of shelter precluded excavation. Majority of area swampy, so no archaeological potential.	c.2.7 km east (Tuggerah end)
Appleton (2004a)	Warnervale	Archaeological survey: Proposed town centre and sewerage infrastructure	No sites or areas of archaeological potential identified.	c.2.7 km east
Churcher (2006)	Tuggerah substation	Archaeological survey: Proposed extension to substation	No sites identified. No areas of archaeological potential, due to wetland landform and extensive modern disturbance.	c.2.7 km east (Tuggerah end)
Dean-Jones (1990)	Boyce Avenue, Wyong	Archaeological survey: Proposed golf course	No sites identified. No archaeological potential due to area being on floodplain wetlands.	c.3 km east
Appleton (2004b)	Lucca Road, North Wyong	Archaeological survey: Proposed rezoning	No sites identified. No areas of archaeological potential, due to swampy land and extensive modern disturbance.	c.3.7 km east
Roberts (2009)	Blue Haven	Archaeological survey: Proposed pipeline	No sites identified. Areas of potential palaeodune deposits; recommended to be conserved, or test excavated prior to impact.	c.4 km east (Doyalson end)
Brayshaw (1998a)	Warnervale Road, Warnervale	Archaeological survey: Proposed rezoning	No sites or areas of archaeological potential identified.	c.4.3 km south-east (Doyalson end)
Brayshaw (1999)	Warnervale Road, Warnervale	Archaeological survey: Proposed subdivision	No sites or areas of archaeological potential identified.	c.4.3 km south-east (Doyalson end)
Corkill & Edgar (2001)	Moala Parade, Charmhaven	Archaeological survey: Proposed rezoning	No sites or areas of archaeological potential identified.	c.4.6 km south- east (Doyalson end)
Brayshaw (1998b)	Louisiana Road, Warnervale	Archaeological survey: Proposed rezoning	No sites or areas of archaeological potential identified.	c.4.8 km south- east (Doyalson end)

Reference	Location	Type of investigation	Findings	Distance from study area
Brown (2009)	Wadalba Hill	Archaeological survey: Proposed urban land release	Location of 1 previously recording axe grinding groove site confirmed; considered to have associated potential archaeological deposit within 20m. Recommended that site be conserved. Other previously recorded sites (scarred tree & grinding grooves) were considered likely not to be the result of past Aboriginal activity; recommended that this be confirmed by arborist inspection (for tree) and microscopic analysis (for grooves).	c.5.7 km east
Bonhomme & Koettig (1984)	Kanwal and Kariong	Archaeological survey: Proposed reservoir sites	No sites or areas of archaeological potential identified.	c.6 km east (Kanwal)

Appendix B

Darkinjung Local Aboriginal Land Council cultural heritage survey report

Aboriginal Cultural Heritage Assessment Report

M1 Widening Tuggerah to Doyalson

Report to

Australian Museum Business Services and Road Maritime Services
May 2013

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Aboriginal Cultural Assessment Heritage Report

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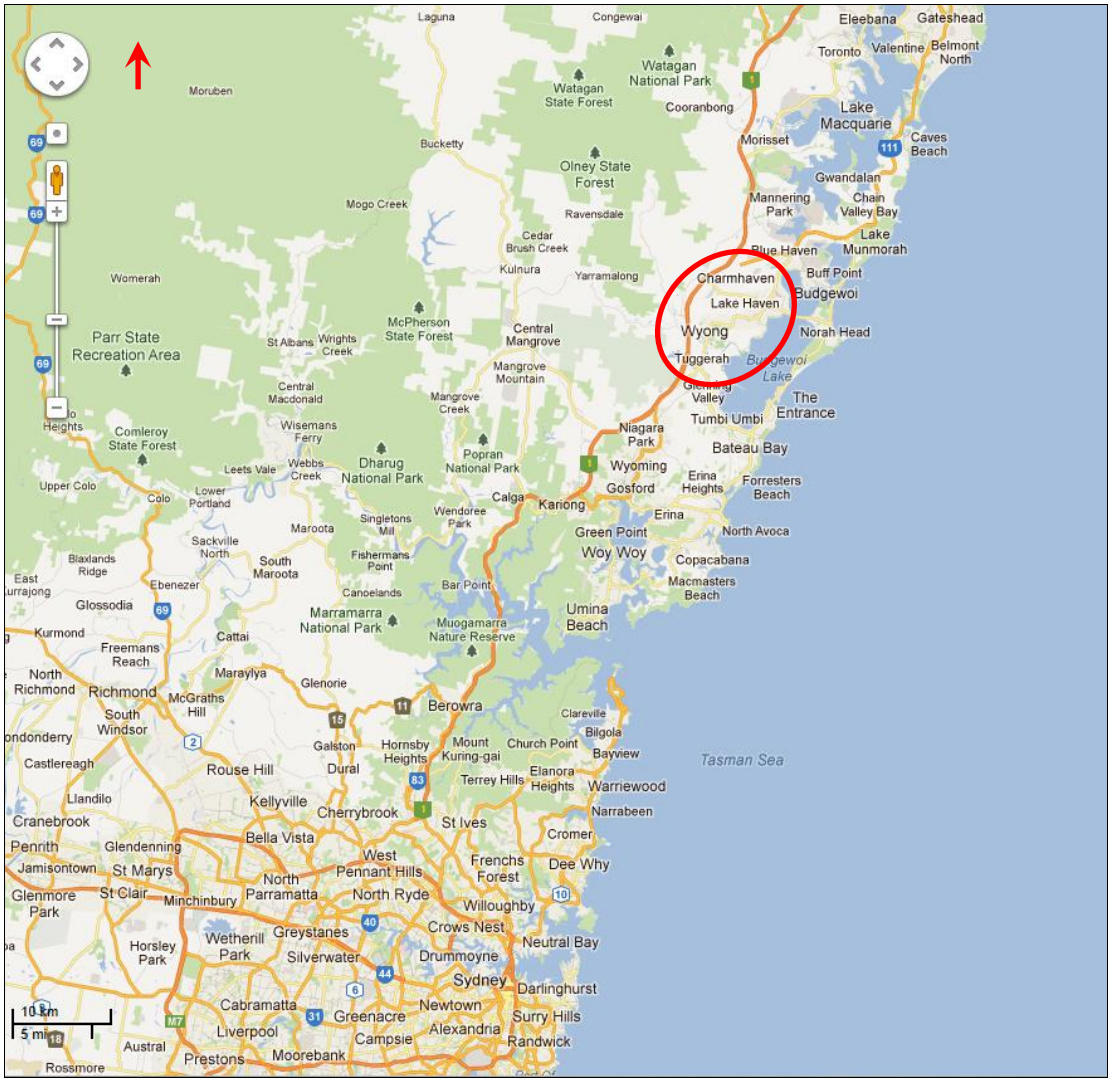


Figure 1: Map shows the location of Tuggerah to Doyalson within the Central Coast region, as indicated by the red circle.

Source: Google Maps.

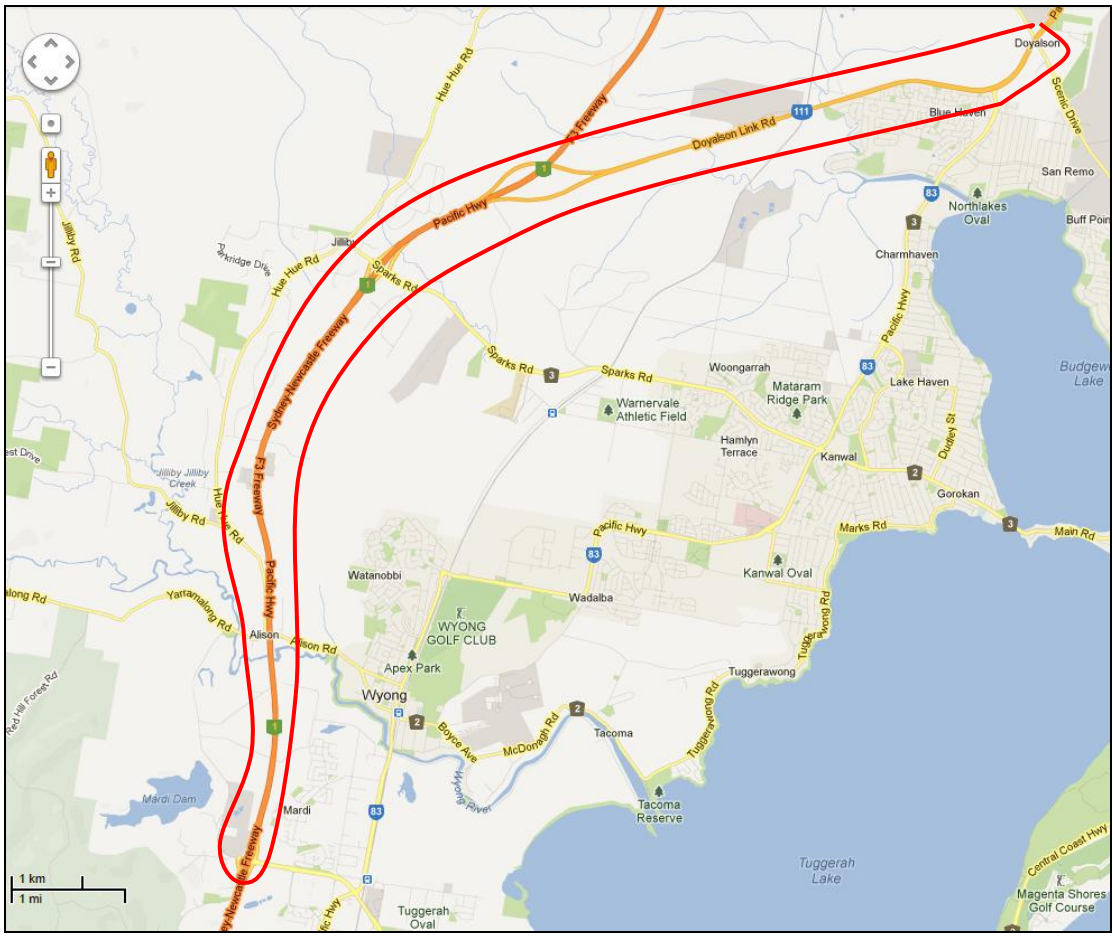


Figure 2: Map shows the approximate location of the assessment site which is indicated by the red area.

Source: Google Maps.

1. Introduction

This Report has been prepared as part of an Aboriginal Cultural Heritage Assessment by Darkinjung Local Aboriginal Land Council (DLALC) for Australian Museum Business Services (AMBS) on behalf of Road and Maritime (RMS).

The assessment was undertaken over two days 1st and 2nd of May 2013.

The aim of the Aboriginal Cultural Heritage Assessment was to inspect a number of the areas proposed for site compounds and road widening between Tuggerah and Doyalson which is located south-west, west and north-west of Wyong.

The inspection was to identify any Aboriginal Cultural Heritage, places, or objects, of significance to the Aboriginal community, and for the site's developer to meet the statutory obligations and requirements under the National Parks and Wildlife Act (1974) and the Environmental Protection Act (1979).

2. Description of the Assessment Area and Development Proposal

The assessment area is situated within the boundaries of the Darkinjung Local Aboriginal Land Council (DLALC). DLALC is located on the Central Coast of New South Wales, its boundaries stretch from Catherine Hill Bay to the Watagan Mountains to the North, Hawkesbury River to the South, Pacific Ocean to the east while the western boundary stretches along Judge Dowling Range from Bucketty to Spencer (Darkinjung Local Aboriginal Land Council).

The assessment site known as the M1 Widening-Tuggerah to Doyalson is situated within the suburb of Tuggerah, Mardi, Alison, Jilliby, Bushells Ridge and Doyalson.

The landscape and vegetation in the area of the proposed development site is largely influenced by terrestrial and aquatic environments, which include large sections of bushland and waters ways including Ourimbah State Forest, Jilliby Conservation State Area, Wyong River and Tuggerah Lakes.

Watagans National Park and Jilliby State Conservation Area Plan of Management identified a number of vegetation communities that occur within the area these include, Coastal Wet Gully Forest, Coastal Narrabeen Moist Forest, Coastal Ranges Open Forest, Hunter Valley Moist Forest and Coastal Foothills Spotted Gum, Ironbark Forest, Hunter Lowlands Red Gum Forest, Hunter Range Grey Gum Forest, Coastal Narrabeen Shrub Forest, Sheltered Dry Hawkesbury Woodland, Exposed Hawkesbury Woodland, Hawkesbury Coastal Banksia Woodland, Hawkesbury Hanging Swamps and Plantation areas.

RMS propose to upgrade and widen the M1 (F3 Freeway) from Tuggerah to Doyalson. Within this area several sites will also be utilised as stockpile sites for the works. The Transport Road and Maritime Service web site states 'Roads and Maritime Services (RMS) is planning improvements on the Pacific Motorway (F3 Freeway) between Wyong Road, Tuggerah, and the Doyalson Link Road, Kiar. The scope of the project is to increase traffic capacity on the motorway by widening each carriageway direction from two to three lanes, improve road safety by upgrading the road to current safety standards, and reduce ongoing maintenance by replacing the existing concrete pavement'
(http://www.rta.nsw.gov.au/roadprojects/projects/central_coast_region/f3_freeway/wyong_to_doyalson.html).

3. Description of Impact

The proposed development may impact the area through exposing soil and exposing or destroying any potential Aboriginal Cultural Heritage sites. Potential erosion may also expose Aboriginal Cultural Heritage sites and / or material. Other negative impacts to consider include, labour to access the site, treadage, transportation of materials and tools and damage from machinery used on and to access the site.

The main potential harm from this type of work has the possibility to expose and disturb ground surfaces and soil which may contain Aboriginal Cultural Heritage sites and / or material. This results in exposure to the elements (wind and rain), which in turn can instigate soil erosion to areas that have been recently cleared.

Construction tools and materials have the potential to expose and / or destroy artefacts on top of, or below the soil surface. Impacts can also include the destruction of vegetation and the surrounding landscape which can contain Aboriginal Cultural Heritage, material remains or cultural places. Other impacts associated with this type of project and disturbance to soil may include alteration to the water and drainage patterns in the area.

The Aboriginal Cultural Heritage most at risk from this type of works is predominantly Aboriginal rock engravings and axe grinding grooves, scar trees, open sites, isolated artefacts and Aboriginal Shell Middens. Other forms of Aboriginal sites at risk include cultural and spiritual places. Adverse impact could include exposure of artefacts and other Aboriginal archaeology and destruction of Aboriginal places, through water runoff and soil erosion, impact from machinery or tools and treadage associated with the works.

These impacts could occur during the various phases of the project, while after completion impacts are also a treat and can be a result of altered runoff and natural water movement. The greatest impact on Aboriginal heritage places in NSW occurs in the form of soil erosion (Byrne 1997:1). Runoff and erosion can potentially cause siltation and/or exposure and destruction of Aboriginal Cultural Heritage sites. Indirect impacts may occur in the form of alterations to drainage and erosion patterns (Byrne 1997:2).

Trampling and treadage has had a significant impact on Aboriginal sites in NSW. The impact of treadage on open sites can result in displacement and damage to individual artefacts. Treadage can also initiate soil erosion (Byrne 1997:3) including for example people damaging the vegetation and exposing the soil surface and workers unknowingly walking over sites or being in the vicinity of sites that may be sensitive, sacred or mythical.

Tools and treadage associated with the project during and post works phases have the potential to destroy or adversely alter sites if the area is not adequately protected.

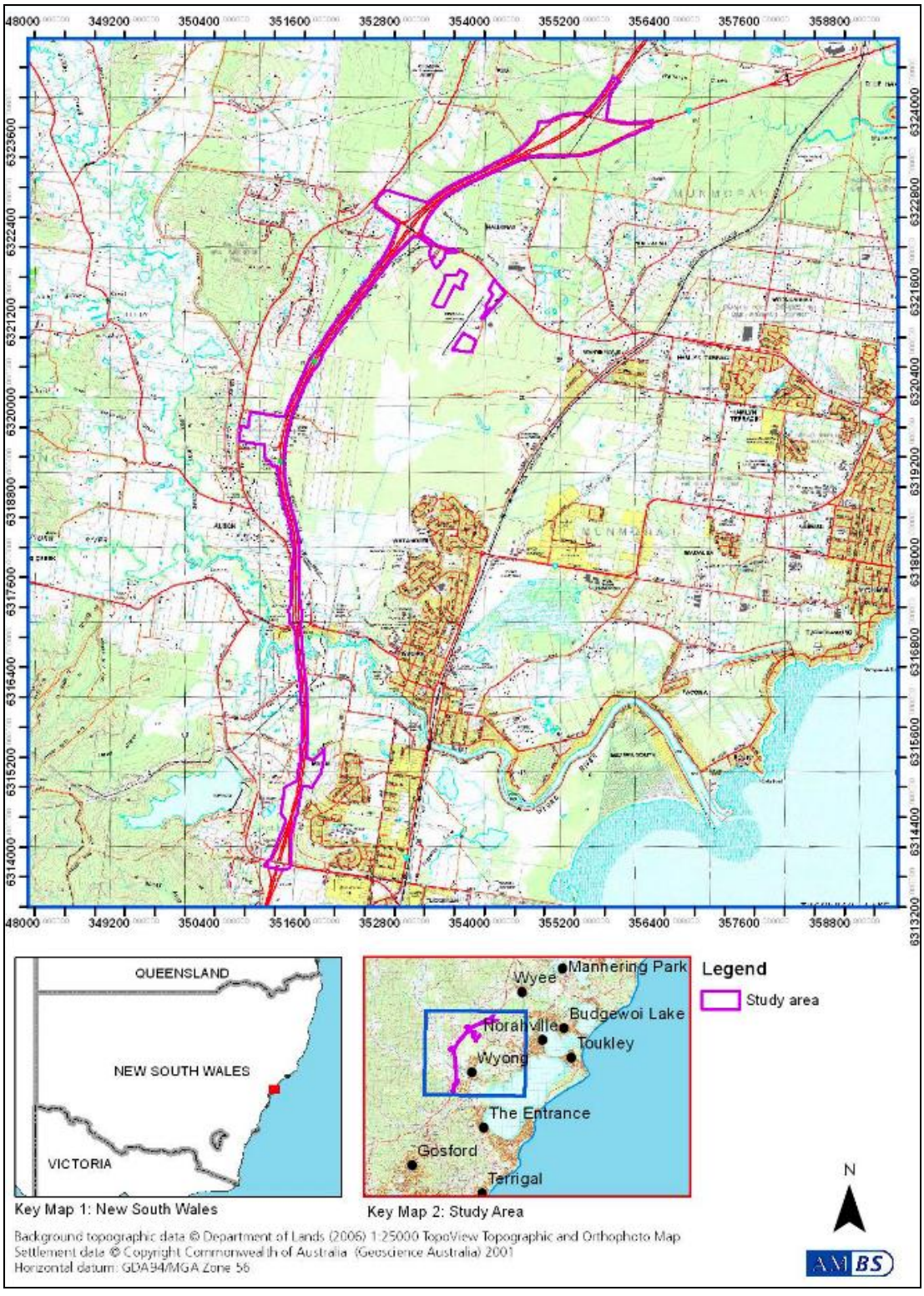


Figure 3. Shows a diagram of the assessment site.

Source: AMBS.

4. Qualifications, Relevant Experience and Community Endorsement

I have completed Certificate III Horticulture, Parks and Garden through the TAFE Open Training and Education Network (OTEN), Certificate III Conservation and Land Management, Specialising in Indigenous Land Management through the Ryde College of TAFE Ryde and have completed the Diploma in Indigenous Archaeology at the University of New England, Armidale NSW. Currently I am studying Certificate IV In Frontline Management also through the TAFE Open Training and Education Network (OTEN).

I have gained experience through liaison and collaborating with both Aboriginal and non-Aboriginal representative from such organisation as, State Forest NSW, NSW National Parks and Wildlife Service, NSW Office of Environment and Heritage, Central Coast Hunter Range Regional Aboriginal Co-management Committee, Greater Blue Mountains World Heritage Area Aboriginal Reference Group, Tuggerah Lakes Estuary Coastal and Floodplain Management Committee, Gosford City and Wyong Shire Councils and professionals such as Archaeologist, Anthropologist, Biologist and Environmentalist. I have worked under the guidance and management of Darkinjung Local Aboriginal Land Council and have the endorsement of the council and the local Aboriginal community.

5. Statutory Requirements and Legislation

Aboriginal heritage and places are protected by law under Legislation. Two basic pieces of legislation concerned with Aboriginal Heritage Management are the National Parks and Wildlife Act 1974 (NPW Act) and The Environmental Planning and Assessment Act 1979 (EP&A Act).

Section 84 of the National Parks and Wildlife Act (1974) provides protection for 'Aboriginal Places'. The act defines Aboriginal places as 'areas of cultural significance to the Aboriginal Community'. Section 90 of this Act gives protection for all 'Aboriginal Relics'. The act defines Aboriginal relics as 'any material evidence of the Aboriginal occupation of New South Wales'. The Minister will gazette areas as Aboriginal places if satisfied that adequate evidence exist to show that the area was or is of special importance to the Aboriginal community.

The National Parks and Wildlife Act 1974 (NPW Act) Legislation does not structure any formal mechanisms to make sure that areas with potential to contain Aboriginal sites or places of special significance are evaluated before impact on those areas. It is the Environmental Planning and Assessment Act (EP&A Act) which carries out this function.

The Environmental Planning and Assessment Acts principal function is to consider 'environmental impacts' in land use and decision making. Environmental impacts include impacts on Aboriginal Heritage. There are three main sections in the EP&A Act which are applicable to Aboriginal Heritage. Part lll, administrate the preparation of planning instruments; Part lV relates to development evaluation process for local government (consent) authorities; and Part V which communicate to activity approvals by Government (determining) authorities.

Part III of the Act governs the preparation of the following three planning instruments: 1. State Environmental Planning Policies (SEPPs); 2. Regional Environmental Plans (REPs); 3. Local Environmental Plans (LEPs). These planning instruments dictate allowable uses and potential constraints on land use. When preparing planning instruments the Department of Urban Affairs and Planning have guidelines which should be followed. These guidelines list Aboriginal sites and places of significant to the Aboriginal community as values which should be assessed.

Part IV of the legislation governs the decision making process by local government authorities during a development application. Section 90 of the Act lists impacts which must be considered before development approval is granted. Under section 90 (1) 9b consideration must be given for 'the impact of that development on the environment (whether or not the subject of an environmental impact statement)'. Section 90 (1) 9b includes Aboriginal sites and heritage.

Part V of the legislation governs the decision making process by State Government authorities for activities conducted by that agency or under authority from the agency are controlled by Part V of the EP&A Act. It is mandatory for these agencies to consider environmental impacts of proposed activities then, determine whether the level of impact is adequate to necessitate the planning of an Environmental Impact Statement (EIS). Environmental impacts include Aboriginal sites and places. The Department of Planning New South Wales has created a set of guidelines for explaining Section 112 which requires that Aboriginal Heritage is assessed as part of the process (Byrne 1997: 2-3).

There are number of amendments to the NPW Act 1974. The amendments include a number of guidelines. These guidelines can be viewed on the NSW Office of Environment and Heritage (OEH) website.

The process of due diligence under the OEH guidelines require that a proponent of a development assess impacts of the proposed activity.

Below is a brief explanation of the process from the OEH web site,

The purpose of due diligence is to identify whether Aboriginal objects are present in an area, and to determine whether a proposed activity will have impacts on Aboriginal objects. Therefore it is essential to identify and understand all the expected impacts of the proposed activity.

There are two categories of activity used for assessing impacts:

(1) Activities involving no additional surface disturbance.
(2) Activities causing additional surface disturbance.

For activities causing additional surface disturbance, it is necessary to determine whether an activity is proposed for:

a) a developed area or a previously disturbed area, or
b) an undisturbed area.

For activities in previously developed or disturbed areas, it is then necessary to determine whether the new activity will create significant additional surface disturbance. If it will, then the process for undisturbed areas will apply'.

Due diligence involves taking reasonable and practicable measures to determine whether your actions will harm an Aboriginal object and if so avoiding that harm (Office of Environment and Heritage formally NSW Department of Conservation Climate Change and Water).

Note: Any works that may disturb, damage, or destroy Aboriginal Cultural Heritage requires an Aboriginal Heritage Impact Permit (AHIP) from OEH, this includes impacts to both registered and unknown Aboriginal sites that may require excavation or disturbance to the soil of any kind. Prosecution may result if works are carried without a relevant permit.

6. Aboriginal Cultural Heritage, Values and Significance

Aboriginal people have inhabited Australia between 50,000 and 60,000 years, evidence for this can be found from material dated from Malakunanja and Nauwalabila rock shelter in the Northern Territory (Mulvaney & Kamminga 1999:141).

Further evidence for human occupation is displayed through the skeletal remains of Mungo 3 discovered at Lake Mungo New South Wales. These remains have been dated to be between 28 000 and 32 000 years old (Morwood 2002:12). In the Sydney region some early occupation dates come from a rock shelter near the Nepean River of around 14,000 years BP (Attenbrow 2002: 153). Aboriginal people's occupation of the Central Coast shown through archaeology, Aboriginal Cultural Heritage, material and spiritual places provides the local Aboriginal community with a sense of connection to the land, the people and culture. These materials and places present tangible evidence of the past and should be conserved.

The first inhabitancies of the Central Coast region were members of the Darkinjung (Darginung, Darginyung), language group. Several researches and publications show tribal or language group boundaries within similar areas, but exact boundaries are unlikely. Boundaries are a European concept and there was likely a zone between language groups which was shared and utilised by neighbouring groups.

Stone artefacts in the Upper Mangrove Creek area of the Central Coast have been dated between 10,000 to 12,000 years old (Attenbrow 2002: 153). These provide some reliable evidence of Aboriginal people's occupation of the region. Upper Mangrove Creek is situated approximately 27 km to the north-west of Wyong.
European exploration of the Central Coast area began soon after the arrival of the First Fleet in 1788. Settlement of the Hawkesbury River began about 1794 and in 1820 the area between the Hawkesbury and the Hunter Rivers become available for settlement (Brisbane Water National Park Plan of Management 1992:19).

Evidence for Aboriginal habitation, includes middens, which consist of shell, bone, charcoal, tools and sometimes burials. A midden is likely to contain only a selection of shell fish species available in the local environment. It may contain a high proportion of individuals of a edible size, stone artefact, charcoal from camp fires, pumice, coral, faunal bone and human burials (Byrne 1997:5). Shell middens are also important scientifically they can be dated, they provide precious information about Aboriginal use of the environment and changes in behaviour over time. Other evidence includes, fish traps and stone arrangements, deposits in sandstone shelters, including artefact, charcoal, shell and bone remains, rock engravings and pigment art. Additional forms of Aboriginal cultural evidence can consist of abraded channels, grooves and grinding stones, axe grinding grooves, scared and carved trees, water holes, quarry sites, open sites or camp sites, stone artefact scatters, graves, earth mound, walking trails along trading routes, mythological and ceremonial sites. In some cases landscape modification can provide evidence of Aboriginal people's occupation.

For many of the Aboriginal groups in NSW including the Darkinjung, Baiame is the Creator God in the dreaming. Daramulan (often depicted with one leg) is the son of Baiame and his emu-wife. Daramulan is associated with ceremonies (usually men's). Ceremonial sites with engraved or pigment art of images of Anthropomorphic like figures which represent Baiame or Daramulan are considered to have very high culture heritage significance.

The landscape surrounding an Aboriginal place or site can be seen in a spiritual sense and is very important to Aboriginal people. The landscape can be an extension of a site, or the landforms and features within the landscape can be the site. Aboriginal sites can also be connected through sight lines to other sites or places of significants. These features are all part of the cultural landscape.

Some sites are associated with sight lines and tracks, their purpose and associated stories connect these sites with other sites across Darkinjung country and should not be viewed in isolation of each other. Considering this, changing the context of an Aboriginal site by landscape degradation compromises the spiritual and cultural connection that Aboriginal people have to the land and or the site. In many cases landscape destruction can be considered, destruction of an Aboriginal site and the Darkinjung cultural landscape.

Recent research of certain areas of the Central Coast has revealed an intricate network of Aboriginal Cultural Heritage sites, connected by Aboriginal walking trails and routes which have been utilised over hundreds and in some cases thousands of years. These tracks where utilised to access seasonal resources, carry out trade, teaching and ceremonies. These sites are connected and form part of a complex Aboriginal Cultural Landscape. The significance of many of these sites and the significance of the connection they have to each other and the landscape has been highlighted as very important for Aboriginal people both culturally and spiritually.

The Darkinjung people were fishers, hunters and gatherer of plants and animals of the land, rivers, estuaries and sea. These places including the hills, valleys, creeks, wetlands, lakes and coastline provided food, medicines, and raw material for tools, weapons, shelter and decoration. These environments and landforms also provided the basis for spiritual and cultural life and are of value and significance to the local Aboriginal community. Certain environments can be considered to have a higher Aboriginal Cultural Heritage potential because of their ecology and landform and the associated flora, fauna and other resources needed for everyday life. The proposed development site lies in an area with a high Aboriginal Cultural Heritage value. This is because of the surrounding, mountains, lakes, creeks, coastline and associated woodland and wetland habitats. These environments and ecological zones provided the local Aboriginal population with many food and other natural resources.

Therefore considering the long Aboriginal occupation of Australia and the Central Coast it could be predicted that most areas, particularly those with minimal disturbance have the potential to produced Aboriginal Cultural Heritage material or places.

Aboriginal sites are connected to each other within the landscape, a number of places and sites hold spiritual and cultural importance to the local Aboriginal community through their physical link to ancestors and the past. This connection attaches the community to land, traditions and strengthens bonds within the Aboriginal community. Safe guards need to be put in place to protect the spiritual and environmental integrity of a site and the cultural landscape. These Aboriginal materials, places and landscapes have value and significance to the local Aboriginal community and need to be protected.

7. The Site

M1 Widening Tuggerah to Doyalson (the assessment site) encompasses an area of approximately 17km long between Tuggerah and Doyalson. The assessment site is located within the suburbs of Tuggerah, Mardi, Alison, Jilliby, Bushells Ridge and Doyalson.

The site can be accessed from a number of locations including Hue-Hue Road, Sparks Road, Doyalson Link Road and the M1 (F3 Freeway). The development proposed includes widening the M1 in each carriageway direction from two to three lanes and the provisions for site compounds to support the works.

The site lies within a semi-rural and urban area, to the south-west, west and north-west of Wyong.

The M1 Widening Tuggerah to Doyalson site is managed by NSW State Government agency Roads and Maritime Services.

The site has been heavily impacted by past activities, including previous roads construction, road upgrades and maintenance, rural and urban development.

The assessment site is situated within the coastal hinterland, surrounded by various hills, ranges, valleys, creeks, wet lands, lakes and coast line. As shown previously these types of environments and the resources they provided to local Aboriginal people were very important.

The M1 Widening Tuggerah to Doyalson site lies within an area which is rich in Aboriginal Cultural Heritage and there are a number of recorded Aboriginal sites within the vicinity.

The Darkinjung LALC Assets Governor Management System incorporating the Office of Environment and Heritage (OEH) Aboriginal Heritage Management Systems (AHIMS) Register has identified a number of these registered Aboriginal sites within the M1 Widening Tuggerah to Doyalson site area.

According to the AHIMS Register there are approximately Thirty (30) recorded Aboriginal sites within approximately 1 km either side of the assessment site.

The assessment site is considered to have the potential for Aboriginal sites or artefacts which may be concealed by thick vegetation or be covered by leaf litter, sand and silt. The areas of the assessment site with a higher potential for Aboriginal Cultural Heritage include places where there has been minimal disturbance or areas with intact soil and vegetation.

Parts of the assessment sites with a lower potential for Aboriginal Cultural Heritage sites includes disturbed areas such as where there has been previous vegetation clearing, excavation or development. In the past these activities in and around the assessment site could have negatively impacted on, or destroyed a number of Aboriginal Cultural Heritage sites.

Site Name	AHIMS Number	Site Type/Contents
Hue-Hue Road Surface Scatter	45-3-0815	Open scatter
Tangy Dangy	45-3-0816	Quarry
Tuggerah	45-3-1108	Open Site
Hue-Hue Road	45-3-1312	Open Site
B-1	45-3-3176	Artefact
B11	45-3-3179	Artefact
B14	45-3-3180	Open artefact scatter
WP1	45-3-3181	Artefact
WP3	45-3-3183	Artefact
WP2	45-3-3184	Artefact
BR13	45-3-3187	Open artefact scatter
BR12	45-3-3188	Artefact
WP2	45-3-3194	Artefact
B7	45-3-3259	Artefact
B3	45-3-3260	Artefact
B4	45-3-3262	Artefact
B8	45-3-3263	Artefact
Halloran ISO 1	45-3-3304	Artefact Scatter
WRMD1	45-3-3312	Open Site
WC-ST1	45-3-3315	Scar Tree
WC-IF1	45-3-3316	Artefact
WC-OS1	45-3-3317	Open Artefact Scatter
Bluetongue IF1	45-3-3377	Artefact/ Open Site
Bluetongue IF2	45-3-3382	Artefact/ Open Site
Bluetongue IF3	45-3-3383	Artefact/ Open Site
Mardi to Mangrove 3	45-3-3398	Isolated artefact
B2	45-7-0232	Scar tree
B5	45-7-0245	2 Artefacts
PAD 1 Munmorah	45-7-0249	PAD
PAD 2 Munmorah	45-7-0250	PAD

Table 1: Shows details of Thirty (30) Registered Aboriginal sites within approximately 1 km from either side of the M1 Widening Tuggerah to Doyalson assessment site.

Source: DLALC Assets Governor and OHE AHIMS Database.

7.1 Site Topography and Vegetation

The landscape and vegetation in the region surrounding the M1 Widening Tuggerah to Doyalson site is largely influenced by the coastal hinterland environment and associated ecosystems.

The vegetation within the assessment site consists of a number of vegetation communities. The Watagans National Park and Jilliby State Conservation Area Plan of Management identified a number of plant vegetation communities within the area.

Tall Moist Eucalypt Forests are widespread in the reserves, commonly containing Turpentine (*Syncarpia glomulifera*), Mountain Blue Gum (*Eucalyptus deanei*), White Mahogany (*E. acmenoides*), Sydney Blue Gum (*E. saligna*), Blue-leaved Stringybark (*E. agglomerata*), Blackbutt (*E. pilularis*) and Grey Gum (*E. propinqua*) with Warm Temperate Rainforest influences dominating the understorey of these communities. Forest oak (*Allocasuarina torulosa*), Sydney peppermint (E. piperita), Broad-leaved White Mahogany (*E. umbra*), Large fruited Red Mahogany (*E. scias* subsp. *scias*), Smooth-barked Apple (*Angophora costata*) and Red Bloodwood (*Corymbia gummifera*) are common in the drier forest areas with understoreys varying from open dry and grassy, to dense shrubbery.

Smaller areas of Warm-Temperate Sub-Tropical Rainforest and Paperbark Palm Forests occur in sheltered gullies and creek-lines. Typical rainforest species include Lillypilly (*Acmena smithii*), Sassafras (*Doryphora sassafras*), Brush cherry (*Syzygium australe*), Wild Quince (*Guioa semiglauca*), Coachwood (*Ceratopetalum apetalum*) with Tree ferns (*Cyathea australis*, *C. leichhardtiana, C. cooperi*), climbing vines and epiphytes common beneath the canopy. Isolated stands of Red Cedar (*Toona ciliata*) and Illawarra Flame Trees (*Brachychiton acerifolius*) remain in more remote areas. The Paperbark Palm Forests contain a number of Melaleuca species (*Melaleuca biconvexa* and *M. linariifolia*) with White Bottlebrush (*Callistemon salignus*) and Cabbage Tree Palms (*Livistona australis*).

Vegetation Communities within the area also include, Coastal Wet Gully Forest, Coastal Narrabeen Moist Forest, Coastal Ranges Open Forest, Hunter Valley Moist Forest, Coastal Foothills Spotted Gum Ironbark Forest, Hunter Lowlands Red Gum Forest, Hunter Range Grey Gum Forest, Coastal Narrabeen Shrub Forest, Sheltered Dry Hawkesbury Woodland, Exposed Hawkesbury Woodland, Hawkesbury Coastal Banksia Woodland, Hawkesbury Hanging Swamps and Plantation areas. *(*http://www.environment.nsw.gov.au/resources/planmanagement/final/20101032WatagansJillibyFinal.pdf).

Many of the native plant, faunal and aquatic species found within the area are considered a valuable food and material resource for the local Aboriginal inhabitants.

Examples of those resource plants found in the area consist of Cabbage Tree Palm (*Livistona australis*), the growing tip was eaten either uncooked or roasted, Mat Rush (*Lomandra longifolia*) which can be used as string or for food (Stewart & Percival 1997:33-35). Bracken (*Pteridium esculentum*), the rhizomes are used for food, but are toxic if not treated by roasting or baking. The young fronds are also roasted and eaten, while the sap of the crushed leaf is used to relieve ant or nettle stings (Stewart & Percival 1997:44). Many of the Paper barks (*Melaleuca* spp), Tea-trees (*Leptospermun* spp), Bottlebrush (*Callistemon* spp) and Wattle (Acacia spp) provide food, medicinal and other resources through the nectar from flowers, leaves and bark (Robinson 1991:55). Lilypilly (*Acmena and Syzygium* spp) provided eatable fruit

(Robinson 1991:369-371) while the bark of Geebung's (*Persoonia species*) has medicinal qualities and the fruit can be eaten. The plant can be used for sore eyes and to strengthen fishing lines (Stewart & Percival 1997:42). Native Rock Lily (*Dendrobium speciosum*) has starchy stems that are roasted before eating. The stems could also be chewed and applied to injuries such as burns or wounds (Stewart & Percival 1997:16). The roots of Native Yams (*Dioscorea transversa*) can be eaten raw (Stewart & Percival 1997:19). The Saw-sedge (*Gahnia aspera*) has seeds that are ground to make flour (Stewart & Percival 1997:33). The Cabbage Tree Palm (*Livistona australis*) has growing tips that are edible raw or roasted. The leaves are also used as thatch for shelters and weaving baskets, while the bark fibres are used for making fishing lines (Stewart & Percival 1997:34).

Flowering plant also provide Aboriginal people with seasonal indicators, when to move to a new area to obtain a particular food source or when certain marine of faunal species may be available, for example when Sydney Golden Wattle (*Acacia longifolia*) comes into flower it indicate to fish for Mullet (Stewart & Percival 1997:8).

Many of the Gum Trees (*Eucalyptus, Angophora, Corymbia* spp) provide resources from various parts of the plant. These include string, tools, weapons, shelter, canoes, food, medicinal and spiritual uses.

The area is abundant in various marine and estuary resources including fish, shell fish, marine birds and animals. Middens provide evidence of these resources utilised by Aboriginal people. Middens where once abundant along the NSW coastline, but since colonization many have been destroyed by erosion, urban development and were ustilised as a resource earlier this century, for such things as lime burning or for building mortar.

Middens contain the remains of meals consumed by Aboriginal people, their tools and also burials. Some of the marine species consumed on the Central Coast include, Turban shell (*Turbo torquata* and *Turbo undulata*), Sydney Rock Oysters (*Saccostrea glomerata*, formerly known as *Saccostrea commercialis*), Sydney Cockle (*Anadara trapezia*), Pipi (*Plebiodonax d' toides*), Sydney Whelk (*Pyrazus ebeninus*), *Nerita* sp and Limets (*Cellana* sp).

The examples above show that the assessment site, including the surrounding area has the potential to provide Aboriginal people with abundant, reliable food and material resources that are within close proximity. Therefore, the assessment site is considered to have potential for Aboriginal Cultural Heritage sites or artefacts which may be concealed by deposits of soil, sand vegetation and leaf litter.

The areas of the assessment site with a higher potential for Aboriginal Cultural Heritage include places where there has been minimal disturbance, and areas with intact soil, found mainly below the current soil surface. In the past, activities on, or near the assessment site could have negatively impacted on destroyed, or relocated potential Aboriginal Cultural Heritage material.

8. Assessment Methodology

Prior to any Aboriginal site survey, assessment or monitoring carried out in the field, a desk top analysis of the area is carried out. This involves consulting the relevant topographical, council and survey maps, and the DLALC Asset Governor incorporating, OEH Aboriginal Heritage Information Management System (AHIMS) Data.

It should be noted in regards to the AHIMS database, many Aboriginal sites listed often are not situated within the location as shown on maps referring to the AHIMS information. Therefore it can be difficult to relocate the precise position of many registered Aboriginal sites due to some of the following reasons:

- Registered sites were recorded before the introduction of GPS units.
- In the past many registered Aboriginal sites were recorded on a topographical map with a scale of 1:25000. The co-ordinates were acquired by cross references to easting and northing figures located along the side of the map. The site was then marked as a point on the map and as a result of this, the co-ordinates could be up to 1 millimetre off, on the map, which then results in the sites location recorded as an error of up to 250 metres on the ground.
- Sites were frequently recorded in different datum, for example: Some site were recorded in AGD which has now changed to GDA 94, therefore the site could be out by as much as 200 metres on the ground.
- Human error, locations of Aboriginal sites may have been incorrectly recorded.
- Inability to visually relocate sites due to thick bush, vegetation, leaf litter, silt and other debris, and hazardous or inaccessible topography.

Having considered the above points, it should also be noted that sites recorded more recently are often situated in the correct location given.

The main strategy used to assess the area was to first consult the relevant maps and DLALC Asset Governor incorporating AHIMS database and information as shown above, then secondly to visually inspect the area and soil surface.

9. Assessment Fieldwork

The inspection of the proposed M1 Widening Tuggerah to Doyalson site for Aboriginal Cultural Heritage sites and places was conducted on the 1st and 2nd May 2013. Involved in the assessment of the site was Sharon Hodgetts representing Darkinjung LALC. Also in attendance were, Stephen Knight Aboriginal Cultural Heritage Officer, RMS and Ngaire Richards and Ronan McEleney Archaeologists from AMBS.

The inspection of the proposed development site was required so that any Aboriginal Cultural Heritage material or sites located within the area could be assessed, protected and properly managed.

Ten (10) transects were walked. These were conducted within several separate areas located within the proposed M1 Widening Tuggerah to Doyalson site. Most of these locations have been proposed as areas designated for site compounds associated with the works.

Day One.
Weather conditions: hot and sunny.

Transect 1. Mardi-proposed site compound, western side of M1.
The assessment site is accessed from Wyong Road (Mardi interchange). Transect 1 starts in the south of the assessment site from GPS location 0351156 63133841 (WGS 84). The transect then proceeds by foot north along the M1 to GPS location 0351385 6314435 (WGS 84).

The area has evidence of previous disturbance. There is evidence of revegetation and plantings. The area is within close proximity to the M1 and may have undergone disturbance through road construction. Ground visibly was poor due to leaf litter and vegetation. Aboriginal Cultural Heritage Site 45-3-1108 is indicated on the AHIMS map and situated within the location of this assessment site.

No Aboriginal Cultural Heritage sites were observed.

Transect 2. Alison- proposed site compound, corner Yarramalong / Alison and Hue-Hue Roads.
Transect 2 is accessed from the corner of Yarramalong / Alison and Hue-Hue Road. The transect proceeds in a northern direction adjacent Hue-Hue Road, from GPS location 0355402 6316900 (WGS 84).

The area has undergone previous disturbance through vegetation clearing and possible works associated with the adjacent roads and the Electricity easements. The easement runs parallel through this section of the assessment site.

Ground visibly was poor due to grass covering.

No Aboriginal Cultural Heritage sites were observed.

Transect 3. Jilliby- proposed site compound, property on St Johns Road.
Transect 3 is accessed from St Johns Road. The Transect starts at a cleared area accessed from St Johns Road prior to the road under passing the M1. The site is on the south of St Johns Road within a cleared area which has evidence of past disturbance, cement slabs and rubble associated with past construction of the M1 (batching plant).

The transect continued from a second cleared paddock at GPS location 0350967 6319785 (WGS 84). This paddock is west of the paddock as described above. The transect then proceeds in a south-east direction inspecting a dam and any soil exposures. The transect heads south inspecting a dirt track before turning back to the south-east and entering a heavy vegetated area of Paperbark trees located at GPS location 0351182 6319611. The transect continued through the vegetation before reaching the cleared paddock previously inspected near the M1. The transect then turns back towards the north-west to end transect.

Soil visibly was poor in the cleared paddocks due to think grass covering. There were a number of soil exposures which were inspected. Soil visibility within the Paperbark forest was poor due to thick ground cover and vegetation.

No Aboriginal Cultural Heritage sites were observed.

Transect 4. Jilliby- proposed site compound, property on Hue-Hue Road.
Transect 4 is accessed from Hue-Hue Road. This section of the assessment site is located adjacent, and on the southern site of Transect 3. The site is located at the rear of a small farm within an open paddock. The paddock has undergone previous disturbance and is currently under pasture and cropping. The site is situated at GPS location 0351232 6319542 (WGS 84).

Soil visibly was poor in the cleared paddocks due to think grass covering.

No Aboriginal Cultural Heritage sites were observed.

Day Two
Weather conditions**:** warm and sunny.

Transect 5. Kiar- proposed site compound, property located on the north side of the M1 between the M1 and Doyalson Link Road.
Transect 5 is accessed from Doyalson Link Road on the northern side of the assessment site. The transect starts at GPS location 0354995 6323702 (WGS 84) and proceeds in south-east direction until intersecting with the M1. The transect heads south until access was prevented by dense vegetation. The transect then turns back to the north-east towards the midsection of the site before heading back to the north-west. Once back on the western side of the site the transect head south-west until reaching a slightly elevated area situated at GPS location 0354807 6323554 (WGS 84). The transect then turns back to the north-east to the start of the transect.

Soil visibly was poor within this transect due to think vegetation and leaf litter. The only soil visibly within this transect is on the south-western side on the elevated rise where the soil is eroding down slope. The soil here is shallow and indicates a limited potential for subsurface deposits.

No Aboriginal Cultural Heritage sites were observed.

Transect 6. proposed site compound, property Kiar / Bushells Ridges south side of M1 and between Doyalson Link Road.
The transect is accessed from Doyalson Link Road on the north-eastern side of the assessment site located at GPS location 0355540 6323718 (WGS 84). Transect proceeds in a northern direction, on the northern side of Doyalson Link Road. The transect follows along a gas and telecommunications easement and enters sections of vegetation to the south-east of the easement where accessible.

The transect then turns back to the south and crosses to the southern side of Doyalson Link Road and follows the gas easement. Approximately halfway through this section of the assessment site the transect turns to the east to enter thick vegetation. The transect process east before turning to the north-west and follows the remnants of an old trail. The transect intersects adjacent Doyalson Link Road before turning west and back to the gas easement. From the gas easement the transect again heads south, before turning west and leaving the easement and into thick vegetation (on the opposite site of the easement).

This part of the transect covers the south of this assessment site. The transect turns west then north proceeding along a drainage line within a Paperbark forest, before re-entering the easement and back to the start of the transect at Doyalson Link Road.

Soil visibly was poor within this transect due to think vegetation and leaf litter. The sections of the transect within the gas easement was also poor due to grass cover.

The north and eastern sections of this transect included woodland species of trees and plants while on the south-western side the vegetation included a damp section with Paperbark forest.

No Aboriginal Cultural Heritage sites were observed.

Transect 7. Warnervale- proposed site compound and road works, properties on north-east and south-east sides of Sparks Road.
Transect 7 is accessed from the north-eastern side of Sparks Road and to the west of the Sparks Road interchange. The transect starts from just south of the south-western corner of the site at GPS location 352694 6322563 (WGS 84). The transect proceeds in a north-east direction before heading east and into the south-east section of the site. The transect continues over Sparks Road and onto an area situated between the southern side of Sparks Road and the eastern side of the M1 off ramp.

The soil visibility on the north-western side of Sparks Road was limited by long grass and think vegetation. The site has underground previous disturbance from land clearing and possible farming, agricultural practices and regrowth. The south-east corner of the site on the northern side of Sparks Road seems to have also undergone previous disturbance. This area contains the remains of a large cement slap and in ground tanks and other waste materials associated with possible an industrial storage area.

The ground surface visibly on the southern side of the assessment site adjacent the M1 off ramp was good within soil exposure although once again has evidence of previous disturbance and selective land clearing and regrowth.

No Aboriginal Cultural Heritage sites were observed.

Transect 8. Warnervale- proposed site compound and road works, properties located on Warren Road, Burnet Road and southern side of Sparks Road.
Transect 8 is accessed from the eastern side of Warren Road at GPS location 353601 6321507 (WGS 84). The transect proceeds in a south-east direction before turning back to the west and inspecting a cleared section to the south. The transect then heads north-west along Warren Road before turning north to inspect a vegetated area located between Warren Road, Burnet Road and Sparks Road. The transect then crosses Burnet Road to second vegetated area to the west of Burnet Road before turning back to the south-east and Burnet Road.

The ground surface visibility was patching in the eastern side of Warren Road. The site has been recently cleared and mulched. The ground surface visibility within the section between Warren, Burnet and Sparks Roads was poor due to leaf litter and vegetation. This section may have undergone previous disturbance as there is evidence of regrowth and underground optical fibre cables. The section to the west of Burnet Road also has poor ground surface visibly due to leaf litter and vegetation. Good ground surface visibility was located along a dirt track. The site has evidence of regrowth.

No Aboriginal Cultural Heritage sites were observed.

Transect 9. Warnervale- (Warnervale aerodrome) proposed site compound and road works, property located south-east of Sparks Road and Jack Grants Ave.
Transect 9 is accessed from the corner of Sparks Road and Jack Grants Ave. The assessment site forms part of the Warnervale aerodrome and is located within a cleared paddock located at GPS location 0354253 6321394 (WGS 84).

The south-east section of this area located at the end of Jack Grants Ave was also inspected. This area is situated at GPS location 0353832 6320588 (WGS 84).

Both sections are located within a cleared paddock with poor ground surface visibly due to thick grass cover.

No Aboriginal Cultural Heritage sites were observed.

Transect 10. Mardi- proposed site compound, property located on McPhersons Road east of the M1.
Transect 10 is accessed from McPhersons Road east of the M1. The transect starts at GPS location 0351711 6315174 (WGS 84). The site seems to have undergone past disturbance due to land clearing. A drainage line runs in a north-south direction within the western side of the site and a electricity easement is located within the south-west. The site was very damp and may undergo periotic inundation. Vegetation on the site includes Tea tree and regrowth of other species. The site is infested with thick weeds including Blackberry indicating past disturbance.

Ground surface visibility within this site is very limited by the thick long grass and weeds.

No Aboriginal Cultural Heritage sites were observed.

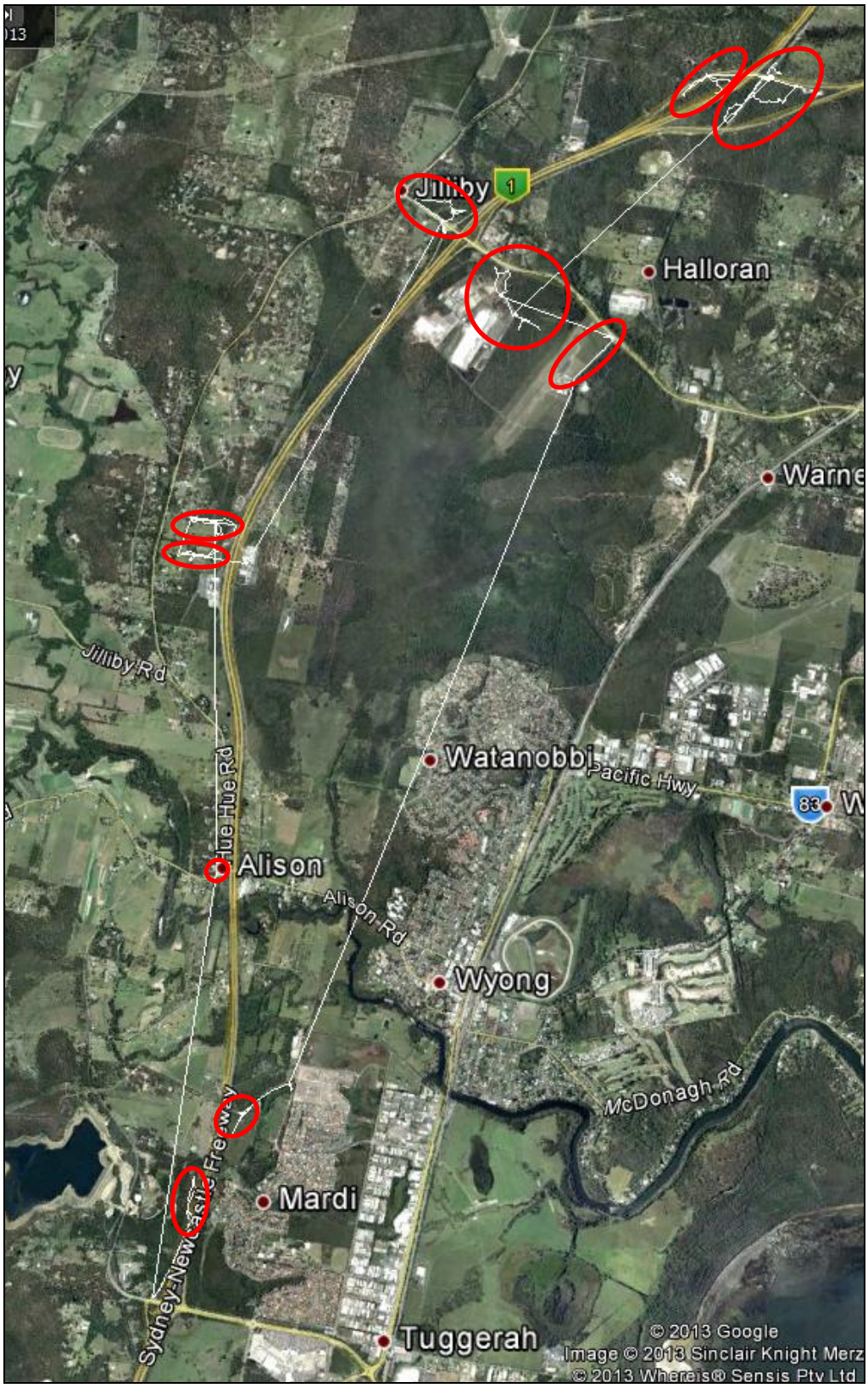


Figure 4: Map shows an overview of the approximate locations of the transects 1 to 10 within assessment area. The transects are indicated by the red circles.

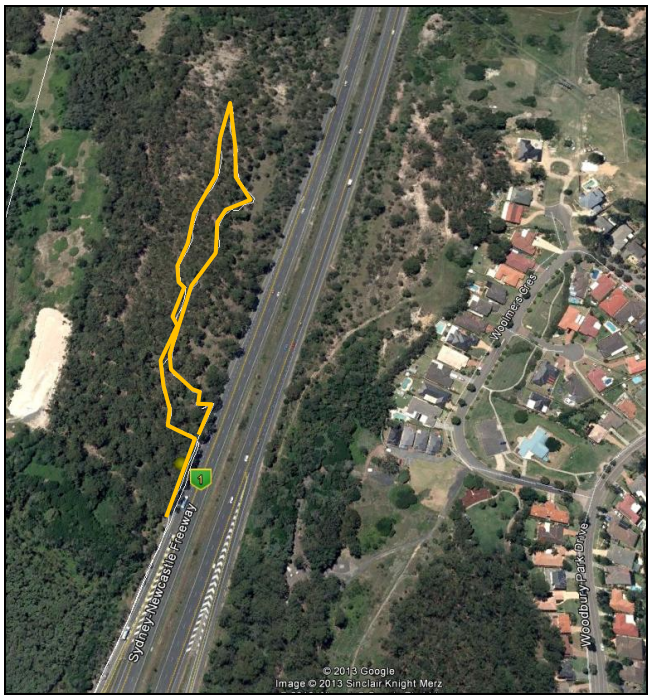


Figure 5:Transect 1. Mardi-proposed site compound, western side of M1.

Figure 6: Transect 2. Alison- proposed site compound, corner Yarramalong / Alison and Hue-Hue Roads.

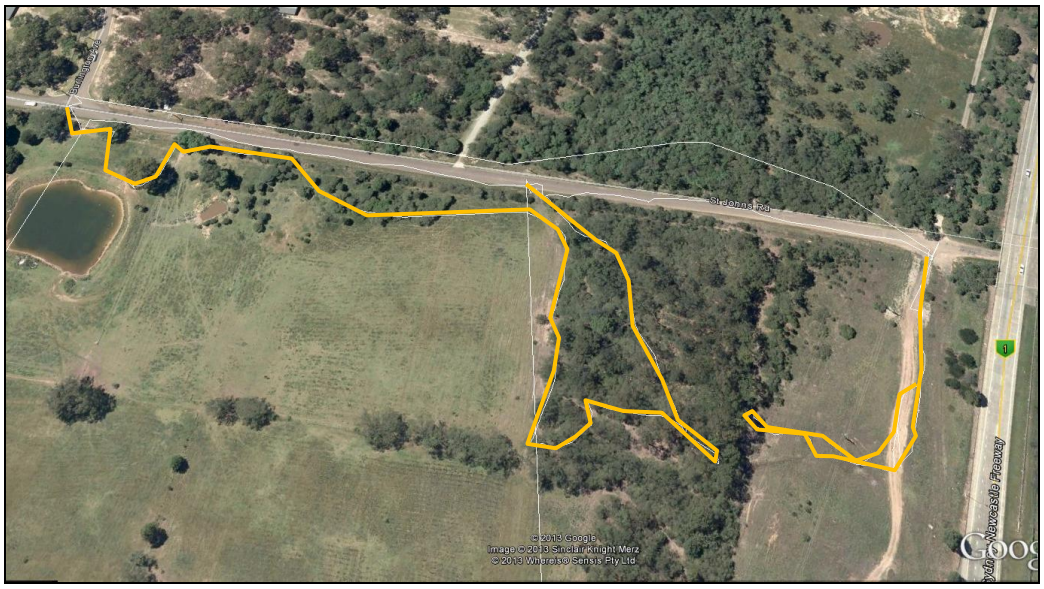


Figure 7: Transcect 3. Jilliby-Site Compound Property St Johns Road.

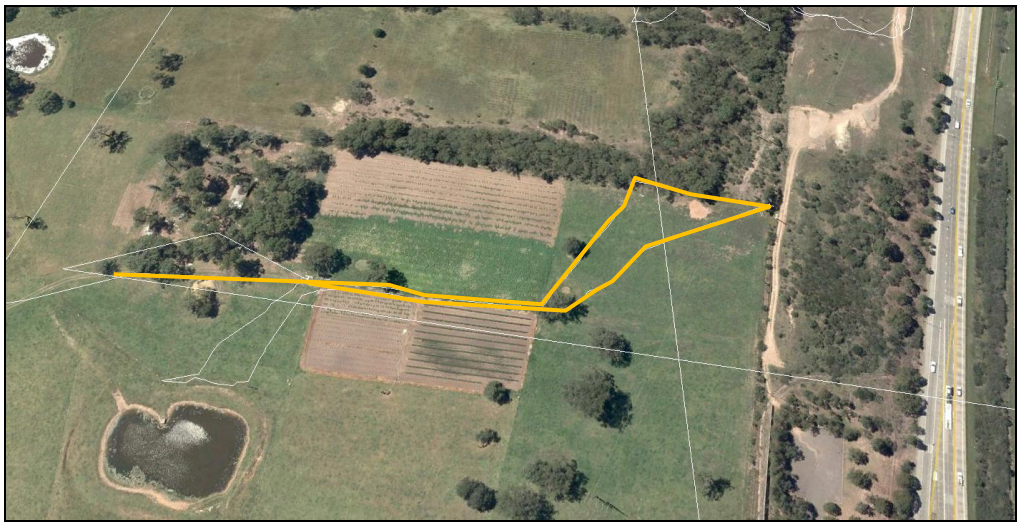


Figure 8: Transect 4. Jilliby- proposed site compound, property located on Hue-Hue Road**.**

Figure 9: Transect 5. Kiar- proposed site compound, property located northern side of M1 between the M1 and Doyalson Link Road.

Figure 10:Transect 6. Kiar / Bushells Ridge- property located on the southern side of M1 between the M1 and Doyalson Link Road.

Figure 11:Transect 7. Warnervale- proposed site compound and road works, properties located on the north-eastern side of Sparks Road.

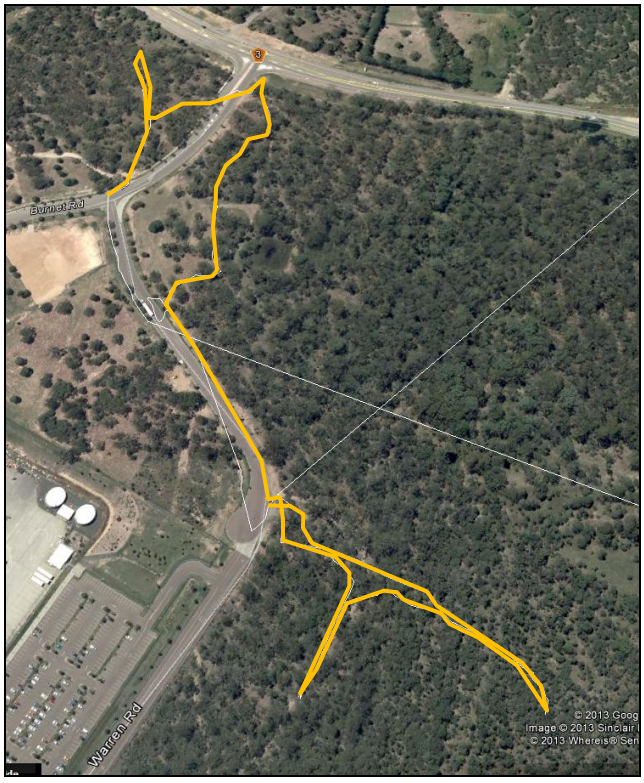


Figure 12: Transect 8. Warnervale- proposed site compound and road works, properties located on Warren, Burnet Roads and southern side of Sparks Road.

Figure 13: Transect 9. Warnervale- (Warnervale aerodrome) proposed site compound, property located on Jack Grants Ave and the south-eastern side of Sparks Road.

Figure 14: Transect 10. Mardi- proposed site compound, property located on McPhersons Road and east of M1.

10. Photographs

*(*Photograph S. Hodgetts)

Figure 15: The photograph shows part of Transect 1. Mardi-proposed site compound, western side of M1 facing south.

(Photograph S. Hodgetts)

Figure 16: The photograph shows evidence of bush regeneration with part of Transect 1.

(Photograph S. Hodgetts)

Figure 17: The photograph shows part of Transect 2. Alison- proposed site compound locate near corner of Yarramalong / Alison and Hue-Hue Roads facing north.

(Photograph S. Hodgetts)

Figure 18: The photograph shows the intersection and part of Transect 2 facing east.

(Photograph S. Hodgetts)

Figure 19: The photograph shows part of Transect 3. Jilliby- proposed site compound, property located on St Johns Road facing east.

(Photograph S. Hodgetts)

Figure 20: The photograph shows the Paperbark forest within part of Transect 3.

(Photograph S. Hodgetts)

Figure 21: The photograph shows part of Transect 3. The eastern section adjacent the M1 on the east of the Paperbark forest facing south.

Photograph S. Hodgetts)

Figure 22: The photograph shows part of Transect 4. Jilliby- proposed site Compound, property located on Hue-Hue Road facing north.

(Photograph S. Hodgetts)

Figure 23: The photograph shows part of Transect 4 facing south.

(Photograph S. Hodgetts)

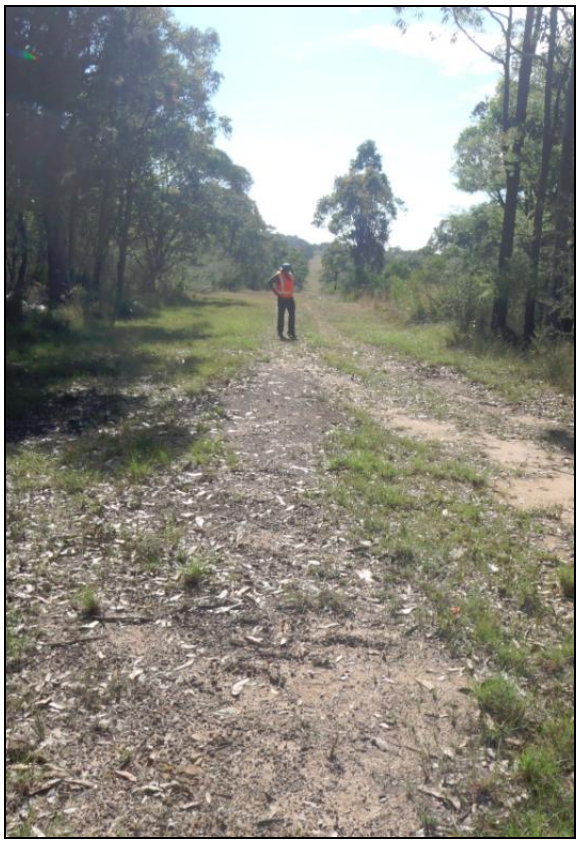
Figure 24: The photograph shows part of Transect 5. Kiar- proposed site compound, property located on the north side of the M1 between the M1 and Doyalson Link Road facing south-west.

(Photograph S. Hodgetts)

Figure 25: The photograph shows part of Transect 5 within the midsection of the site.

(Photograph S. Hodgetts)

Figure 26: The photograph shows part of Transect 5 within the south-west facing north-east.



(Photograph S. Hodgetts)

Figure 27: The photograph shows part of Transect 6. proposed site compound, property located within Kiar / Bushells Ridges on the south side of the M1 between Doyalson Link Road. This photograph shows the section to the north of Doyalson Link Road facing north-east along the gas easement.

(Photograph S. Hodgetts)

Figure 28: The photograph shows part of Transect 6 south side of Doyalson Link Road facing south west along the gas easement.

(Photograph S. Hodgetts)

Figure 29: The photograph shows part of Transect 6, within the thick vegetation on the eastern side of the gas easement.

(Photograph S. Hodgetts)

Figure 30: The photograph shows part of Transect 6, within the Paperbark forest to the west of the gas easement.

(Photograph S. Hodgetts)

Figure 31: The photograph shows part of Transect 7. Warnervale- proposed site compound and road works properties located on the north-east and south-east sides of Sparks Road. Photograph shows the western side of the north-eastern property facing south-east.

(Photograph S. Hodgetts)

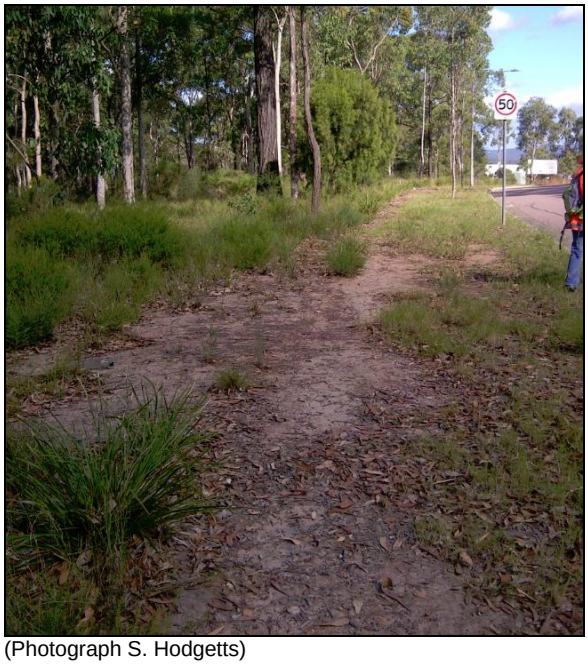
Figure 32: The photograph shows part of Transect 7, the eastern side of the north-eastern property facing south-east.

(Photograph S. Hodgetts)

Figure 33: The photograph shows part of Transect 7 and the Warnervale interchange and towards the south-east section of the site.

(Photograph S. Hodgetts)

Figure 34: The photograph shows part Transect 8. Warnervale- proposed site compound and road works, properties located on Warren and Burnet Road on the south side of Sparks Road. The photograph shows the section of the site east of Warren Road.



(Photograph S. Hodgetts)

Figure 35: The photograph shows part of Transect 8 and the section of the site located between Warren and Burnet Roads.

(Photograph S. Hodgetts)

Figure 36: The photograph shows part of Transect 8. The section of the site to the north-west of Burnet Road.

(Photograph S. Hodgetts)

Figure 37: The photograph shows part of Transect 9. Warnervale- (Warnervale aerodrome) and the proposed site compound and road works, property located on Jack Grants Ave and to the south-east side of Sparks Road. The photograph shows the section of the site on the corner of Sparks Road and Jack Grants Ave, facing south west.

(Photograph S. Hodgetts)

Figure 38: The photograph shows part of Transect 9 at the end of Jack Grants Ave facing north west.

(Photograph S. Hodgetts)

Figure 39: The photograph shows part of Transect 10. Mardi- proposed site compound, property located on McPhersons Road and to the east of the M1 facing south.

(Photograph S. Hodgetts)

Figure 40: The photograph shows part of Transect 10 facing west.

11. Fieldwork Results

No Aboriginal Cultural Heritage sites were found on the proposed development site.

12. Discussion and Recommendations

The assessment site is located between Mardi and Doyalson. The RMS propose to upgrade and widen the M1 (F3 Freeway) from Tuggerah to Doyalson. Within this area several sites are also proposed to be utilised as stockpile sites for the works.

The assessment site has undergone land disturbance in the past through various types of activities related to road construction, agriculture and rural and urban development. As a result some areas of the assessment site have been heavily impacted, while others have undergone minimal impact.

There is possibility for further objects or sites of Aboriginal Cultural Heritage within the assessment area. All Aboriginal Cultural Heritage sites have value. Areas of higher Aboriginal Cultural Heritage potential are those areas with minimal disturbance, while any disturbed areas of the assessment site have a low possibility for objects or sites of Aboriginal Cultural Heritage. It is possible that Aboriginal Cultural Heritage could lie beneath the top soil surface of the assessment sites

Within the assessment site ten (10) separate locations for site compounds and / or road widening where inspected. These locations area described within transect with recommendations as follows:

- <u>Transect 1. Mardi-proposed site compound western side of M1.</u>
  This site has undergone previous disturbance and revegetation associated with the construction of the M1. Aboriginal Cultural Heritage Site 45-3-1108 is indicated on the AHIMS map to be located within the location of this assessment site. Information within the AHIMS site cards indicate the site is not situated within this location. Therefore there are not Aboriginal Cultural Heritage constraints on this site.

- <u>Transect 2. Alison- proposed site compound, corner Yarramalong / Alison and Hue-Hue Roads .</u>
  The area has undergone previous disturbance through vegetation clearing and an electricity easements. There are not Aboriginal Cultural Heritage constraints on this site.

- <u>Transect 3. Jilliby-</u> <u>proposed site compound, property located on St Johns Road.</u>
  The western section of this transect is located within a paddock which has undergone land clearing and some disturbance. The midsection incorporated a Paperbark forest while the eastern section of this transect has undergone disturbance associated with the construction of the M1. Therefore any soil disturbances within the western and mid-section should be monitored. There are no Aboriginal Cultural Heritage constraints on the eastern section of the site adjacent the M1.

- <u>Transect 4. Jilliby- proposed site compound, property located on Hue-Hue Road.</u>
  The site is located within an open paddock and has undergone land clearing and some disturbance, therefore any soil disturbances within this area should be monitored.

- Transect 5. Kiar- proposed site compound, property located on the northern side of the M1 between the M1 and Doyalson Link Road.
  Visibly was poor within this transect due to think vegetation and leaf litter. There is some evidence of disturbance adjacent the M1 and Doyalson Link Road. Shallow soil to the south-west of the site indicates a limited potential for subsurface deposits. Therefore soil disturbances within the midsection of this area only should be monitored.

- Transect 6 Kiar / Bushells Ridges- proposed site compound, property located on the southern side of the M1 between the M1 and Doyalson Link Road
  This area includes a gas and telecommunications easement and large sections of thick bush including dry forest and a Paperbark forest. Within the areas of the easement there are no Aboriginal Cultural Heritage constraints. Within the thickly vegetated areas of this site soil disturbances should be monitored.

- Transect 7. Warnervale- proposed site compound, properties, located to the north-west and south-east side of the Sparks Road interchange.
  The north-eastern side of Sparks Road has undergone previous disturbance through some land clearing and possible past farming practises. Soil visibly was poor due to think long grass. The area closer to the M1 seems to have undergone more substantial soil disturbances with the remains of industrial infrastructure. The southern side of Sparks Road and the eastern side of the M1 off ramp has undergone disturbance through the construction of the road. Soil disturbances within the west of this north-western site should be monitored. There are no Aboriginal Cultural Heritage constraints on the eastern section, north of Sparks Road or within and south-eastern side of Sparks Road.

- Transect 8 Warnervale- proposed site compound, properties located on Warren and Burnet Roads the southern side of Sparks Road.
  The site to the east of Warren Road has been highly disturbed and cleared. The section between Warren, Burnet and Sparks Roads is vegetated and has poor ground visibly. The section west of Burnet Road also has poor ground surface visibly due to leaf litter and vegetation.

  There are no Aboriginal Cultural Heritage constraints on the site to the east of Warren Road. The sites between Warren, Burnet and Sparks Roads and to the west of Burnet Road should have any soil disturbances monitored.

- Transect 9. Warnervale- proposed site compound (Warnervale aerodrome), property located on Jack Grants Ave and south-east of Sparks Road.
  Both areas are located within a cleared paddock and have undergone some disturbance due to land clearing. The ground surface visibly is poor due to thick grass cover. Both site should has any soil disturbances monitored.

- Transect 10. Mardi- proposed site compound, property located on McPhersons Road and east of the M1.
  The side has undergone previous disturbance as indicated by the present of weeds and the electricity easement. Ground surface visibility within this site is very limited by with thick long grass, weeds and regrowth. The site seemes to form part of a wetland. There are no Aboriginal Cultural Heritage constraints on this site.

Darkinjung LALC Standard Recommendations are as follows:

The site developers, employees or contractor must give notice to Darkinjung LALC 30 days prior to any commencement of construction work. They must engage a Darkinjung LALC Sites Officer to monitor any earthworks or excavations on the assessment site when recommended until such time as is satisfied that there is very little or no possibility of Aboriginal Cultural Heritage. This is due to the possibility of uncovering Aboriginal objects/items of significance whilst excavation takes place.

The site developers, employee's, contractors and personnel should receive basic training in the recognition of Aboriginal Cultural Heritage sites and material and have an awareness of the importance of such material and places to both the Aboriginal and non-indigenous community. When any soil excavation, vegetation clearing and leaf litter removal activities are carried out workers associated with the project should be observant and keep a look out for surface shell, bone, rocks or any other Aboriginal Cultural Heritage material.

If any Aboriginal Cultural Heritage sites or material are found, work should cease immediately in that area and the Office of Environment and Heritage (OEH) and Darkinjung LALC be notified immediately. Work should only recommence when an appropriate and approved management strategy has been agreed to by OEH and Darkinjung LALC.

Any negative impacts including excavations to an area containing an Aboriginal Cultural Heritage site will require the application of an Aboriginal Heritage Impact Permit (AHIP) from the Office of Environment and Heritage (OEH) prior to any soil disturbance taking place.

Finally the Registered Aboriginal Site information contained in this report is considered confidential and should be deleted from this report if it is to enter the public domain.

Overview of recommendation

1. Transect 1. Mardi-proposed site compound located on the western side of M1
    - There are not Aboriginal Cultural Heritage constraints on this site.

2. Transect 2. Alison- proposed site compound located on the corner of Yarramalong / Alison and Hue-Hue Roads.
    - There are not Aboriginal Cultural Heritage constraints on this site.

3. Transect 3. Jilliby-property located on St Johns Road.
    - Any soil disturbances within the western and mid-section should be monitored.
    - There are no Aboriginal Cultural Heritage constraints on the eastern section of the site adjacent the M1 site.

4. Transect 4. Jilliby- property located on Hue-Hue Road.
    - Any soil disturbances within this area should be monitored.

5. Transect 5. Kiar- proposed site compound, property located on the northern side of M1, between M1 and Doyalson Link Road.
    - Soil disturbances within the midsection only of this area should be monitored.

6. Transect 6. Kiar / Bushells Ridges, property located on the southern side of M1, between M1 and Doyalson Link Road.
    - There are no Aboriginal Cultural Heritage constraints within the areas of the easement.
    - Within the thickly vegetated areas of this site, soil disturbances should be monitored.

7. Transect 7. Warnervale- properties located to the north-eastern side of Sparks Road.
    - Soil disturbances within the west of this north-western site should be monitored.
    - There are no Aboriginal Cultural Heritage constraints on the eastern section, north of Sparks Road or within and south-eastern side of Sparks Road.

8. Transect 8. Warnervale- properties located on Warren and Burnet Roads and the southern side of Sparks Road.
    - There are no Aboriginal Cultural Heritage constraints on the site to the east of Warren Road.
    - The sites between Warren, Burnet and Sparks Roads and to the west of Burnet Road should have any soil disturbances monitored.

9. Transect 9. Warnervale- (Warnervale Aerodrome) properties located on Jack Grants Ave and to the south-east of Sparks Road.
    - Any soil disturbances should monitored.

10. Transect 10. Mardi- property located on McPhersons Road to the east of the M1.
    - There are no Aboriginal Cultural Heritage constraints on this site.

11. The site developers, employees and /or contractor must give notice to Darkinjung LALC 30 days prior to any commencement of construction work. They must engage a Darkinjung LALC Sites Officer to monitor any excavations where recommended.

12. The site developers, employees, contractors and personnel of the developers should receive basic training in the recognition of Aboriginal Cultural Heritage material and sites.

13. When any soil excavation, earth works, vegetation clearing and leaf litter removal activities are conducted workers should be observant and keep a look out for, surface shell, bone, rocks or any other Aboriginal Cultural Heritage material.

14. If Aboriginal Cultural Heritage sites or material are discovered, work should cease. The area should then be avoided and the Office of Environment and Heritage (OEH) and Darkinjung LALC should be notified immediately.

15. Any impacts, including excavations to an area, containing an Aboriginal Cultural Heritage site will require the application of an Aboriginal Heritage Impact Permit (AHIP) from the Office of Environment and Heritage (OEH) prior to any soil disturbance taking place.

16. Registered Aboriginal Site information in this report is confidential and not for public interest.

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