Technical Paper 6

Aboriginal Heritage

South West Rail Link – Glenfield to Leppington Rail Line: Aboriginal Heritage Assessment

Prepared by Australian Museum Business Services
for Parsons Brinckerhoff Australia Pty Ltd


April 2010

100077

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Approved by:	Jennie Lindbergh

Executive Summary

Australian Museum Business Services (AMBS) has been commissioned by Parsons Brinckerhoff Australia Pty Ltd (PB) on behalf of Transport Infrastructure Development Corporation (TIDC) to prepare an Aboriginal heritage assessment of the proposed South West Rail Link – Glenfield to Leppington Rail Line project (the project). The project has been designated a major project to which Part 3A, section 75B of the *Environmental Planning and Assessment Act* 1979 (EP&A Act) applies. Concept Plan approval was granted under Part 3A on 29 August 2007 by the Minister for Planning. This assessment is in support of an application for Project Approval.

The Aboriginal heritage assessment was undertaken in accordance with the relevant Minister's Conditions of Approval (MCoAs) for the Concept Plan, as follows:

> ***Indigenous Heritage:*** *for all aspects of the project (as relevant), describe the Indigenous heritage impacts of the project in accordance with Steps 1 to 4 of the Protocol for Aboriginal Stakeholder Involvement in the assessment of Aboriginal cultural heritage in the Sydney Growth Centres (Context Pty Ltd, 2006a) and the Precinct Assessment Method for Aboriginal Cultural Heritage in the Sydney Growth Centres (Context Pty Ltd, 2006a), identifying mitigation priorities with consideration to the regional significance of impacts. The assessment must consider cumulative impacts associated with other projects related to this concept plan approval and of surrounding development.*

The locations of five previously recorded Aboriginal sites were identified during the archaeological survey of the proposed project route and ten new Aboriginal heritage sites were recorded. Five other sites that had been previously recorded in the vicinity of the route were not able to be located. Twelve areas of archaeological sensitivity were identified; three of high archaeological sensitivity, five of moderate sensitivity and five of low sensitivity.

The following recommendations are made for the management of Aboriginal heritage for the project:

- All construction personnel involved in the project works should be made aware of the statutory obligations for Aboriginal cultural materials, particularly as they relate to sites located outside of the land subject to Part 3A approval.
- Should any previously unidentified Aboriginal objects be discovered outside of the land subject to Part 3A approval during the construction works, all work in the vicinity of the find or with the potential to impact the find should stop immediately and the Cultural Heritage Unit of the DECCW should be informed in accordance with Section 91 of the NPW Act. Works should not proceed without the written consent of the DECCW. Should the proposed development footprint be realigned beyond the identified development corridor surveyed, further archaeological assessment and Aboriginal community consultation should be undertaken.
- TIDC should consult with appropriate Aboriginal heritage specialists and the local Aboriginal community should there be any modifications or alterations to the current footprint of the proposed development, as identified in this report.
- A program of test excavation should be undertaken throughout the impact zone of the project route, site compound and stockpile areas on the slope and ridge between MFH#2 and the Hume Highway to systematically sample the landforms between Bunbury Curran and Maxwells Creeks and obtain a representative sample of artefacts across the landscape.

- Aboriginal communities should be offered the opportunity to relocate artefacts at SW1, SWRL Site 7 and SWRL Site 10 outside of the construction impact area prior to works beginning.
- A program of test excavation should be undertaken throughout the impact zone of the project route in the areas where it proposes to cross the Edmondson Park precinct, and at EPCS7, to systematically sample the various landforms of this area around Cabramatta and Maxwells Creeks and obtain a representative sample of artefacts across the landscape.
- The locations of DD1, SW2 and SWRL Sites 1-4, 6 and 8 should be clearly demarcated with high visibility temporary fencing, such as star pickets and mesh barrier fencing, to prevent accidental impacts arising from the construction works.
- Any impacts on land outside the project construction area, such as access routes or temporary structures, should avoid sites DD1, SW2 and SWRL Sites 1-4, 6 and 8. Should any unavoidable impacts be proposed to sites DD1, SW2 and SWRL Sites 1-2, then they should be included in the proposed test excavations.
- A program of test excavation in conjunction with representatives of the local Aboriginal communities should be undertaken throughout the impact zone of the project route in the area where it crosses Kemps Creek to determine the density and type of archaeological deposit in this area of high archaeological sensitivity.
- A program of test excavation in conjunction with representatives of the local Aboriginal communities should be undertaken throughout the impact zone of the access track between Bringelly Road and the stabling facility, in the elevated area above a tributary of Kemps Creek, to determine the density and type of archaeological deposit in this area of moderate archaeological sensitivity.
- Current Masterplanning for the Edmondson Park Composite Site indicates that the extent of lands to be retained with minimal or no development as 'environmental protection/conservation' and 'public recreation' will be an appropriate offset for the destruction (following further archaeological investigation) of adjacent Aboriginal heritage sites, providing that appropriate care is taken to avoid any impact to these sensitive areas and sites.

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1 Introduction

1.1 Preamble

Australian Museum Business Services (AMBS) has been commissioned by Parsons Brinckerhoff Australia Pty Ltd (PB) on behalf of Transport Infrastructure Development Corporation (TIDC) to prepare an Aboriginal heritage assessment of the proposed South West Rail Link (SWRL) – Glenfield to Leppington Rail Line project. This project comprises Stage 2 of the SWRL (which was previously known as Stage B2). Stage 1 of the SWRL (which was previously known as Stage A and Stage B1), comprises the Glenfield Transport Interchange and was determined by TIDC in April 2009.

The project has been designated a major project to which Part 3A, section 75B of the Environmental Planning and Assessment Act 1979 (EP&A Act) applies. Concept Plan approval was granted under Part 3A on 29 August 2007 by the Minister for Planning. This assessment is in support of an application for Project Approval. The Minister's Conditions of Approval (MCoA) for Indigenous (Aboriginal) Heritage for the Concept Plan are as follows:

> ***Indigenous Heritage**: for all aspects of the project (as relevant), describe the Indigenous heritage impacts of the project in accordance with Steps 1 to 4 of the Protocol for Aboriginal Stakeholder Involvement in the assessment of Aboriginal cultural heritage in the Sydney Growth Centres (Context Pty Ltd, 2006a) and the Precinct Assessment Method for Aboriginal Cultural Heritage in the Sydney Growth Centres (Context Pty Ltd, 2006a), identifying mitigation priorities with consideration to the regional significance of impacts. The assessment must consider cumulative impacts associated with other projects related to this concept plan approval and of surrounding development.*

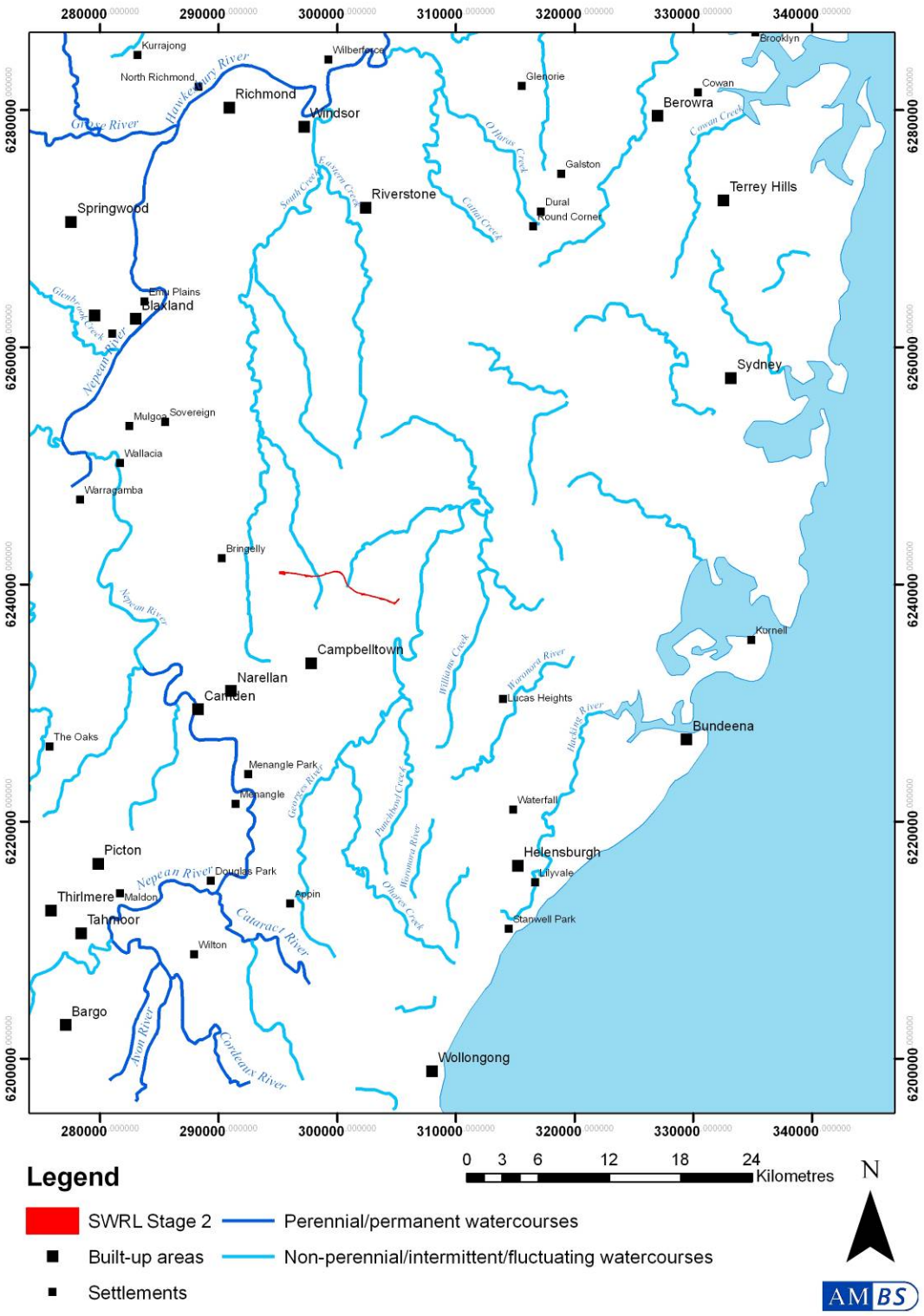
TIDC's Statement of Commitments (SoC) for Indigenous heritage identified for the approved Concept Plan is as follows:

> *Indigenous heritage assessment would be undertaken in accordance with the Protocol for Aboriginal Stakeholder involvement in the assessment of Aboriginal Cultural Heritage in the Sydney Growth Centres (Context Pty Ltd 2006a) and the Precinct Assessment Method for Aboriginal Cultural Heritage in the Sydney Growth Centres (Context Pty Ltd 2006b), in consultation with DECC.*
>
> *Offsets would be developed in consultation with the Aboriginal community in regard to any unavoidable disturbance to Aboriginal heritage sites and places. The adopted approach to offsets would be consistent with the Aboriginal Stakeholder involvement in the assessment of Aboriginal Cultural Heritage in the Sydney Growth Centres (Context Pty Ltd 2006a) and the Precinct Assessment Method for Aboriginal Cultural Heritage in the Sydney Growth Centres.*

This report addresses the Indigenous (hereafter referred to as Aboriginal) heritage requirements of the MCoA and TIDC's SoC for the project Concept Plan and provides management recommendations for the 2 project.

1.2 Study Area

The study area comprises the approximately 11km rail alignment which extends from south west of the existing Glenfield Rail Station (north of Macquarie Fields House) to a proposed train stabling facility at Rossmore (see Figure 1.1 and Figure 1.2). The study area is a linear easement that traverses the Camden, Campbelltown and Liverpool Local Government Areas (LGAs). The study area for this assessment does not include South West Rail Link – Glenfield Transport Interchange, which involves the upgrade of Glenfield Station and has been assessed separately.



Settlement & Hydrology data © Copyright Commonwealth of Australia (Geoscience Australia) 2001
Horizontal datum: GDA94/MGA Zone 56

Figure 1.1 Regional map showing the location of the proposed South West Rail Link Stage 2 project.

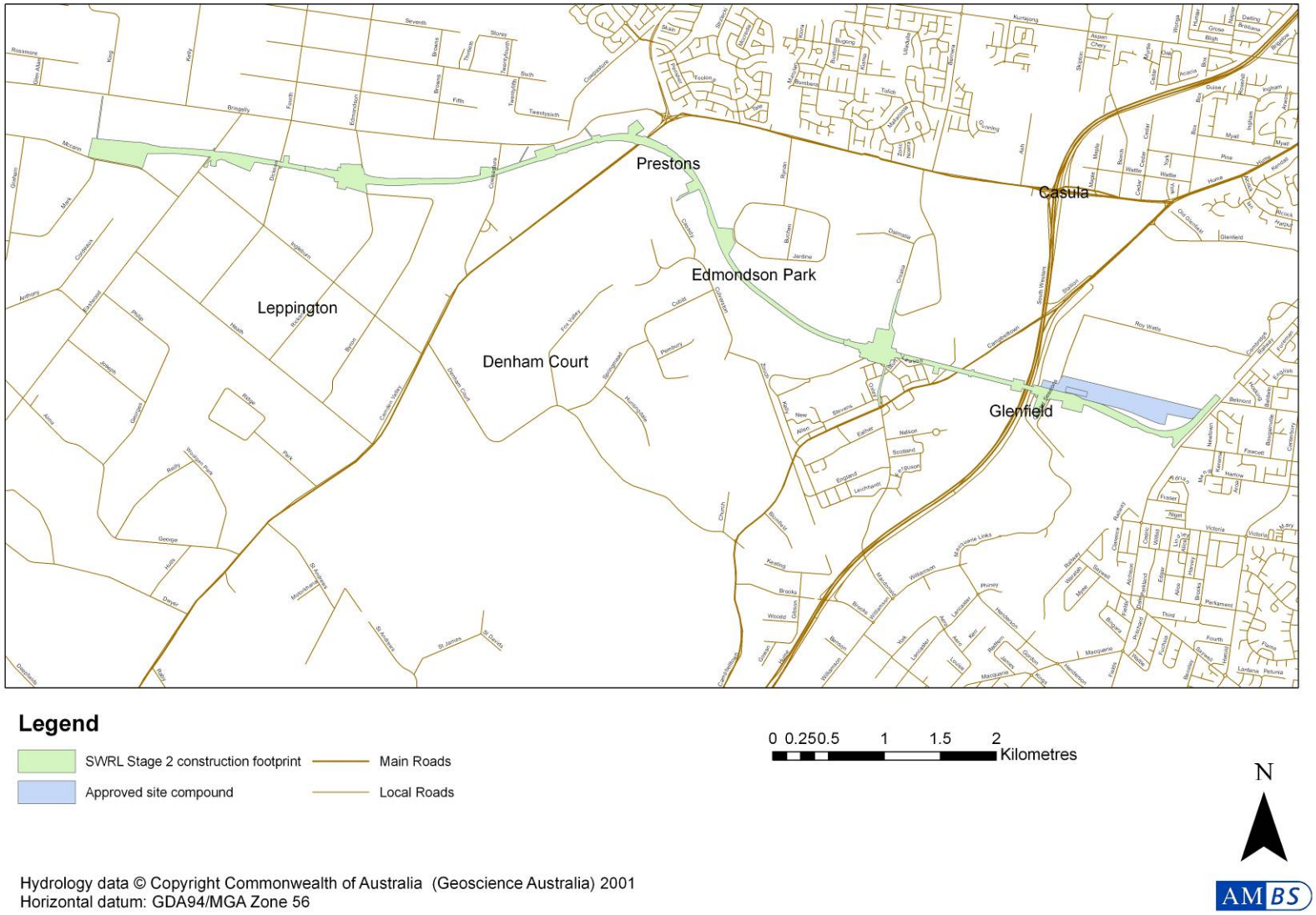


Figure 1.2 Proposed project alignment. Please note that SWRL Stage 1 is excluded from this assessment and is the area north of where the project alignment joins the current rail line in the vicinity of Glenfield Station.

1.3 Proposed Development

The project works as provided by TIDC are proposed to include:

- a new dual track rail line and associated infrastructure between Glenfield South Junction and a train stabling facility at Rossmore, including construction of the stabling facility and grade-separated flyovers over the Main South and Southern Sydney Freight Lines;
- new stations and interchanges at Leppington and Edmondson Park; and
- construction sites and ancillary facilities, including power supply, substations, sectioning huts, signalling structures, overhead wires, access roads, and other infrastructure required for the operation and maintenance of rail services and infrastructure.

1.3.1 Associated Developments

A large number of potential urban developments and associated infrastructure projects are planned for lands associated with the SWRL Stage 2 development. These large scale developments have potential to significantly impact on the Aboriginal heritage of the local region. At this time, the majority of the environmental and heritage assessments for these projects have not been undertaken, completed or made available, and as such it is not possible to provide an accurate discussion of the Aboriginal heritage sites, items or that will be impacted by the developments, nor is it possible to discuss possible Aboriginal heritage impact mitigation or management strategies that may be adopted by these developments.

The following potential projects are due to be completed within the next five years:

Urban Development

- Landcom (LB) redevelopment lands, northwest of Edmondson Park station (currently under construction)
- Ingleburn Gardens (currently underway)
- Edmondson Park broader area and town centre (see Figure 4.5)
- Redevelopment in the Leppington North precinct (likely to proceed)

Roads and Transport

- Upgrade of Camden Valley Way (likely to proceed)
- Upgrade of Campbelltown Road (not currently planned)
- Upgrade of Bringelly Road (not currently planned)

Utilities

- ***Hoxton Park Recycled Water Scheme***

  The Hoxton Park Recycled Water Scheme in south western Sydney will supply c.900 million litres of recycled water to businesses and c.7,000 homes by 2015. This major recycled water scheme will be commissioned in two stages from 2013 and will eventually serve Edmondson Park, Middleton Grange, Ingleburn Gardens, Yarrunga Industrial Area and Panorama Estate (see Figure 1.3).

  Construction of the recycled water pipelines began in May 2008, and is almost complete. Three new recycled water reservoirs will be built as part of the scheme. Two reservoirs will be located at Edmondson Park, and another at South Hoxton Park.

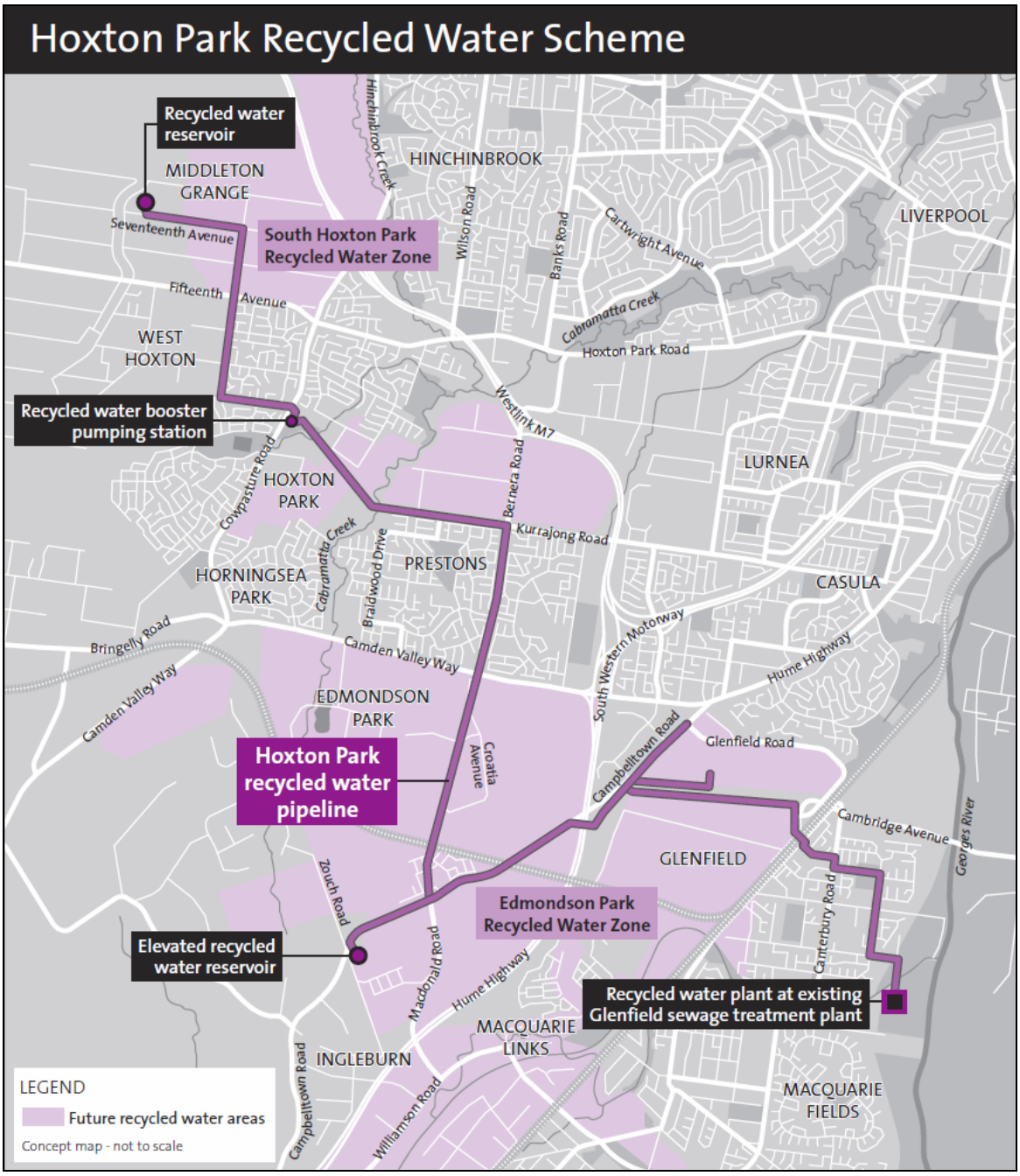


Figure 1.3 Hoxton Park Recycled Water Scheme concept map

- ***Renewable Energy Generation (REG) Program - Glenfield Sewage Treatment Plant***
  Sydney Water is implementing a Renewable Energy Generation (REG) Program as part of its recent pledge to be carbon neutral by 2020. The program aims to reduce greenhouse gas emissions by approximately 54,000 tonnes per year, this is equivalent to 12.5 per cent of Sydney Water's total emissions. As part of this program a cogeneration plant will be installed at Glenfield Sewage Treatment Plant to convert biogas, a product of the wastewater treatment process, into electricity.

- ***South West First Release Precincts***
  Sydney Water is planning the water related infrastructure for drinking water, recycled water and wastewater services for NSW Government's First Release Precincts (Oran Park and Turner Road) and adjoining areas. Additionally, they are considering providing services to the Camden

development area of Central Hills and two other SWGC precincts including Marylands and Lowes Creek.

The following infrastructure will be built as part of the proposal:

- drinking water mains and reservoirs;
- recycled water mains and reservoirs;
- wastewater rising mains;
- recycled water, drinking water and sewage (wastewater) pumping stations; and,
- ancillary components including work compounds, maintenance structures, overflow structures, vent shafts, scour valves, scour lines, air valves and hydrants.

Once the proposal for this infrastructure is approved, it is anticipated construction will start in 2009, and will continue until about 2015.

- ***South West Remaining Precincts***

Sydney Water is preparing an environmental assessment that considers the impacts of providing water-related services to the remaining precincts of the South West Growth Centres (see Figure 1.4). The Environmental Assessment for the remaining precincts will be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979*.

Extensive new regional infrastructure is required to service the remaining precincts beyond the first stage of release within the Growth Centres. In general, the Proposal comprises the construction, operation and maintenance of drinking water, recycled water and wastewater infrastructure for the SWGC, including:

- Pipelines;
- pumping stations;
- reservoirs; and,
- recycled water plants.

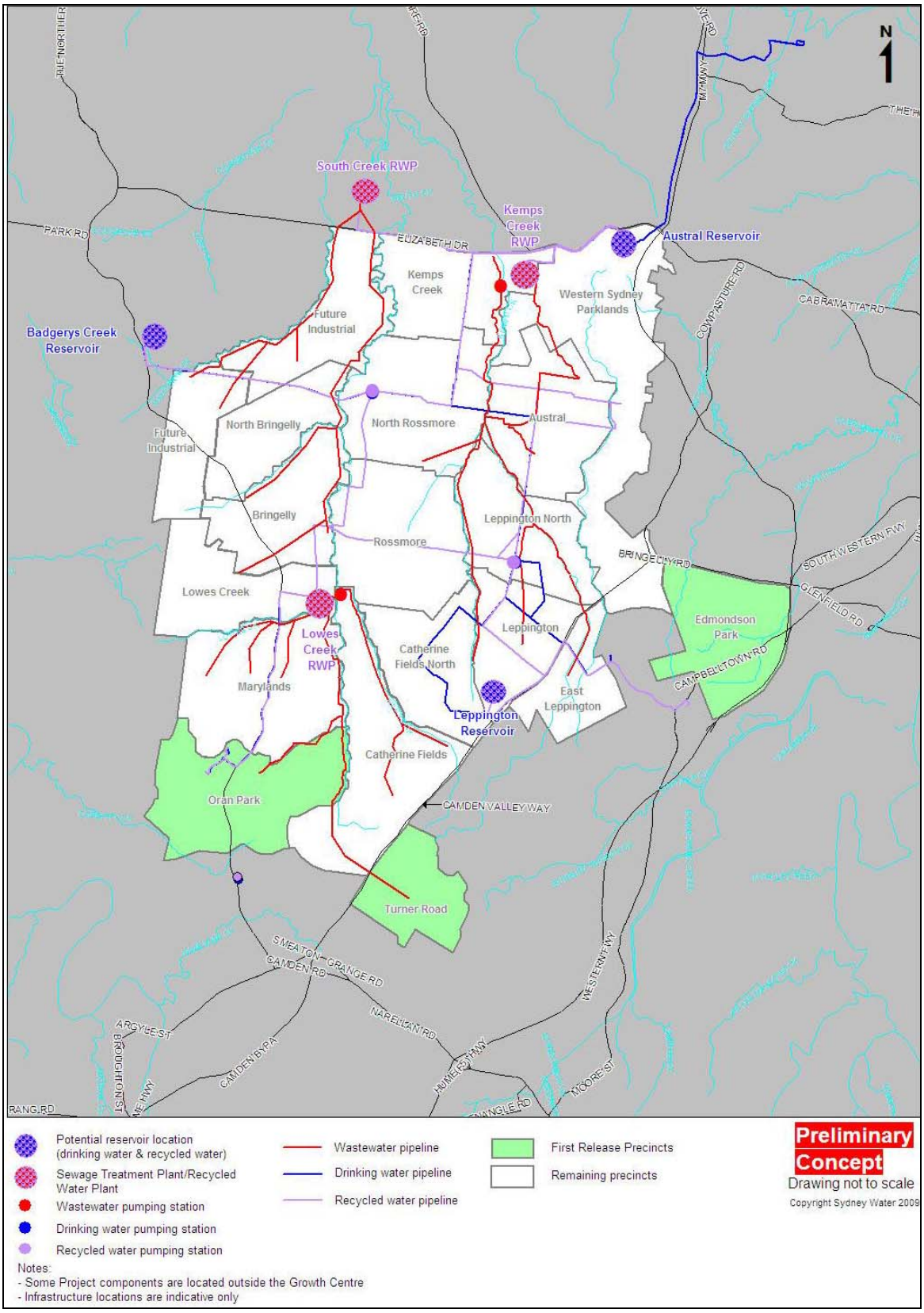


Figure 1.4 South West Growth Centres drinking water, recycled water and wastewater infrastructure.

1.4 Methodology

In accordance with the Indigenous heritage requirements of the MCoA and TIDC's SoC for the Concept Plan, this assessment follows the methodologies and protocols for heritage assessment that have been developed by the former NSW Growth Centres Commission (now the Strategic Land

Release Project Office of the NSW Department of Planning) and the Department of Environment and Climate Change (now the Department of Environment, Climate Change and Water [DECCW]), namely *The Consultants Brief for Identifying and Assessing Aboriginal Cultural Heritage in the Sydney Growth Centres* (Context 2006) and its two Appendices:

- *Appendix A: Protocol for Aboriginal Stakeholder involvement in the assessment of Aboriginal Cultural Heritage in the Sydney Growth Centres*; and
- *Appendix B: Precinct Assessment Method for Aboriginal Cultural Heritage in the Sydney Growth Centres*.

The Precinct Assessment Method outlines the following steps to be undertaken:

- Step 1 – gather and analyse existing information;
- Step 2 – identify and assess Aboriginal cultural heritage and values;
    - 2a – undertake investigations;
    - 2b – assess significance;
- Step 3 – develop land use and management options; and
- Step 4 – input into Precinct Planning.

Step 1 was undertaken by Heritage Concepts (2006) for the Concept Plan EA. This assessment expands and follows on from that work, encompassing Steps 2-3 of 4.

Step 2 comprises the following:

- Step 2A – undertake sufficient archaeological investigations, landscape mapping, historical research and community-based cultural research to adequately identify Aboriginal heritage places and values in the Precinct.
- Step 2B – assess significance to identify and rank the relative importance of heritage places so that meaningful recommendations about protection and management can be made in Step 3.

Step 3 involves the development of land use recommendations and management options based on the significance assessments and rankings, and also considering the obligations arising from significance, the likely impacts of proposed changes on each place and its significance, and the needs and preferences of stakeholder Aboriginal communities, the Strategic Land Release Project Office of the NSW Department of Planning, and land owners. A draft final report is then to be prepared and presented to stakeholder Aboriginal communities for review and comment.

Step 4 involves ongoing advice to the Precinct planning team during development of the Precinct Plan and its various means to manage, conserve, interpret and accommodate those places of Aboriginal cultural heritage significance. This is outside the scope of the current study and will be a process led by the NSW Department of Planning. This report will inform that process.

Stakeholder Aboriginal communities are to be consulted and involved at all stages of the assessment to:

- ensure that places of importance to the stakeholder Aboriginal communities are identified and taken into consideration during project development;
- ensure that values and places of importance to Aboriginal culture and community identity are clearly identified and articulated;

- identify and document those cultural values held by the Aboriginal groups and people, which may not have been identified during the archaeological investigation or historical research; and
- provide an understanding of the cultural values of information obtained during archaeological investigation or historical research and other investigations.

The stakeholder Aboriginal communities identified for this project (by Heritage Concepts during Step 1) are:

- Cubbitch Barta Native Title Claimants Aboriginal Corporation (CBNTCAC);
- Darug Aboriginal Cultural Heritage Assessments (DACHA);
- Darug Custodian Aboriginal Corporation (DCAC);
- Darug Tribal Aboriginal Corporation (DTAC);
- Tharawal Local Aboriginal Land Council (TLALC); and
- Northern Illawarra Aboriginal Collective (NIAC).

1.5 Previous Aboriginal Heritage Assessments for the Project

As part of the Aboriginal heritage section of the Concept Plan EA for the project, a Step 1 assessment was undertaken by Heritage Concepts in 2006. At that time, Heritage Concepts identified that the following sites would be potentially affected by the project:

AHIMS Site Number	Site Name	Site Type
45-5-2495	MFH#2	Stone artefact scatter
45-5-2744	MLE1	Isolated find
45-5-2455	DD1	Stone artefact scatter
45-5-2559	TLC1	Isolated find
45-5-3529	EPCS4	Stone artefact scatter
45-5-3246	EPCS5	Stone artefact scatter
N/A	EPCS6	Isolated find
45-5-3304	EPCS7	Isolated find
45-5-3305	EPCS8	Stone artefact scatter
N/A	EPCS9	Isolated find
N/A	EPCS10	Isolated find
45-5-3306	EPCS11	Stone artefact scatter
N/A	SW1	Isolated find
N/A	SW2	Stone artefact scatter
N/A	SW3	Isolated find
N/A	SW4	Isolated find
N/A	SWST1	Possible scarred tree

Following on from the Heritage Concepts assessment, Steps 2 and 3 were initially undertaken by AMBS in 2008. One of the aims of AMBS' October 2008 draft Aboriginal Heritage Assessment was to verify and assess the Aboriginal heritage constraints identified by Heritage Concepts. The 2008 assessment was able to determine that the following items identified by Heritage Concepts would not be affected by the project:

AHIMS Site Number	Site Name	Site Type
45-5-2744	MLE1	Isolated find
45-5-2455	DD1	Stone artefact scatter
45-5-2559	TLC1	Isolated find
45-5-3246	EPCS5	Stone artefact scatter
N/A	EPCS6	Isolated find
45-5-3304	EPCS7	Isolated find
N/A	EPCS9	Isolated find
45-5-3306	EPCS11	Stone artefact scatter

N/A	SW1	Isolated find
N/A	SW2	Stone artefact scatter
N/A	SW4	Isolated find
N/A	SWST1	Possible scarred tree

The 2008 AMBS report was provided to the Aboriginal stakeholder communities for comment; however, the report was not finalised as the project was suspended.

In 2009, the project was reinstated, with some modifications to the original design. As such, this current assessment reviews and updates existing Aboriginal heritage information in accordance with current heritage best practice requirements and the revised scope of the project since 2008, for Steps 2 and 3.

1.6 Limitations

Many of the properties within the study area were covered in long grass, trees, market gardens, dams and buildings, resulting in limited ground surface being visible for inspection.

1.7 Authorship & Acknowledgements

This report has been prepared by AMBS Project Officer, Jenna Weston and AMBS Project Manager, Christopher Langeluddecke. AMBS Senior Project Manager, Jennie Lindbergh reviewed the report.

2 Statutory Context

Part 3A, Division 4, Section 75U of the EP&A Act describes those legislative approvals that do not apply to projects approved under Part 3A. In this instance, the following is relevant:

- the permit and consent requirements of sections 87 and 90 of the *National Parks and Wildlife Act 1974* (NPW Act) do not apply to an approved project.

DECCW is nevertheless given the opportunity to review Part 3A applications and the following statutory and non-statutory requirements are relevant.

2.1 New South Wales National Parks & Wildlife Act 1974

Under the provisions of the NPW Act, all Aboriginal Objects are protected regardless of their significance or land tenure. 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 "*a place that is or was of special significance to Aboriginal culture. It may or may not contain Aboriginal objects*", and may only be declared by the Minister administering the NPW Act.

2.2 Environmental Planning & Assessment Act 1979

The EP&A Act requires consideration to be given to environmental impacts as part of the land use planning process. In NSW, environmental impacts include cultural heritage impacts and as such any required Review of Environmental Factors (REF), Environmental Impact Statement (EIS) or Environmental Assessment (EA) should incorporate an assessment of Aboriginal cultural heritage. The consent authority is required to consider the impact on all Aboriginal heritage values, including natural resource uses or landscape features of spiritual importance, as well as the impact on Aboriginal Objects and Aboriginal Places.

As the project has been classified a major project under Part 3A of the EP&A Act, the developer is not required to apply for approvals or permits under the NPW Act. However, the Department of Planning (DoP) is still required to fully assess the heritage impacts of any proposal under Part 3A of the EP&A Act in accordance with established guidelines. To this end, the DoP generally provides the relevant statutory authorities the opportunity to review Part 3A applications for the appropriateness of the proposal to the heritage significance of items identified. The statutory authorities then advise the DoP on the appropriate conditions of approval.

2.2.1 Environmental Assessment Requirements under Part 3A of the EP&A Act

In November 2006, the SWRL Concept Plan Environmental Assessment (EA) and Concept Plan were lodged with the DoP in accordance with S.75O of the EP&A Act. A public exhibition of the Concept Plan EA and Concept Plan occurred in early 2007 and a Submissions report including TIDC's SoCs was lodged with the DoP in May 2007.

On 29 August 2007, the Minister for Planning granted Concept Approval for the project works. The project works are subject to further design and assessment in accordance with the Minister's Conditions of Approval (MCoA) and TIDC's SoC for the Concept Plan. The works require the preparation of an Environmental Assessment (EA) report to document and assess the key environmental issues associated with the proposed activity.

Pursuant to Section 75P(1)(a) of the EP&A Act, TIDC received the MCoA for the Concept Plan on 29 August 2007. These conditions state that the EA must include an assessment of impacts on

Indigenous heritage, in accordance with Steps 1-4 of the *Protocol for Aboriginal Stakeholder involvement in the assessment of Aboriginal Cultural Heritage in the Sydney Growth Centres* and the *Precinct Assessment Method for Aboriginal Cultural Heritage in the Sydney Growth Centres*, identifying mitigation priorities with consideration to the regional significance of impacts. The MCoA also state that the assessment must consider cumulative impacts associated with other projects related to the Concept Plan approval and surrounding development.

TIDC's SoC for the project includes minimising impacts on Indigenous heritage through the design process and application of management measures are consistent with established protocols and guidelines. The SoC states that:

- Indigenous heritage assessment would be undertaken in accordance with the *Protocol for Aboriginal Stakeholder involvement in the assessment of Aboriginal Cultural Heritage in the Sydney Growth Centres* and the P*recinct Assessment Method for Aboriginal Cultural Heritage in the Sydney Growth Centres*, in consultation with DECCW.
- Off–sets would be developed in consultation with the Aboriginal community in regard to any unavoidable disturbance to Aboriginal heritage sites and places. The adopted approach to off-sets would be consistent with the *Aboriginal Stakeholder involvement in the assessment of Aboriginal Cultural Heritage in the Sydney Growth Centres* and the *Precinct Assessment Method for Aboriginal Cultural Heritage in the Sydney Growth Centres*.

2.3 Aboriginal Community Consultation

Aboriginal community consultation is an integral part of the assessment of Aboriginal cultural heritage significance. Consultation was undertaken in accordance with *The Consultants Brief for Identifying and Assessing Aboriginal Cultural Heritage in the Sydney Growth Centres* (Context 2006) and its two Appendices, particularly Appendix A (see Section 1.4). The current assessment follows on from a preliminary assessment undertaken by Heritage Concepts (2006), which identified six stakeholder Aboriginal communities for this project (see Section 1.4).

The aims of this consultation process were to:

- ensure that places of importance to the stakeholder Aboriginal communities are identified and taken into consideration during project development;
- ensure that values and places and importance to Aboriginal culture and community identity are clearly identified and articulated;
- identify and document those cultural values held by the Aboriginal groups and people which may not have been identified during the archaeological investigation or historical research; and
- provide an understanding of the cultural values of information obtained during archaeological investigation or historical research and other investigations.

The Aboriginal heritage assessment was undertaken in consultation with all identified Aboriginal community groups, and AMBS liaised with their representatives throughout all stages of the process. Each of the stakeholder Aboriginal communities was initially contacted regarding Steps 2 and 3 of the Precinct Assessment Method on 6 February 2008, and all had been involved in Step 1 of the Precinct Assessment Method undertaken by Heritage Concepts (2006).

Each community was provided with details of the proposed survey methodology, and invited to participate in the field survey. Appropriate representatives from the community groups were engaged to participate in the fieldwork program. Aboriginal community groups who participated in the fieldwork are listed in Table 2.1.

Table 2.1 Aboriginal community fieldwork participants

Aboriginal Community Organisation	Field Representative
Cubbitch Barta Native Title Claimants Aboriginal Corporation	Glenda Chalker, Alfred Fazldeen
Darug Aboriginal Cultural Heritage Assessments	Gordon Morton, Tim Wells
Darug Custodian Aboriginal Corporation	Leanne Watson, Justine Coplin
Darug Tribal Aboriginal Corporation	Gordon Workman, Shane Loch, Greg Morley, Eve McMartin, John Riley, Dennis Hardy
Tharawal Local Aboriginal Land Council	Donna Whillock, Cliff Foley
La Perouse Botany Bay Aboriginal Corporation (represented by NIAC)	Keith Simms, Yvonne Simms
Wadi Wadi Coomaditchie Aboriginal Corporation (represented by NIAC)	Allan Carriage, Keith Ball
Woronora Plateau Gundungara Elders Council (represented by NIAC)	Paul Cummins

Information provided by the Aboriginal community groups in the initial consultation phase, and during the field survey, has been integrated into the assessment where appropriate.

The draft Aboriginal heritage assessment report was provided to each group for review and comment in October 2008, prior to change being proposed to the southern flyover. The revised draft report was provided to each group for review and comment in April 2010, prior to the field inspection of the proposed access tracks at Edmondson Park Station and the Leppington stabling facility. Information provided by the Aboriginal community groups following review of the draft report has been integrated into the assessment and associated documentation, and also attached to this report upon receipt (see Appendix C), where appropriate. A meeting or workshop will be arranged to discuss further Aboriginal social/cultural values to integrate into the report, if required.

3 Environmental Context

Consideration of environmental factors at work within the study area may provide a comparative basis to assess the potential for heritage sites to be present within the study area. This section is summarised from Heritage Concepts (2006) and supplemented from additional sources. It includes an overview of the site's geology and topography, soils, hydrology and drainage systems, flora and fauna, and land use and disturbance.

3.1 Geology & Topography

The topography of the study area consists of low hills (of maximum elevation c.70-80m asl) and gently undulating plains. The area is located on Hawkesbury Sandstone, overlain by Minchinbury sandstone, and Triassic Wianamatta shales (Bringelly and Ashfield). Quaternary alluvium, gravel, sand, silt and clay underlies the eastern part of the study area, in the area of the Georges River (Sydney 250 000 Geological Map). These geological formations do not tend to be sources for Aboriginal stone tool raw materials.

3.2 Soils

The dominant soils in the study area are those of the Blacktown and Luddenham landscapes (Bannerman & Hazleton 1990). These soils are characterized by red and brown podzolics and earthy clays on crests, upper slopes and well drained areas, and yellow podzolics in lower, poorly drained areas and watershed drainage areas (Chapman & Murphy 1989; Hazleton & Tille 1990). South Creek soils, comprising red clays and sands and yellow podzolics, occur mainly in drainage lines, flats and floodplains soils (Hazleton & Tille 1990). The potential for stratified or *in situ* archaeological deposits is most likely in the fluvial South Creek soils which underlie Maxwells, Cabramatta and Kemps Creeks.

3.3 Hydrology & Drainage

The Georges River is located to the east of the study area, with Bunbury Curran Creek branching off south of the eastern (Glenfield) part of the study area. The proposed rail alignment crosses Cabramatta Creek and a number of small unnamed tributaries at different points throughout its length, and Kemps Creek near its western end. The rail alignment also proposes to cross the Sydney Water Supply Upper Canal. The presence of these creeks and small tributaries, being potential water sources for Aboriginal people in the past, indicates that Aboriginal sites may be present throughout the area.

3.4 Flora & Fauna

Vegetation present in the study area would once have included open forests of spotted gum, grey box, broad and narrow leaved iron bark and red gum, and Sydney blue gum and Blackbutt in wetter areas (Chapman & Murphy 1989; Hazleton & Tille 1990). Four native vegetation communities presently remain in the study area, being Shale Hills and Shale Plain Woodland (sub units of Cumberland Plain Woodland), and Alluvial Woodland and Riparian Forest (sub units of Sydney Coastal River Flat Forest). However, these communities are predominantly regrowth, as the area has been extensively cleared since European settlement. Such clearing impacts the integrity of archaeological deposits, and will have removed any trees modified (scarred or carved) by Aboriginal people in the past.

The faunal resources that would have been present in the study area with the potential to be exploited by local Aboriginal people may include kangaroo, kangaroo rat, wallaby, echidna, possum, and various kinds of lizards, snakes and birds (Heritage Concepts 2006:15).

3.5 Land Use & Disturbance

Land use in the vicinity of the study area comprises predominantly pastoralism, agriculture, horticulture (market gardening) and residential use. Hurlstone Agricultural High School (HAHS) is located in the vicinity of the eastern part of the study area. Ingleburn Military Area is to the west of HAHS. The Forest Lawn Memorial Gardens Cemetery takes up a large area of land on the south western branch of Camden Valley Way, in the vicinity of Cemetery Curve, in the central part of the study area. Commercial land use is mainly located to the north of the study area, in the immediate vicinity of Camden Valley Way.

The various land use activities have resulted in the majority of the study area having been extensively cleared of its original vegetation, particularly mature trees. Further disturbance has resulted from the development of infrastructure associated with various land use activities. This consists predominantly of roads, electricity and telecommunications transmission lines, water/sewage pipelines, including the Upper Canal, and the current railway line at the eastern end of the study area. In particular, the project route proposes to cross the following roads:

- Quarter Sessions Road;
- Macquarie Links Road
- Hume Highway;
- Campbelltown Road;
- Camden Valley Way;
- Cowpasture Road;
- Rickard Road;
- Dickson Road; and
- Eastwood Road.

Further, there is an electricity transmission line in the western part of the study area (through the property at 227 McCann Road), and on the Camden Valley Way properties in the vicinity of Adventureland, and there is a pipeline on the property adjacent to (east of) the Upper Canal.

These disturbances will have affected the integrity of the archaeological resource, particularly subsurface artefactual deposits, in the above-mentioned areas. Further, any trees modified (scarred or carved) by Aboriginal people in the past are unlikely to remain in the study area.

4 Archaeological 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 DECCW Aboriginal Heritage Information Management System (AHIMS). This review and discussion allows the development of a predictive model for potential Aboriginal sites within the study area, and establishes a context for a comparative significance assessment.

4.1 Regional Archaeological Context

At the time of European settlement, the Aboriginal people of the Sydney region were organised into named territorial groups. The groups local to the study area would most likely have belonged to the Darug and Gundundurra (and possibly the Dharawal) language groups (Attenbrow 2003:34).

The spread of urban development on the Cumberland Plain, particularly over the last thirty years, has meant that archaeological investigations have intensified with the need for environmental impact assessments. Most archaeological investigations conducted within this framework have been restricted by small study areas (as defined by individual developments) and limited project briefs.

As a result, the Cumberland Plain has become the most intensively investigated archaeological landscape in Australia. These studies carried out over these decades of development in the west provide a broad picture of the archaeological context of the region.

Aboriginal occupation of the Sydney region is likely to have spanned at least 20,000 years, although dates of more than 40,000 years have been obtained from 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.11,000 BP at Mangrove Creek and Loggers Shelter (Attenbrow 1981, 2004), and c.20,000 BP at Burrill Lake on the South Coast (Lampert 1971). 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 (Attenbrow 1987, 2003, 2004; 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 2003).

The most common site types found on the Cumberland Plain are open artefact scatters/open camp sites, followed by scarred trees and isolated finds. Shelter sites and grinding grooves are also found, although mainly around the periphery of the Plain in sandstone geology.

A number of predictive models relating to Aboriginal occupation patterns and site locations have been formulated through archaeological investigations in the Cumberland Plain (Dallas 1989a; Haglund 1980; Kohen 1986; Smith 1989a). More recent works have helped to refine these models (AMBS 2000a, 2002a; Jo McDonald Cultural Heritage Management [JMCHM] 1997, 1999a, 2001; McDonald 1999). Key trends are summarized below:

- site frequency and density are directly related to their location within the landscape;
- many site types are represented, however low density surface open artefact scatters and isolated finds are most common;

- high concentrations of artefacts are more likely to be located within resource rich areas;
- fewer sites occur on ridgetops and hill crests;
- artefact scatters are most commonly linked to the close proximity of permanent water sources in areas such as creek and river banks and alluvial flats. The majority of these sites are located within 100m of permanent fresh water;
- sites situated in alluvial soils retain the potential for stratified deposits;
- complex sites are usually located close to permanent water sources, with major confluences being key locations for occupation sites. Such areas were used intensively by larger groups or used repeatedly by smaller groups over a longer period of time;
- artefact assemblages generally comprise a small proportion of formal tool types with the majority of assemblages dominated by flakes and debitage;
- silcrete is the dominant raw material used for tool manufacture, followed by chert. Silcrete sources are located in the north western Cumberland Plain at places such as St Marys, Plumpton Ridge (the closest source to the study area, c.16km north), Marsden Park, Schofields, Riverstone, Deans Park, Llandilo and Ropes Creek. Other raw materials include indurated mudstone from Nepean River gravels, quartz and volcanic stone which may be derived from Rickabys Creek gravels, and basalt;
- evidence of post-contact camp sites may be located in close proximity to early European houses and farms, or official buildings;
- stands or remnant old growth vegetation retain the potential for scarred trees to be present; however, large-scale land clearance of the plain in general means that such stands of vegetation are rare;
- Potential Archaeological Deposits (PADs) are most likely to be situated along valley floors and low slopes in well-drained areas; and
- surface artefact distribution does not accurately reflect the composition or density of subsurface archaeological deposits. Those areas with few or no surface manifestations have often been shown to contain subsurface archaeological deposits.

The most prominent of these regional trends suggest that Aboriginal sites are most frequently located close to permanent water courses in areas such as creek banks and alluvial flats, or on high ground in close proximity to water sources; and within range of resources such as food and the raw materials for tool making. However, other work has demonstrated some exceptions. For example, excavations at Mungerie Park and Parklea Leisure Centre identified large artefact scatters located up to 200-250m from major watercourses (AMBS 2000a, AMBS 2002b). McDonald suggested that this site distribution pattern may be due to surface visibility and site formation processes, rather than a true depiction of the cultural distribution of artefacts across the landscape (1994, cited in Mills & Kelton 2002). Most recently, ENSR Australia Pty Ltd (ENSR) undertook excavations at the Oran Park and Turner Road Land Release Precincts, approximately 5km south of the project study area, and concluded that:

> *The archaeological landscape revealed by this investigation suggests that archaeological models derived from other regions or other areas should not be applied uncritically. There was no evidence for greater complexity (defined as intricacy) associated with confluences. There was no evidence of greater densities of archaeological material associated with higher order watercourses. Instead it appears that archaeological deposit in the south west [Cumberland Plain] is of relatively low density with occasional clusters in association with all areas of reliable water regardless of stream order. Future assessments in south west Sydney would benefit from paying greater attention to the investigation of areas within 300 m of all reliable watercourses (i.e. more than the conventional 50 m vicinity of watercourses) (ENSR 2009:66).*

ENSR also found that large sites tended to be located in elevated areas with a good outlook over surrounding major creek valleys, over 150 metres away from creeks. It was suggested that this may reflect strategic defensive positioning of camp sites within a cultural interaction zone between three different language groups – the Darug, Gundungurra and Thawaral speaking peoples (ENSR 2009). It should be noted that the ENSR excavations were concerned with testing archaeological patterning throughout a large landscape; however, this type of landscape model has not been extensively tested in other archaeological studies. It is also possible that the "strategic defensive positioning" of sites will not be seen in areas that were not major cultural interaction zones between Aboriginal groups.

Previous studies have also highlighted the problems inherent in characterising archaeological sites on the Cumberland Plain solely by the presence of visible surface stone artefacts, and the importance of test excavation in establishing the nature and density of archaeological material in the Cumberland Plain. Studies have demonstrated that the average ratio of subsurface artefacts to those found at surface could be 25:1, with more recent work indicating this could be as much as 2,000:1 in some locations (JMCHM 2001). Further, the detection of sites is often influenced by factors such as previous land-use and disturbance, and location within the landscape (JMCHM 2003). A high proportion of sites located in the region are found in disturbed contexts (e.g. Smith 1989a).

4.2 Local Archaeological Context

4.2.1 Ethnographic Context

The Aboriginal history of the Campbelltown area was compiled as a Bicentennial project by Liston (1988). This study documents interactions between Europeans and the Tharawal people from the early 18th century. Traditionally, this area was thought to be close to the intersection of a number of language group (tribal) boundaries. Language groups include the Dharug who inhabited much of the Cumberland Plain between the Blue Mountains and the coast, the Tharawal who ranged from the coast westwards towards Camden, and the Gandangara who inhabited areas westward and southwest of the Tharawal and into the Blue Mountains. The Tharawal people and other Aboriginal groups continue to be active in the Campbelltown area (Liston 1988).

4.2.2 Site Types

The AHIMS search revealed a total of 185 sites within an area 17.5km x 8km centred on the study area (AMGE 292000-309500, AMGN 6235000-6243000; see Figure 4.1 and Apart from the new sites recorded by AMBS during the 2008 project assessment, there are ten previously recorded sites located in close proximity to the project route: sites SW1-4, SWST1, ISF1, MFH#2, EPCS4, EPCS7 and EPCS10 (see Figure 4.1, Table 4.2 and Section 4.2.3). The recorded AHIMS coordinates of EPCS7 place this site at a distance from impact zone; however, when compared to the topographic map in the AMBS (2003a) report, it is located within the construction footprint area. This is considered to be the correct location of the site. Although the AHIMS coordinates of site ISF2, recorded by Dallas (1999) place it within 10m of the construction footprint, the location recorded on the map by Dallas (1999) places the site at a distance from the SWRL alignment (see below). Further, the AHIMS coordinates of site MFH#2 place it approximately 230m from the SWRL footprint, but the location recorded on the map by Dallas (1989b) places the site approximately 14m from the SWRL alignment, and the associated area of PAD within the SWRL footprint (see below).
Table 4.1). This includes the sites recorded by AMBS in 2008 as part of the original Aboriginal heritage assessment for the project. Sites that are not registered on the AHIMS, but are within the area for which the AHIMS search was undertaken (up to approximately 3km outside the study area), include six sites and one possible scarred tree recorded by Heritage Concepts (2006), six sites recorded by AMBS (2003a) and four isolated find sites recorded by Dallas (1999). Stone artefact sites (scatters and isolated finds) are the most common site types in the area, comprising 85% of the recorded archaeological sites within the search area, while PADs and scarred trees are less common. Shelter sites

(having art such as painting or engraving, or archaeological deposits) and axe grinding groove sites are relatively rare in the region, due to the lack of suitable stone outcrops. Midden sites do not occur due to the distance from the coast and estuarine areas.

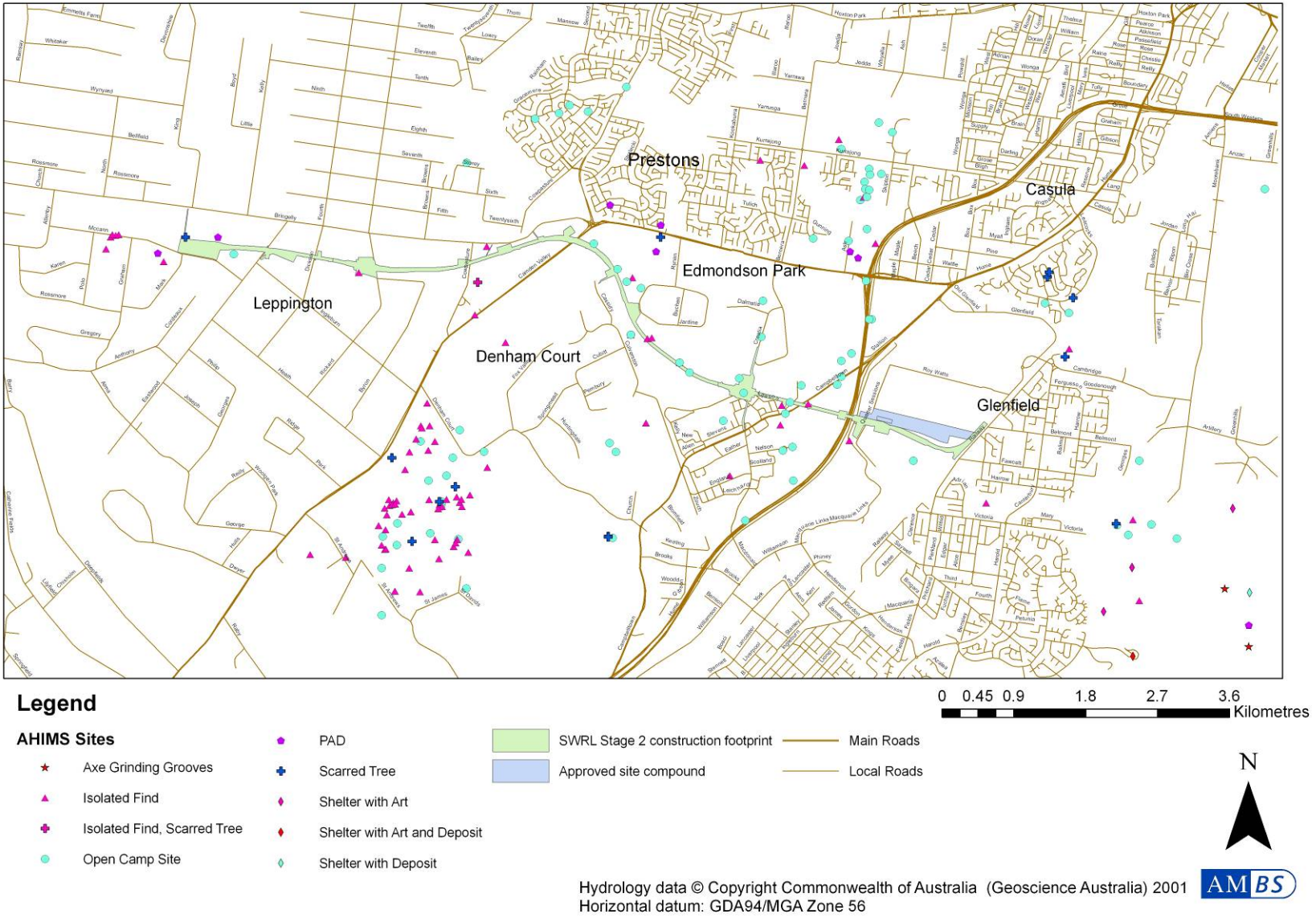


Figure 4.1 Location of previously recorded Aboriginal sites within a 17.5km x 8km search area centred on the South West Rail Link route.

Apart from the new sites recorded by AMBS during the 2008 project assessment, there are ten previously recorded sites located in close proximity to the project route: sites SW1-4, SWST1, ISF1, MFH#2, EPCS4, EPCS7 and EPCS10 (see Figure 4.1, Table 4.2 and Section 4.2.3). The recorded AHIMS coordinates of EPCS7 place this site at a distance from impact zone; however, when compared to the topographic map in the AMBS (2003a) report, it is located within the construction footprint area. This is considered to be the correct location of the site. Although the AHIMS coordinates of site ISF2, recorded by Dallas (1999) place it within 10m of the construction footprint, the location recorded on the map by Dallas (1999) places the site at a distance from the SWRL alignment (see below). Further, the AHIMS coordinates of site MFH#2 place it approximately 230m from the SWRL footprint, but the location recorded on the map by Dallas (1989b) places the site approximately 14m from the SWRL alignment, and the associated area of PAD within the SWRL footprint (see below).

Table 4.1 Frequency of Aboriginal site types within c.3km of the study area

Site Type	Number	Percentage Frequency (%)
Isolated find	88	43
Stone artefact scatter	84	42
Scarred tree (two possible)	13	6.5
PAD	8	4
Shelter with art	4	2
Axe grinding groove	2	1
Shelter with deposit	1	0.5
Shelter with art and deposit	1	0.5
Isolated find, scarred tree	1	0.5
Total	***202***	***100***
Results of DECCW AHIMS search undertaken on 10 February 2010		

Table 4.2 AHIMS sites within 50m of the study area

Site	Site Type	Approximate Distance from Study Area
SW1	Isolated find	Within SWRL footprint
SW2	Stone artefact scatter	Within 13m of SWRL footprint
SW3	Isolated find	Within SWRL footprint
SW4	Isolated find	Within 40m of SWRL footprint
SWST1	Possible scarred tree	Within 15m of SWRL footprint
ISF1	Isolated find	Within SWRL footprint
MFH#2	Stone artefact scatter	Area of associated PAD within SWRL footprint; surface expression of artefacts within 14m of SWRL footprint
EPCS4	Stone artefact scatter	Within SWRL footprint
EPCS7	Isolated find	Within SWRL footprint
EPCS10	Stone artefact scatter	Originally recorded within 50m of SWRL footprint; now within footprint

4.2.3 Previous Archaeological Investigations

There have been a number of archaeological investigations in the general area (see Appendix A). The reports most relevant to the study area are those by AMBS (2003a), Dallas (1989b, 1999), Heritage Concepts (2006), Navin Officer (2007) and Smith (1989b), all of which report on archaeological investigations undertaken in parts of the current study area.

In the preliminary archaeological assessment of the project study area, Heritage Concepts (2006) identified two stone artefact scatters, four isolated artefacts and one possible scarred tree (see Table 4.2, Table 4.3 and Figure 4.2). Two of the isolated finds (SW1 and SW3) are located within the SWRL footprint and will be impacted, while stone artefact scatter SW2 and isolated find SW4 are

within 40m of the SWRL footprint and may be impacted. The possible scarred tree (SWST1) is within 15m of the SWRL footprint – the Leppington stabling facility access track.

Further assessment of all of the sites identified by Heritage Concepts (2006) was recommended and is undertaken, where appropriate, by this assessment.

Table 4.3 Summary of Aboriginal sites located by Heritage Concepts (2006)

Site Name	Site Type	Material	Landform
SWST1	Possible scarred tree	Grey box eucalypt	Flat ground, c.500 from creekline
SW1	Isolated find	1 quartz artefact	Low slope of a closed depression
SW2	Artefact scatter c.50mx10m	Mudstone, silcrete and quartz artefacts	Low slope adjacent to creekline
SW3	Isolated find	1 silcrete artefact	Creek flat
SW4	Isolated find	1 mudstone artefact	Creek flat
SW5	Artefact scatter	2 mudstone artefacts	Ridge near creekline
SW6	Isolated find	1 red-grey silcrete artefact, quartz inclusions	Ridge near creekline

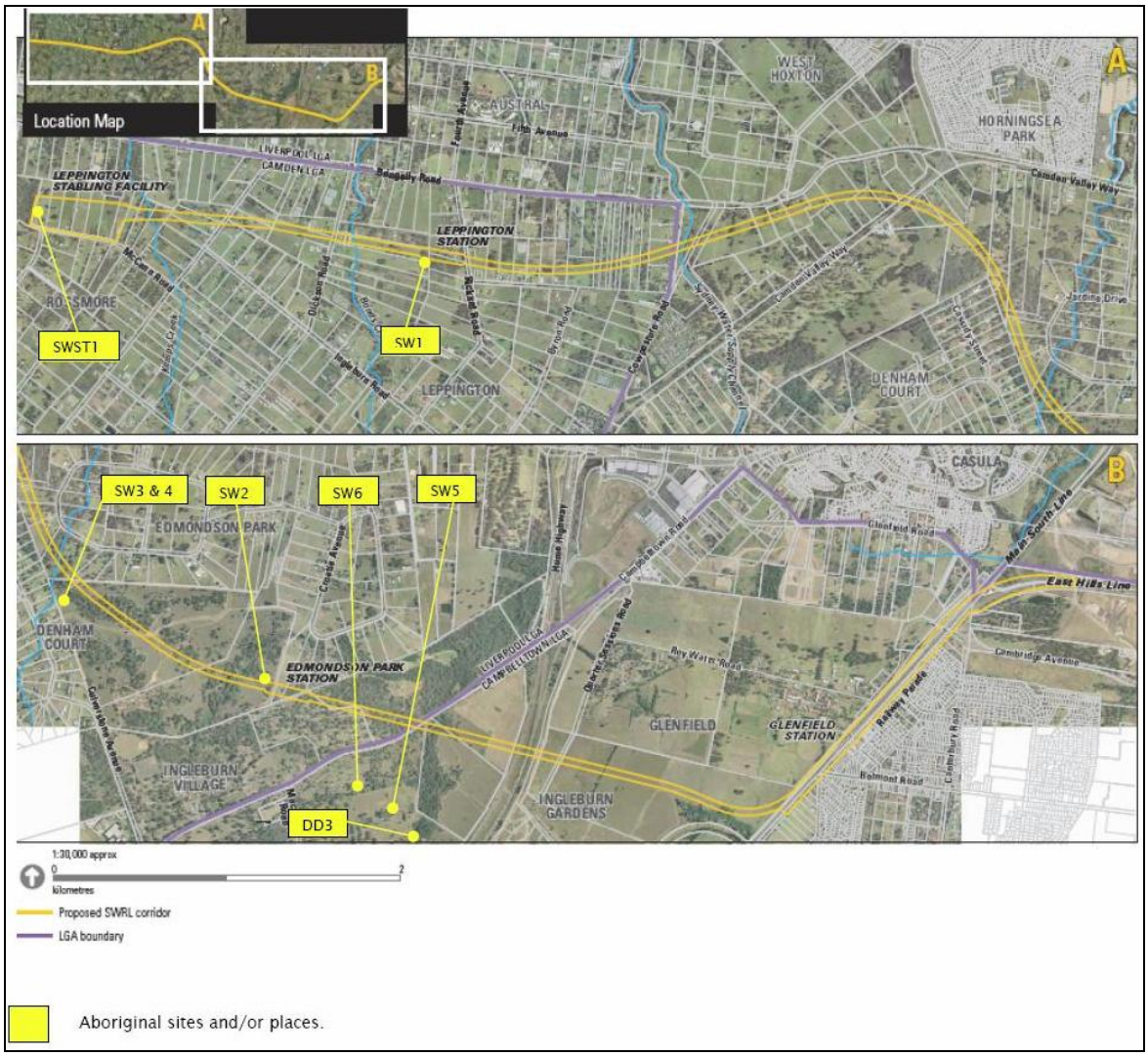


Figure 4.2 Aboriginal heritage sites recorded by Heritage Concepts (Source: Heritage Concepts 2006:50). (NB. Heritage Concepts include Site DD3 in this figure because they were able to verify its location during their survey; however, it was not recorded by them originally.)

Smith (1989b) surveyed approximately 2700ha in the Liverpool Release Areas, including part of the study area at Edmondson Park. Twelve of the artefact scatters and the scarred tree site identified

during that study are located within c.3km of the study area; however, none of these sites are within the proposed impact area of the rail alignment.

Dallas (1989b) surveyed the Macquarie Fields House Estate, the north part of which includes part of the current study area (north of Macquarie Fields House; currently overgrown with grass). A low-density artefact scatter (AHIMS#45-6-2495, MFH#2) was located within the impact area of the eastern end of the proposed Estate, and an adjacent area of PAD was identified as potentially representing Aboriginal occupation focused around a bend of Bunbury Curran Creek (see Figure 4.3). This site was later subject to test excavation as part of assessments for a proposed housing subdivision, and was found to comprise a low density background scatter of stone artefacts, of types common in the region, and hence of low archaeological significance (Dallas 2000).

Dallas, Irish & Steele (2002) surveyed the land between the railway and the Hume Highway, south of Hurlstone Agricultural High School and north of Macquarie Fields House, but did not locate any additional artefacts. They also considered it unlikely that extensive, *in situ* archaeological deposits would be present in the area.

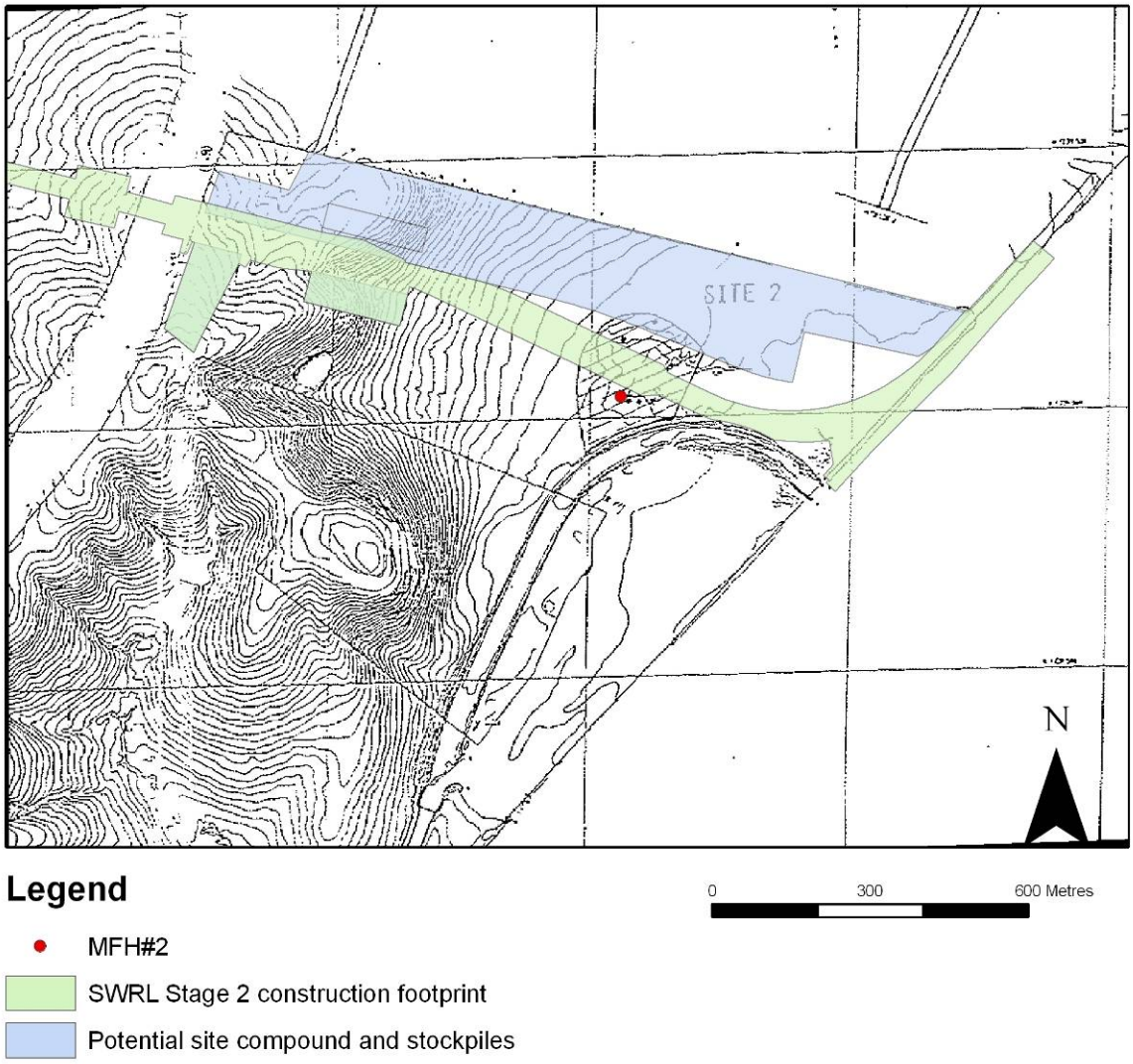
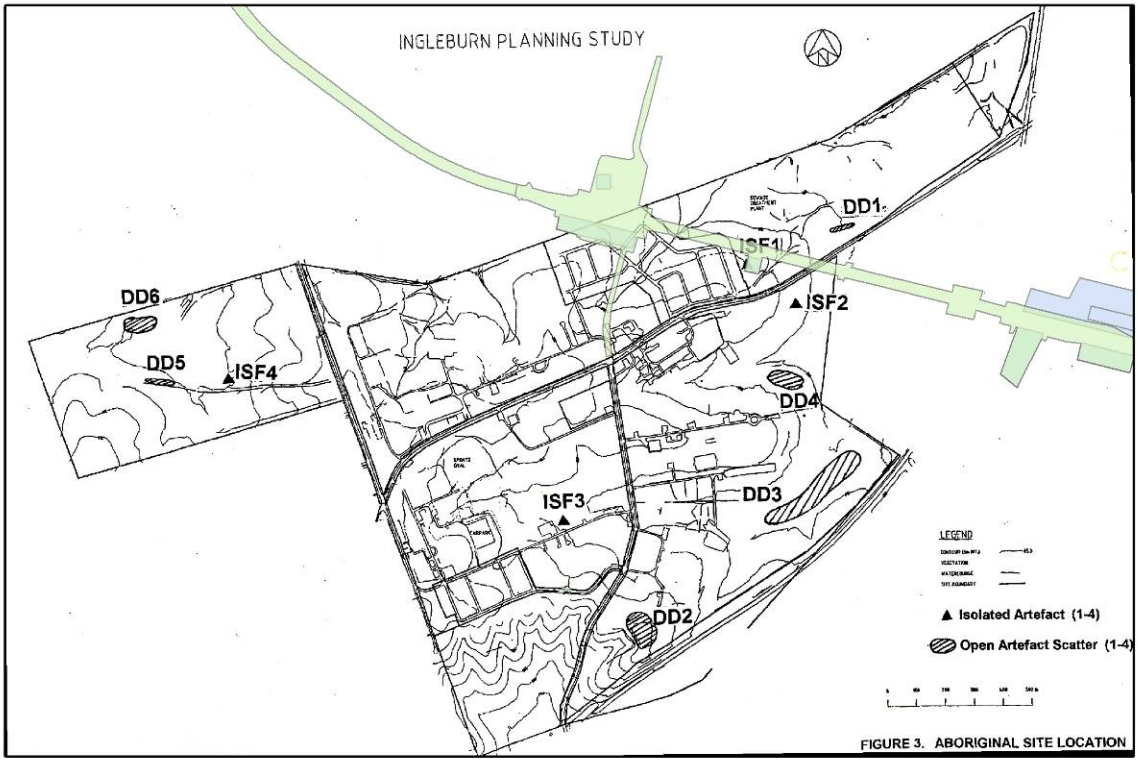


Figure 4.3 Location of MFH#2 and adjacent area of PAD (cross-hatching) in relation to the proposed SWRL development (Dallas 1989b: Map 3).

GML (2000) surveyed a small part of the rail alignment along Quarter Sessions Road. One isolated find (MLE#1) was located on a grader track, approximately 400m north of the rail alignment, and a S.90 consent to destroy the site was granted.

Dallas (1999) surveyed the Department of Defence lands at Ingleburn and located 10 stone artefact sites (see Figure 4.4). ISF1 (a silcrete flake recorded in an eroded firebreak behind Ingleburn Village accommodation) is located within a potential site compound area. Given the level of disturbance in these areas, the poor condition of the sites and the low likelihood of subsurface material to be present, the sites were assessed as having low significance.



Legend

SWRL Stage 2 construction footprint

Potential site compound and stockpiles

Figure 4.4 Location of sites recorded by Dallas (1999:Figure 3) in relation to the proposed SWRL development.

AMBS surveyed and prepared an Aboriginal Heritage Management Plan for the Edmondson Park Composite Site (EPCS), which includes part of the study area at Edmondson Park (2003a). It was noted that 13 artefact scatters and five isolated finds had previously been recorded across the EPCS, comprising a total of 276 artefacts, and that "[m]ost sites were located in areas of low or moderate disturbance along tributaries of Maxwells Creek, either on the alluvial flats immediately adjacent to the creekline or on the associated elevated, gently sloping undulating rises above the creeks" (AMBS 2003a:10).

The 2003 AMBS survey located 15 new stone artefact sites (comprising a total of 32 artefacts), of which one, EPCS4, was within the proposed South West Rail Link alignment (see Figure 4.5). Site EPCS4 was described as a small artefact scatter comprising three stone artefacts (one distal flake, one silcrete flake and one mudstone flaked piece) located on the dirt vehicle access track running up a low

slope behind Bardia Village, above a tributary of Cabramatta Creek and was considered to have high potential for *in situ* subsurface archaeological deposit because of its prime geographic location on a slope within the same creek confluence as EPCS3. The site was also identified as having high cultural significance (AMBS 2003a:31). The report recommended test excavation and salvage of the archaeologically sensitive area at the creek confluence associated with EPCS3 and 4, where impact cannot be avoided (AMBS 2003a:37).

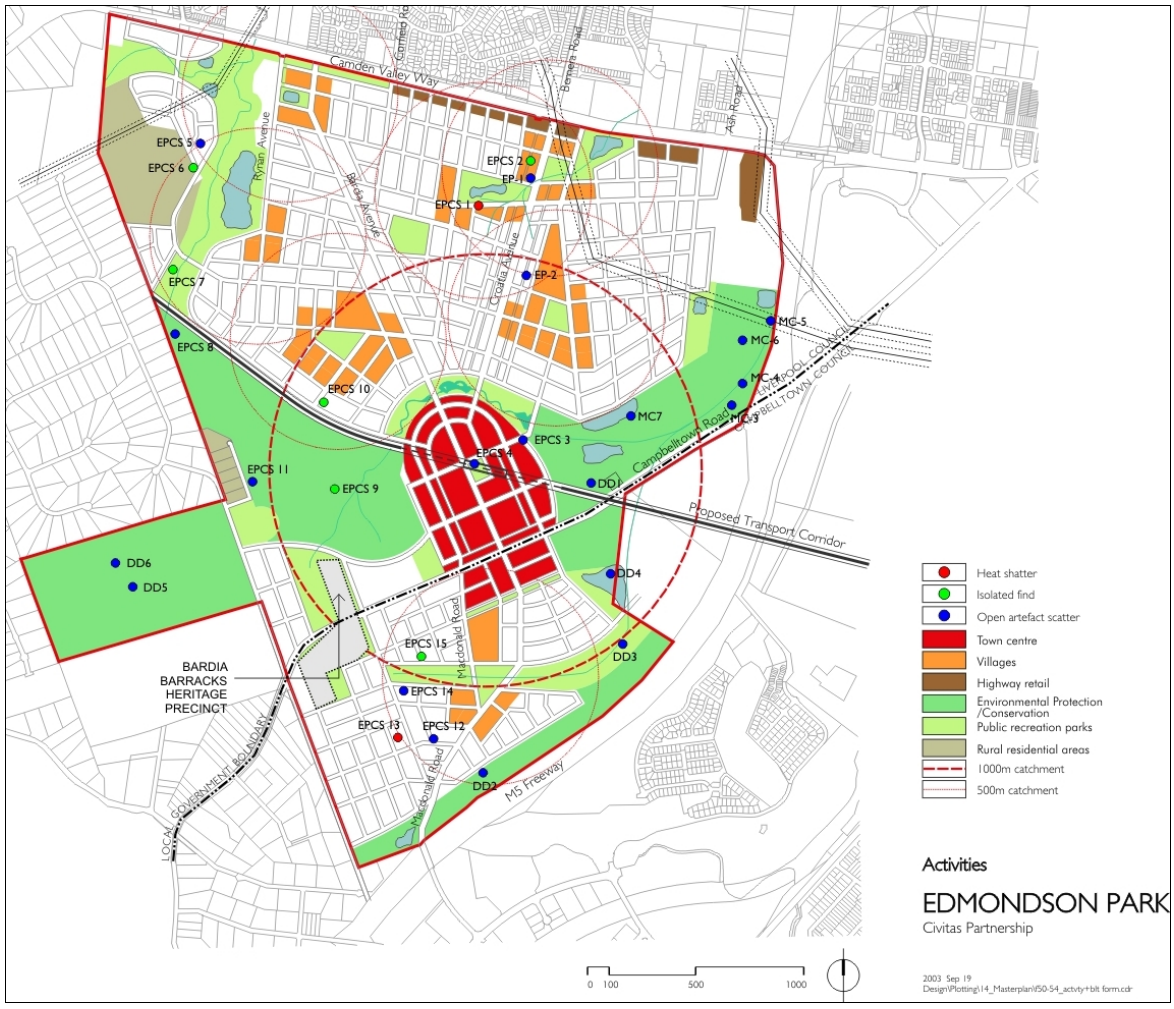


Figure 4.5 Location of sites in Edmondson Park (AMBS 2003a:Figure 6).

In the 2003 assessment for Edmondson Park, site EPCS7 was located within an area proposed for preservation as parkland. However, under the proposed project development, the site is located within the SWRL footprint area. Although EPCS7 is an isolated stone artefact, AMBS (2003a:25) considered the site to have moderate archaeological potential, as it was located 10-15 m from the creek bank where the topsoil profile is 10-50cm deep, and the creek corridor in this area was relatively undisturbed.

Two other sites, EPCS8 and EPCS10, are within the vicinity of the proposed rail alignment. Although the originally recorded locations of these sites are not within the impact zone of the proposed project route, the extents of these sites have been enlarged as a result of the current field survey, and they are discussed further in Section 5 (and following).

The report identified several areas of sensitivity where *in situ* archaeological deposits were considered likely to remain. Most sensitivity areas are associated with known surface archaeological

manifestations or landforms conducive to Aboriginal occupation. Areas were divided into four categories in accordance with their estimated archaeological potential:

- areas of high sensitivity are those where the original landscape has not been significantly disturbed and include locations conducive to Aboriginal occupation. These locations have either surface archaeological evidence and/or have the potential to yield substantial subsurface archaeological deposits based on landform and degree of disturbance;
- areas of moderate sensitivity are those where the original landscape has been partially disturbed by past land uses although subsurface archaeological deposits are likely to remain intact to some degree. These locations have been identified by surface archaeological evidence or their potential to yield subsurface archaeological deposits based on landform and degree of disturbance;
- areas of low sensitivity are those where the original landscape has been more substantially disturbed by past land uses and subsurface archaeological deposits are likely to remain intact to a lesser degree. Locations were identified by surface evidence or their potential to yield subsurface archaeological deposits based on landform; and
- the remainder of the site has been categorised as disturbed landscape because of the substantial degree of previous land disturbance that has taken place. While the presence of archaeological material within these zones cannot be ruled out, it is considered unlikely that intact archaeological deposits would still be present (AMBS 2003a:27-30).

Figure 4.6 shows the location of areas of high, moderate and low sensitivity identified by AMBS in 2003.

Although site EPCS10 was assessed as having low archaeological potential for *in situ* deposits because the slope on which it is located is moderately steep, and to have low significance since it was likely the artefact had been washed down slope and was therefore out of context, the site was considered to be part of an area of high sensitivity due to its proximity to the creek and was recommended to be preserved (AMBS 2003a:26, 29, 37). Further, the headwater tributaries of Cabramatta Creek in the vicinity of EPCS8 were assessed as having moderate archaeological sensitivity but EPCS8 was considered to have low archaeological potential. As the area had been built up, and the creekline modified as a result, it was deemed unlikely that the artefacts were *in situ* or that intact archaeological deposits would be present in the immediate area (AMBS 2003a:25, 29). Nevertheless, the site was identified as being within a conservation corridor and not to be impacted (see Figure 4.6).

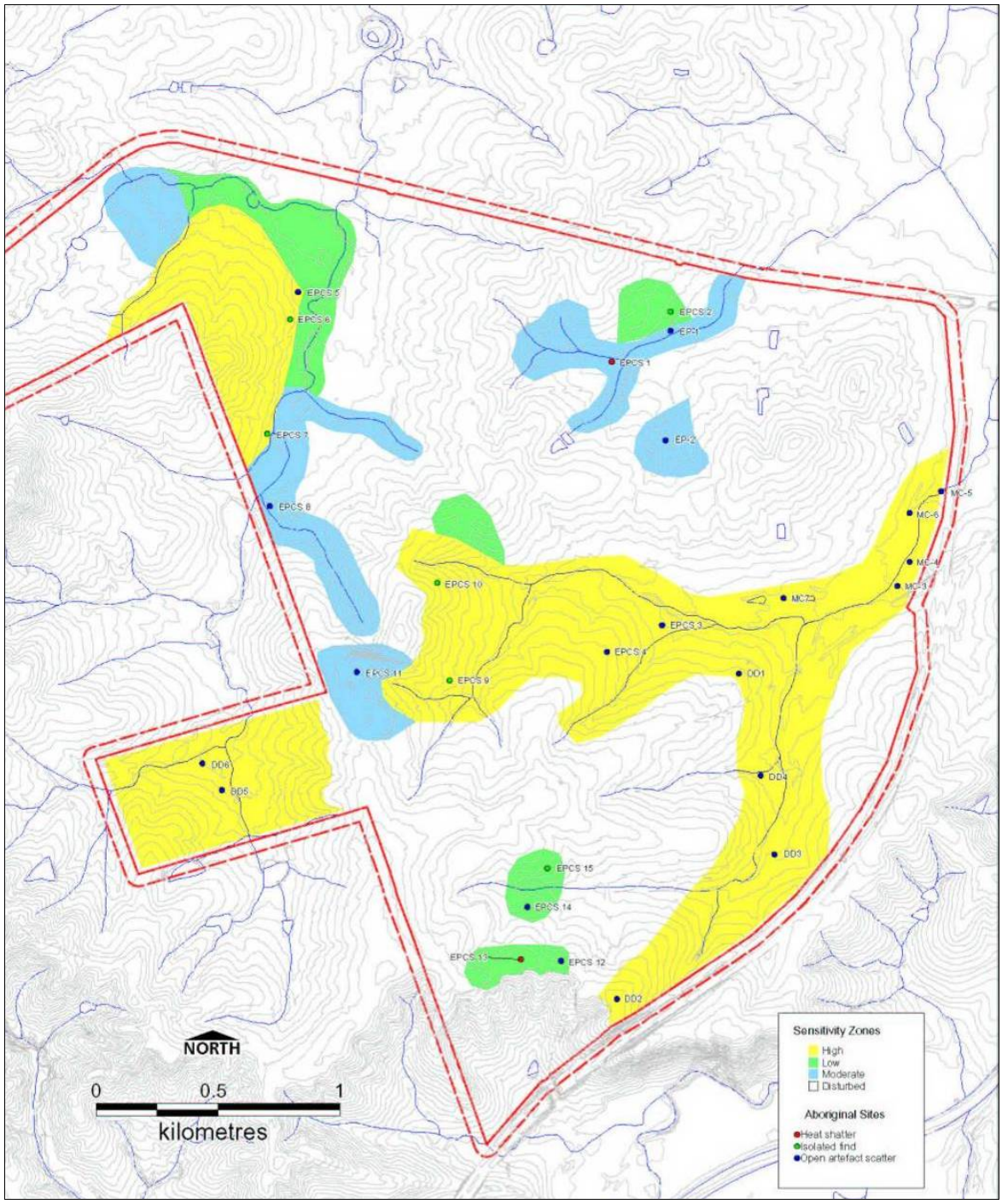


Figure 4.6 Archaeological sensitivity zones within EPCS (AMBS 2003a:Figure 4).

The rise overlooking Cabramatta Creek, including site EPCS5, was subject to test excavation by Navin Officer (2007). A total of 68 test pits were mechanically excavated throughout this area, in areas of least disturbance (see Figure 4.7). A low density of artefacts were recovered, 33 in total recovered from 68 excavated pits, with the majority situated on a low slope near the banks of a second order tributary of Cabramatta Creek. At this time, an isolated find was located in Pit 23, and was identified as a new site, LLB1. It was recommended that this area required no further archaeological assessment.

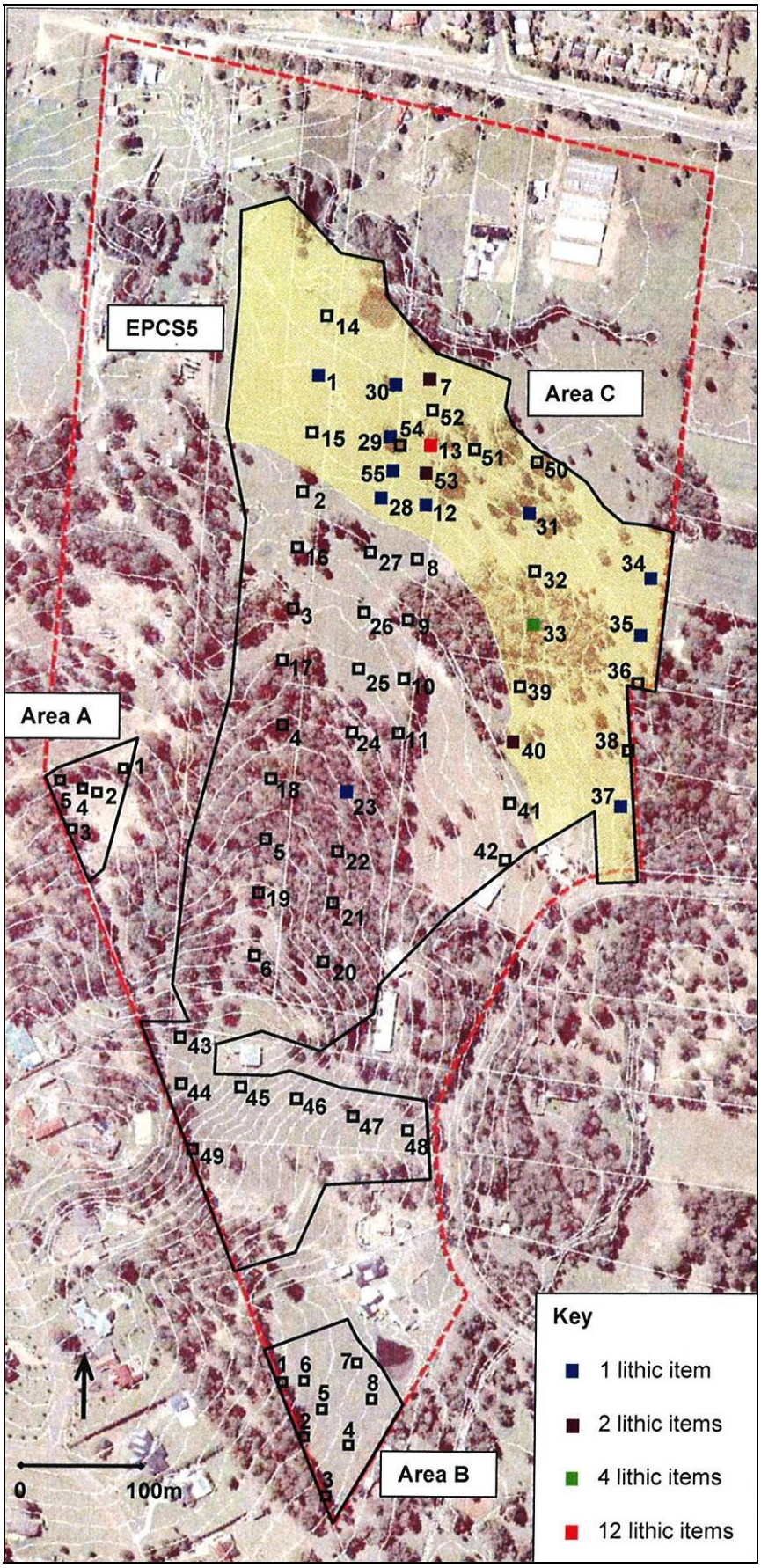


Figure 4.7 Location of test pits excavated by Navin Officer (2007:27).

4.3 Aboriginal Heritage Site Prediction Modelling

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

- stone artefact sites are the most common site type occurring across the landscape, and are the type of sites most likely to be present in the study area. This site type usually appears as surface scatters of stone artefacts in areas where vegetation is limited and ground surface visibility increases. While found in all environmental contexts, larger and denser sites tend to be found on riverbanks and slopes overlooking watercourses, as well as ridgelines and other areas that offer movement routes. However, such sites are likely to have been significantly disturbed (and hence not *in situ*) by the construction of the existing railway, roads, past agricultural practices and other development;
- stone artefact density will be greater in closer proximity to the Georges River, although given that much of the study area is over 1km from the River, sites are more likely to occur in the vicinity of the creek tributary in the northern part of the study area; however, any such sites will not contain the density of artefacts that is likely to be present in the vicinity of the River. Excavations in the region have indicated that high densities of artefacts can be present up to 250-300m from water sources, and that subsurface material may be much greater than indicated by surface numbers of artefacts; and
- the presence of some ground exposure within the vegetation of the proposed rail corridor indicates that artefacts remaining in the study area may be visible during a site inspection.

4.3.1 Sites Unlikely to be Present

On the basis of the archaeological sites registered in the region and review of previous archaeological studies, the following types of sites are unlikely to be present in the study area:

- stone quarry sites, axe grinding grooves, stone engravings/art and shelter sites will not be found in the study area because of the lack of suitable stone outcrops;
- scarred or carved trees are unlikely to be present in the study area as the majority of the route traverses lands have been subject to extensive vegetation clearing and past agricultural practices, resulting in a lack of mature trees; and
- burials and ceremonial sites (including stone arrangements) are unlikely to be present in the area given the disturbance caused by early pastoralism, agriculture, roads and more recent development.

5 Field Survey

5.1 Survey Methodology

The initial Aboriginal cultural heritage site inspection was undertaken over six days, on 6-7 March, 8 and 11 April, and 28-29 July 2008 by Christopher Langeluddecke and Jenna Weston, accompanied by Aboriginal community representatives (see Table 2.1). Additional site inspections were undertaken by Christopher Langeluddecke, Jenna Weston and the Aboriginal community on 9 March, and 7 and 9 April 2010. The fieldwork methodology, the rail alignment and available mapping information were discussed with all Aboriginal community representatives present prior to beginning fieldwork, and copies of topographic maps and aerial photography were made available to all representatives to guide the survey.

The aims of the inspection were to:

- employ the landscape and landform categories developed during Step 1 to inform the survey areas;
- ensure appropriate sampling of undisturbed land and land not previously surveyed;
- record any Aboriginal sites/objects and areas of Potential Archaeological Deposit;
- re-visit known Aboriginal places identified during Step 1 and record their current condition;
- identify those sites or areas where investigation is required to identify their extent and/or significance/value; and,
- identify places or areas of cultural significance to the Aboriginal community.

The inspection methodology involved pedestrian transects throughout the length of the rail alignment corridor, focussing particularly on areas that had not previously been surveyed, and on areas of archaeological potential identified during the preliminary survey. This included relatively undisturbed creeks such as Cabramatta and Maxwell Creeks and their tributaries, Kemps Creek and Bonds Creek, and the proposed train stabling facility and Leppington Station.

Where mature native trees were noted within the study area, they were examined for the presence of Aboriginal cultural scarring. Where Aboriginal artefacts were encountered, notes were made regarding their type, size, and material. Australian Map Grid (AMG) coordinates were taken using a handheld Magellan Explorist 500LE GPS unit, and descriptions of the site of the artefacts were recorded, including the environmental setting and details of any disturbance to archaeological material in the site's vicinity. Photographs of objects and their location were also taken.

5.2 Survey Results

5.2.1 Aboriginal Heritage Sites

The locations of five previously recorded Aboriginal sites were identified during the archaeological survey of the proposed project route, and ten new Aboriginal heritage sites were recorded. The previously recorded sites are SWST1, EPCS4, DD1, EPCS10 and EPCS8, with site EPCS8 incorporating previously recorded sites SW3 and SW4 (sites SW3 and SW4 have been incorporated into EPCS8, given that they are located within the same landform, in close proximity to this site). Sites ISF1, MFH#2, EPCS7, SW1 and SW2 are not included in this section, as no evidence of these sites was observed during the survey.

The new sites comprised seven artefact scatters and two isolated stone artefacts. The ten new identified sites are referred to in this report as SWRL Sites 1 to 10, dependent upon the order in which they were recorded. A summary of sites identified during the survey is presented in Table 5.1,

and their location relative to the overall proposed railway corridor is presented in Figure 5.1. Figure 5.2, Figure 5.9, Figure 5.12, Figure 5.17, Figure 5.21 and Figure 5.28 show more closely the locations of each site, in order from east to west.

Table 5.1 Summary of Aboriginal heritage sites identified during survey

Site Name	Type	Easting	Northing	Landform	Details
EPCS10 (01)* EPCS10 (02)	Stone Artefact Scatter	301503 301533	6239403 6239428	Slope	5 artefacts recorded 1 previously recorded artefact located
SWRL Site 1	Stone Artefact Scatter	301502	6239575	Slope	5 artefacts recorded
SWRL Site 2	Isolated Artefact	301379	6239528	Flat	1 artefact recorded
EPCS8	Stone Artefact Scatter	300961	6239813	Creek flat	2 artefacts recorded 4 previously recorded artefacts located
SWRL Site 3	Stone Artefact Scatter	300303	6241016	Creek flat	8 artefacts recorded
SWRL Site 4	Isolated Artefact	298965	6240982	Mid-slope	1 artefact recorded
SWRL Site 5 (01)* SWRL Site 5 (02) SWRL Site 5 (03) SWRL Site 5 (04)	Stone Artefact Scatter	302756 302755 302768 302757	6239171 6239136 6239054 6239032	Slope	5 artefacts recorded
DD1	Stone Artefact Scatter	302898	6239142	Slope	5 artefacts recorded 2 previously recorded artefacts located
SWRL Site 6	Stone Artefact Scatter	300601	6240699	Flat/gentle slope	13 artefacts recorded
SWRL Site 7	Stone Artefact Scatter	298808	6240768	Flat	4 artefacts recorded
EPCS4 (01)* EPCS4 (02) EPCS4 (03)	Stone Artefact Scatter	302074 302178 302278	6239146 6239148 6239193	Flat	7 artefacts recorded 3 previously recorded artefacts located
SWRL Site 8	Stone Artefact Scatter	300714	6240540	Flat	18 artefacts recorded
SWRL Site 9	Stone Artefact Scatter	295798	6240883	Creek flat	3 artefacts recorded
SWRL Site 10	Stone Artefact Scatter	300379	6240545	Flat/gentle slope	14 artefacts recorded
SWST1	Possible Scarred Tree	295194	6241097	Flat	Determined not to be an Aboriginal scarred tree

*given the extensive area in which artefacts were located, more than one GPS location was recorded for the site

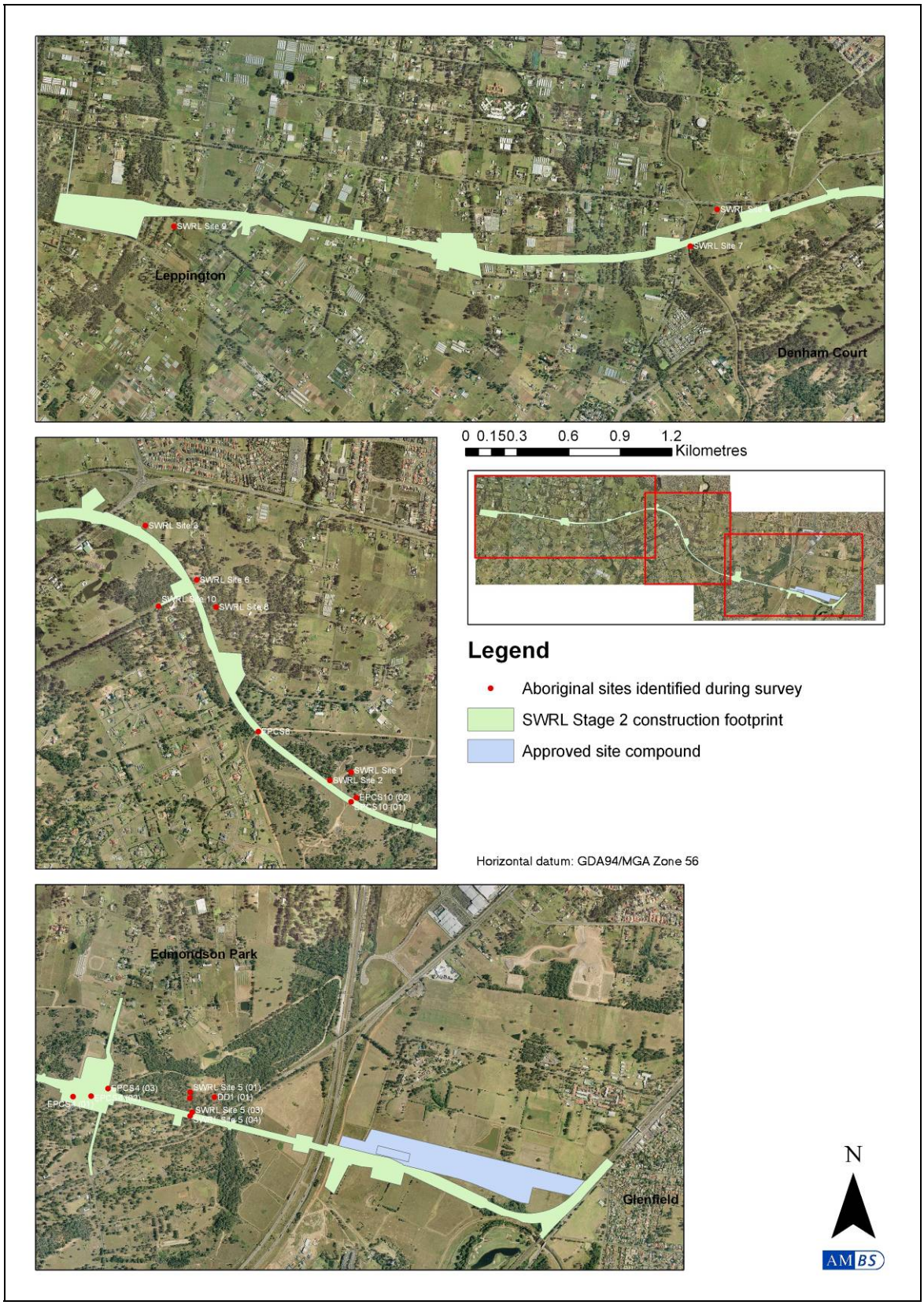


Figure 5.1 Location of Aboriginal sites recorded during the AMBS 2008 & 2010 surveys.

EPCS10 – Stone Artefact Scatter

Landform: Slope
Site Size: 50m x 10m
Exposure: Dirt vehicle track on slope near crest of hill and gravel dump, sloping down to north-east
Site Description: This site is located c.100m south of a small first order tributary of Maxwells Creek and c.300m east of a first order tributary of Cabramatta Creek, within Lot 1 DP807460 (Figure 5.2). The proposed railway line passes through the site. AMBS (2003a) located site EPCS10 in this area (Figure 4.5) and described it as comprising one mudstone artefact (see Table 5.2) within an eroded vehicle track on a moderate slope above a tributary of Maxwells (Cabramatta) Creek. Therefore, this site has been recorded as EPCS10.

During the current survey, five stone artefacts were located on the eroding slope of a vehicle track. One of the artefacts was located near the crest of a hill, three of the artefacts were observed within c.5m of each other around 30m along the track (EPCS10 [01]), while the fifth artefact was located a further 20m downslope (EPCS10 [02]). It seems likely that this fifth artefact had moved down the eroding slope during vehicle use of the track. Artefacts present comprised mudstone, silcrete and quartz, all of which had been flaked. Ground surface visibility within the exposure was around 70%. The site is currently being impacted by erosion from water and from vehicle use.

Table 5.2 EPCS10 artefact details

Material	Colour	Maximum Size (cm)	Artefact Type	Source of Information
Mudstone	Orange	2.5	Flaked piece	AMBS (2003a)
Silcrete	Red	1.5	Flaked piece	Current survey
Silcrete	White	1.5	Flake	Current survey
Mudstone	Brown	2	Flake	Current survey
Mudstone	Cream/brown	2	Flaked piece	Current survey
Quartz	White	1.5	Flake	Current survey

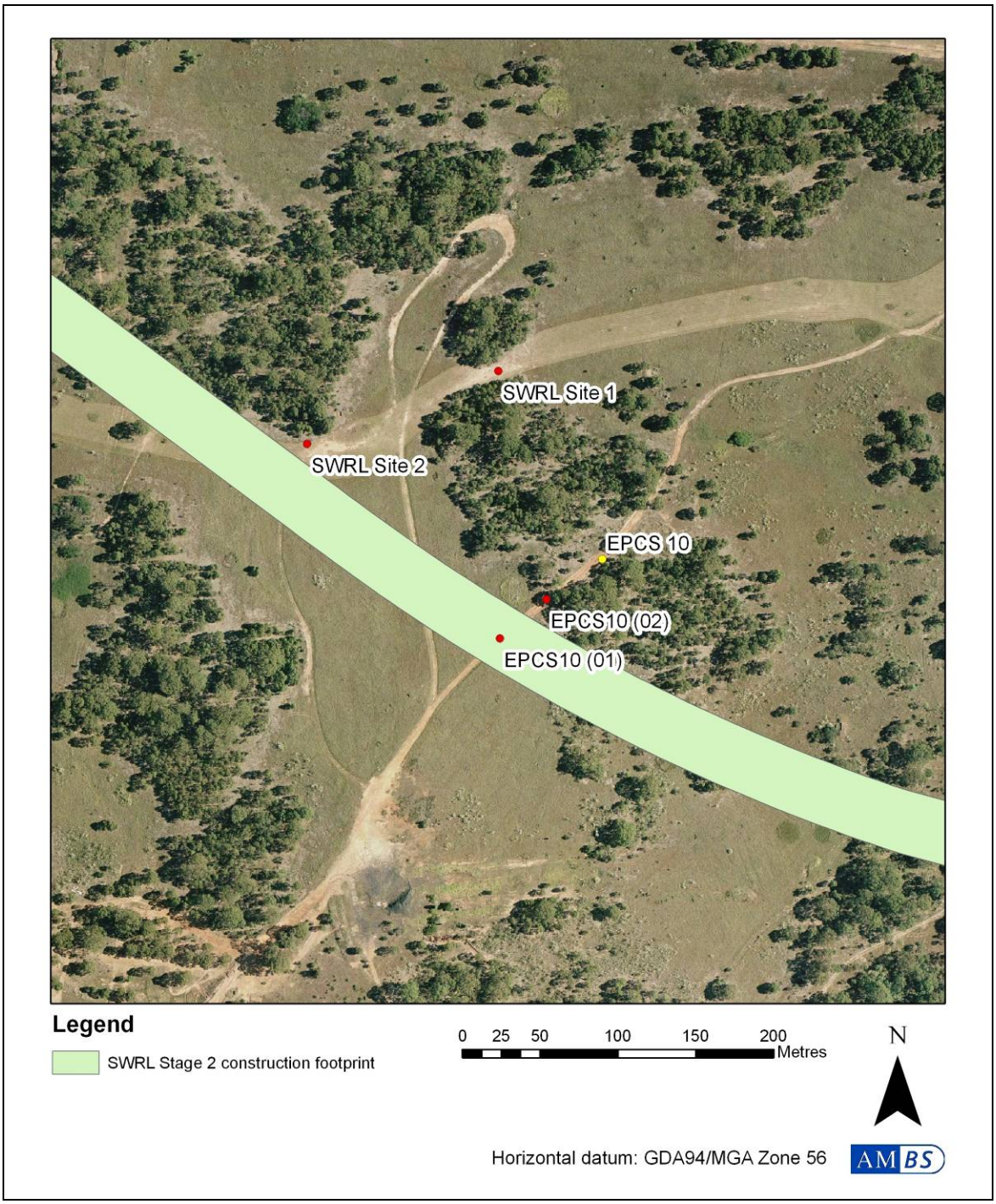


Figure 5.2 EPCS10 (AMBS [2003a] location in yellow, current recorded location in red), SWRL Site 1 and 2.

Figure 5.3 View south west to northern end of EPCS10.

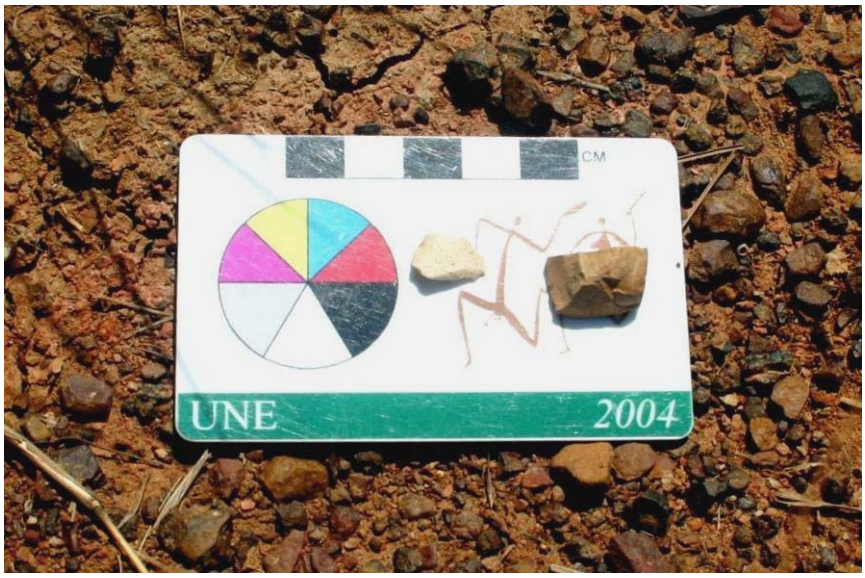


Figure 5.4 EPCS10 silcrete and mudstone artefacts.

SWRL Site 1 – Stone Artefact Scatter

Landform: Slope
Site Size: 30 x 15m
Exposure: Dirt vehicle track
Site Description: SWRL Site 1 is located c.30m north of a small first order tributary of Maxwells Creek, c.400m east of a first order tributary of Cabramatta Creek, and approximately 150m north of the proposed rail alignment, within Lot 1 DP807460 (Figure 5.2). The site comprises five mudstone flakes on a dirt vehicle track which passes through a stand of trees. The site is currently being impacted by erosion from vehicle use of the track.

Table 5.3 SWRL Site 1 artefact details

Material	Colour	Maximum Size (cm)	Artefact Type
Mudstone	Yellow	3	Flake
Mudstone	Yellow	2.5	Flake
Mudstone	Yellow	2	Flake
Mudstone	Yellow	2	Flake
Mudstone	Yellow	2	Flake

Figure 5.5 View south west to SWRL Site 1.

Figure 5.6 SWRL Site 1 mudstone artefacts.

SWRL Site 2 – Isolated Find

Landform: Flat
Site Size: N/A
Exposure: Area adjacent to stand of trees and mown easement/informal track
Site Description: SWRL Site 2 is located c.100m west of a small first order tributary of Maxwells Creek, c.250m east of a first order tributary of Cabramatta Creek, and approximately 20m north east of the proposed rail alignment, within Lot 1 DP807460 (Figure 5.2). The site comprises a single mudstone artefact in an area of erosion adjacent to a mown easement/informal track and an extensive stand of trees. There are no indications of subsurface deposit. The artefact is a distal flake, with evidence of usewear on two of its margins.

Table 5.4 SWRL Site 2 artefact details

Material	Colour	Maximum Size (cm)	Artefact Type
Mudstone	Grey	2.5	Distal flake

Figure 5.7 View east to SWRL Site 2.

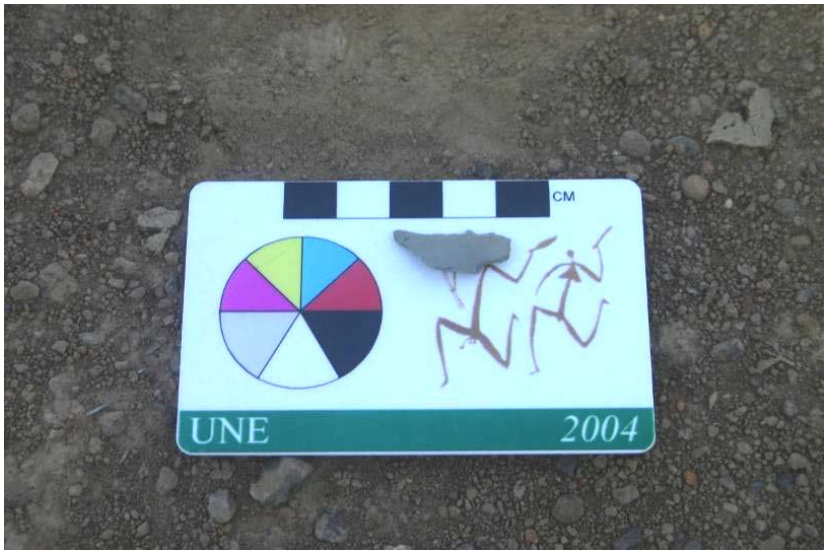


Figure 5.8 SWRL Site 2 mudstone artefact.