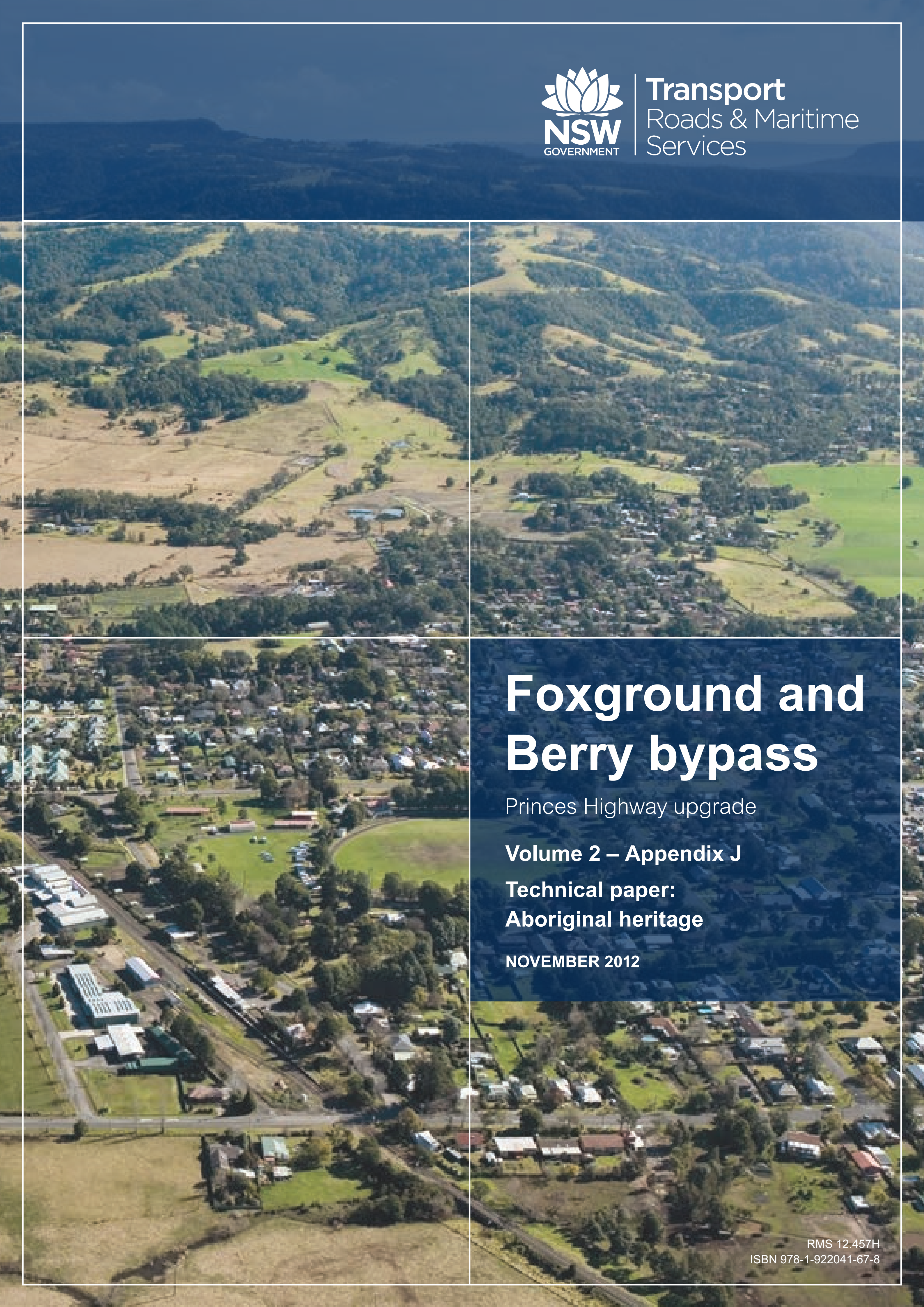

NSW GOVERNMENT | Transport Roads & Maritime Services

Foxground and Berry bypass

Princes Highway upgrade

Volume 2 – Appendix J

Technical paper: Aboriginal heritage

NOVEMBER 2012

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Foxground and Berry bypass

GENERAL (UNRESTRICTED) RELEASE VERSION

Prepared for

Roads and Maritime Service

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November 2012

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Executive summary

The Roads and Maritime Services (RMS) is seeking approval under Part 3A of the *Environmental Planning and Assessment Act 1979* for the upgrade of 11.6 kilometres of the Princes Highway between Toolijooa Road north of Foxground and Schofields Lane south of Berry, in New South Wales (NSW) (the project), to achieve a four lane divided highway (two lanes in each direction) with median separation. The project includes bypasses of Foxground and Berry.

This report presents the results of a program of archaeological survey and subsurface testing undertaken by Navin Officer Heritage Consultants (NOHC) for the project. In order to minimise the potential for vandalism to sites, some locational information has been removed from this unrestricted public release version of the report.

Wherever possible, test pits were situated within the anticipated construction 'footprint' - the area that would be subject to direct impact from the project. Test pits were arranged in straight line transects, which in most cases were aligned according to the confines of the development footprint and therefore in parallel to the project and/or the existing highway.

The project is being conducted under the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979*.

Results of data research and the field survey program

Data review and field survey identified twenty nine Aboriginal heritage items within the project area. These comprised two lithic artefact occurrences (G2B A3 and G2B A38), twenty three potential archaeologically sensitive areas [PASAs] (PASA12-29 and PASA 40-44), and four non-archaeological recordings of places of Aboriginal cultural heritage significance.

The non-archaeological recordings comprise: three places relating to historical events or occupation - The '*Little Mountain'* or '*Dicky Wood's Meadow*' battle ground (G2B A13) and Aboriginal Encampments at '*Brookside*' (Broughton Village) (G2B A14) and Berry (G2B A39), and one cultural landscape, the Toolijooa Ridge Aboriginal cultural landscape.

Two generalised Aboriginal cultural heritage values are recognised; large and old growth fig trees, and Aboriginal burial sites. Twelve large or old growth fig trees have been identified in or near to the project area (MFT12 – 23).

Results of the subsurface testing program

Twenty one PASAs were selected for archaeological testing across the project area. These were: PASA12, 13, 14, 15, 16, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 40, 41, 42, 43 and 44.

Eighteen of the 21 PASAs subject to testing were determined to contain archaeological deposits.

Two hundred and ninety eight archaeological test pits were excavated in the twenty one PASAs in the project area.

Two hundred and thirty six lithic artefacts were recovered from 19 PASAs and 92 test pits.

The lithic assemblage is classifiable into twenty seven distinct types and seven raw materials.

The lithic assemblage is dominated by flakes (58 per cent), and flaked pieces (19.1 per cent).

Chert is the dominant raw material (71 per cent), followed by quartz (27 per cent), and minor occurrences of volcanic stone silcrete, chalcedony, mudstone, quartzite, sandstone, glass, ochre, and an unidentified sedimentary stone (<five per cent in total).

The assemblage shows internal differentiation between PASAs, with differences evident in artefact abundance, activities represented, vertical distribution of artefacts, and assemblage richness. The project assemblages show higher than average regional assemblage richness and raw material richness.

Three PASAs stand out as having higher than average richness: PASA 25, 27 and 29, while four have lower than average richness: 13, 16, 23 and 28.

PASA 12 has a large and diverse assemblage with abundant subsurface material. Flake manufacture and retouching also appear to be well represented at this location even though the site is not especially rich in comparison to other PASA in the study. These factors make PASA 12 probably the most important location identified in the subsurface testing program.

The assemblage is quite fragmented, with more than half the assemblage broken, and more than half of these by excessive heat. The assemblage nevertheless retains high identifiability and contributes to understanding regional stone procurement, stone artefact manufacture and other behaviours of regional significance such as implement manufacture and reduction.

The assemblages are all small despite their high regional richness, and this may detract from their overall significance.

Twenty-three Aboriginal sites have been identified across the 19 PASAs that were found to contain archaeological deposits relating to Aboriginal occupation. The identified sites are: G2B A15, G2B A16, G2B A17, G2B A18, G2B A19, G2B A20, G2B A21, G2B A22, G2B A23, G2B A24, G2B A25, G2B A26, G2B A27, G2B A28, G2B A29, G2B A30, G2B A31, G2B A32, G2B A33, G2B A34, G2B A35, G2B A36 and G2B A37.

Subsequent to the drafting, review and finalisation of the test excavation program, a proposal to change access infrastructure in the area just south of Broughton Village was added to the project. A consequence of this would be construction impact to a locally elevated spurline crest adjacent to Broughton Creek. Based on the results of the test excavation program and the subsequently revised predictive site location model, this landform can be classed as archaeological sensitive with a predicted moderate or high archaeological potential. This area has been identified as a potential archaeological deposit (G2B PAD1).

The main conclusions regarding trends in site location are as follows:

- Higher artefact incidence and/or assemblage richness tends to coincide with major spurlines and low gradient basal slopes above, and set back from, the valley floor.
- The valley floors, and in particular the alluvial flats, are generally characterised by intermittent and low incidences of artefacts.
- Micro-topographic features such as locally elevated terraces and creek banks, within the broader valley floor context, tend to contain a higher incidence of artefacts.
- The ridgeline crests and saddles tend to be characterised by intermittent and low incidences of artefacts, with higher incidences occurring in association with features such as low gradient knoll crests and break of slope interfaces.

Development impact and potential mitigation strategies

Of the 42 Aboriginal heritage recordings, (two surface artefact occurrences, 23 subsurface artefact occurrences (archaeological deposits), one potential archaeological deposit, twelve fig trees, and four ethno-historical recordings), sixteen would not be impacted by the project, eighteen would be partially impacted, and eight fully impacted. Of those fully impacted, all consist of archaeological deposits, with the exception of one fig tree. Three of the four ethno-historical recordings would be partially impacted. In the cases of G2B A13 and G2B A14, impact is measured relative to the broadly defined areas within which those places may have been located. Only one of the twelve fig trees would be impacted by the project.

The project would directly impact (either partially or fully) the confirmed location of 21 subsurface artefact occurrences. These are: G2B A15, G2B A16, G2B A17, G2B A18, G2B A19, G2B A21, G2B A22, G2B A23, G2B A24, G2B A25, G2B A26, G2B A27, G2B A28, G2B A29, G2B A30, G2B A31, G2B A32, G2B A33, G2B A34, G2B A35 and G2B A36.

One potential archaeological deposit (identified following the completion of the test excavation program) would be partially impacted (G2B PAD1).

The project would have direct, albeit partial impacts to three ethno-historical places. These are: G2B A13 and G2B A14 and the Toolijooa Ridge Aboriginal Cultural Landscape.

The potential avoidance of the above sites by the realignment of the preferred project route would be counterproductive given that in most cases the identified archaeological deposits extend either side of the construction footprint. A shifted alignment would simply impact the same archaeological resource within an adjacent area. A re-alignment would also move the preferred project alignment away from the disturbance corridor associated with the existing highway, which is paralleled closely by the project works.

It is considered a better proposal to focus the project disturbance as close as possible to the existing disturbance corridor than establish new corridors which would likely impact a more intact and less degraded archaeological resource.

Recommendations

The following recommendations have been prepared with input from the RMS and in certain instances are limited by RMS policy which excludes monitoring strategies.

These recommendations would be incorporated into the Statement of Commitments and included, as appropriate, within a project specific Construction Environmental Management Plan or relevant Heritage Sub Plan or equivalent.

<u>With regard to stakeholder consultation it is recommended that:</u>

1. Aboriginal stakeholders should continue to have the opportunity to actively participate in an on-going consultation program regarding the management of Aboriginal cultural heritage within the project area.

<u>With regard to archaeological sites it is recommended that:</u>

2. Avoid unnecessary impact to site G2B A32, G2B A20 and G2B A37. All of these sites are outside of the project area.

3. Avoid impact to site G2B A38, and the associated area of potential archaeological deposit. This site is situated within a proposed ancillary area (refer also recommendation 23 b).

4. No further archaeological investigation is necessary at G2B A15, G2B A17, G2B A19, G2B 20, G2B 21, G2B A22, G2B A23, G2B 25, G2B 26, G2B 27, G2B 28, G2B 34, G2B A35 or G2B 37.

5. A program of salvage archaeological excavation should be completed at G2BA16, G2B A18, G2B A24, G2B A29, G2B A30, G2B A31, G2B A32, G2B A33, G2B 36 and G2B PAD1 prior to the conduct of construction related ground disturbance within the area of those sites. The aim of this program would be to realise the information potential of the deposits through the recovery and analysis of a larger sample of artefacts from each site.

6. Where an Aboriginal site, or portion thereof, is situated adjacent to, but outside of the zone of construction activity, temporary fencing should be erected between the zone of construction activity and the adjacent site area and/or archaeological deposit, with the aim of defining a 'no–go' area for vehicles, material storage or other actions likely to result in ground disturbance. This function may be realised by temporary and purpose specific fencing, or by standard fencing which may be erected to define the road easement and works area, regardless of heritage requirements. Temporary fencing should be removed at the cessation of construction activities. This recommendation is relevant to the following known Aboriginal sites: G2B A2, G2B A3, G2B A15, G2B A16, G2B 17, G2B A18, G2B A19, G2B A21, G2B A23, G2B 24, G2B 25, G2B A26, G2B A27, G2B A28, G2B A29, G2B A30, G2B A31, G2B 32, G2B A33, G2B A34, G2B A35, G2B A36 and G2B A38.

7. The protocols provided in Appendix M of this report should be adopted and followed in the event that construction related disturbance involves the unanticipated discovery of Aboriginal objects or suspected human remains.

<u>With regard to Aboriginal cultural values and Ethno-historical recordings, it is recommended that:</u>

8. A Heritage Interpretation Plan (HIP) should be developed, with the aim of identifying options for the promotion of the cultural values of the project area for current and future generations. The HIP should be drafted with the involvement of Aboriginal stakeholders, landowners and local Councils. Options may include interpretive signage, educational materials, and supporting local museum displays. In particular, the HIP should address the acknowledgement and promotion of Aboriginal cultural values associated with the Toolijooa Ridge Aboriginal cultural landscape, and the Dicky Wood's Meadow traditional battleground (G2B A13).

9. The RMS continue to liaise with Aboriginal stakeholders regarding the management and curation of all Aboriginal artefacts (Aboriginal objects) recovered or salvaged from the project, following the completion of any required description and analysis. Where possible a consensus or majority view should be determined. If and as necessary, an application for a Care Agreement may need to be approved by OEH where artefacts are to be held in the care of an individual or organisation. Alternatively, recovered artefacts may be re-buried on-site or deposited with the Australian Museum (Sydney) pursuant to section 88 of the *National Parks and Wildlife Act 1974*.

   The location of all reburied Aboriginal objects must be recorded on an OEH Aboriginal site recording form and submitted to the OEH.

10. In order to minimise and mitigate impacts to cultural landscape values, the following strategies should be conducted where feasible:

    a. Reduce the visual impact of the project through the planting and regeneration of vegetation.
    b. Minimise and mitigate impact to ecological values.
    c. The re-establishment of native vegetation should be a priority in areas requiring revegetation.
    d. The use of native plant species with Aboriginal cultural values should be encouraged in revegetation programs. Appropriate species can be identified through liaison with Aboriginal stakeholders.
    e. Incorporate or allow for the interpretation of cultural values, through the erection of signage, the adoption of Aboriginal nomenclature, or the inclusion of appropriately commissioned Aboriginal art or motifs.
    f. Provide opportunities and access for the conduct of Aboriginal ceremony.

11. The RMS provide an opportunity for the Aboriginal stakeholders to conduct ceremonial activities, where required, within the project area sections of the Toolijooa Ridge Aboriginal cultural landscape, and Dicky Wood's Meadow traditional battleground (G2B A13) prior to construction works

G2B A13 "Little Mountain" or "Dicky Wood's Meadow" battle ground

12. Where feasible, minimise disturbance to the natural soil profile of G2B A13 within the construction footprint. This would generally be achieved by constructing the proposed carriageway on an embankment, thus reducing the need to cut into the natural soil profile.

13. Prior to the conduct of construction works within G2B A13, archaeological salvage excavation should be conducted in all areas where it is anticipated that the natural soil profile would be impacted, such as from pier, abutment and swale construction. Consideration should be given to the use of remote sensing techniques as an initial stage of the salvage excavation program. This could assist in the selection of areas warranting detailed salvage methodologies.

G2B A14 Brookside (Broughton Village) Aboriginal Encampment

14. Where feasible, adopt a carriageway elevation and a construction methodology which minimises disturbance to the natural soil profile within the construction footprint, and which requires the construction of an embankment across the valley floor rather than the excavation and removal of the natural soil profile.

G2B A39 Historical Aboriginal encampments at Berry (G2B A39)

15. The proposed roundabout at the intersection of Woodhill Mountain Road and the current Princes Highway, should be designed and constructed in such a way that direct impact is limited to the area of the existing disturbance corridor around the intersection. This corridor is illustrated in Appendix I.

16. Temporary fencing should be erected between the zone of construction activity and the adjacent areas of G2B A39, with the aim of defining a 'no–go' area for vehicles, material storage or other actions likely to result in ground disturbance. This function may be realised by temporary and purpose specific fencing, or by standard fencing which may be erected to define the road easement and works area, regardless of heritage requirements. Temporary fencing should be removed at the cessation of construction activities.

Toolijooa Ridge Aboriginal Cultural Landscape (TRACL)

17. Where feasible, construct and finish the embankment and cutting faces in such a way as to minimise adverse visual impacts, and re-establish vegetation to reduce visual impacts and minimise disruption to wildlife corridor values.

<u>With regard to the management of potential impact to mature fig trees it is recommended that:</u>

18. Wherever feasible, direct impact to mature fig trees is avoided and the continued and sustainable health of near or adjacent trees is considered in the detailed design of the bypass.

19. In cases where direct impact to mature fig trees is unavoidable:

    a. Then, wherever feasible, trees with reduced health, condition or vigour are impacted in preference to examples displaying good condition, health and vigour.

    b. Establish a management and impact mitigation program in consultation with the Aboriginal Focus Group (AFG).

20. Consultation with Aboriginal stakeholder groups should be conducted with regard to all incidences of anticipated impact to mature fig trees. The objective of this consultation is to propose strategies for the management of the Aboriginal cultural values which may be effected by the impact. Some impact mitigation strategies previously suggested by Aboriginal stakeholders for consideration by the RMS include:

    a. Conducting a program of propagation (such as via semi-hardwood cuttings) for replanting within and outside of the development.

    b. Make available established cuttings to members of the local Aboriginal and non-Aboriginal community for use in private gardens and landholdings.

    c. Removal and transplantation of high or exceptional value trees, to a new secure location and providing necessary aftercare.

<u>With regard to potential impact within ancillary areas it is recommended that:</u>

21. The following selection criteria for the location of ancillary facilities should be adopted:

    a. Ancillary facilities to be located on sites that have a low likelihood of having Aboriginal significance and/or potential.

    b. Sites or areas of moderate to high Aboriginal significance and\or potential, including known sites, potential archaeologically sensitive areas and areas of Aboriginal cultural significance, are not to be used for ancillary facilities except where the impact is authorised and managed by a relevant approval or an approved Heritage Management Plan.

22. In all cases, direct impact to areas of predicted archaeological potential should be avoided where feasible. This could be achieved by:

    a. Fencing off and excluding these areas from ancillary functions and use.

    b. Avoiding disturbance to the natural soil profile, by overlaying the area with a temporary protective treatment and barrier (such as a geotextile), followed by a layer of hard stand gravels, all of which would be removed after construction and during rehabilitation.

       The design and deployment of this strategy should seek to address recently identified limitations of the technique in other RMS projects, and take into account the characteristics and possible refinements outlined in section 11.1.3

23. Where direct impact to areas of predicted archaeological potential cannot be avoided, it is recommended that:

    a. Those areas of potential which consist of an extension of a landform on which a confirmed archaeological deposits is situated, and which has been recommended for salvage excavation, should be the subject of a program of salvage excavation prior to impact. This applies to the proposed ancillary areas: east of Broughton Creek, the two areas west of Broughton Creek, the area southwest of Tindalls Lane, and on the south side of North Street.

    b. Those areas of greater than low predicted archaeological potential which are unrelated to adjacent confirmed archaeological deposits should be subject to a program of test excavation prior to direct impact, and any management strategies developed as a consequence of the results of the test program. This applies to the proposed ancillary areas: southwest of Toolijooa Road, (including site G2B A38), the ridgeline knoll in the southern area on Toolijooa Ridge, southwest of Austral Park Road, and south of Graham Park.

    c. Any required test excavation program should be conducted and completed as part of the detailed design stage of the project, and prior to construction. This would allow for a focused approach, in which testing can be limited to defined facility locations, and necessary revisions or mitigation actions can be proposed and enacted.

<u>With regard to the management of unanticipated finds it is recommended that:</u>

24. Conduct of the following strategies is recommended to address the potential for encountering unanticipated finds, including human remains:

    a. Basic recognition skills for Aboriginal artefacts and human remains should be included in all construction fieldwork induction programs.

    b. Adopt and conduct, when and as necessary, the protocols outlined in the RMS policy - Unexpected Finds Procedure, provided in Appendix M of this report.

<u>With regard to on-site staff training it is recommended that:</u>

25. An appropriate representative of the registered Aboriginal parties and a project archaeologist be invited to give a tool box talk to construction teams prior to construction. The purpose would be to make the construction teams aware of the cultural significance of Dicky Wood's Meadow, Brookside and Toolijooa Ridge. In particular, to be aware that if any bones are identified during construction, works must cease until they can be dealt with in accordance with the RMS' *Unexpected archaeological finds procedure*.

26. With regard to any anticipated works (including mitigation actions such as revegetation and land rehabilitation) to be conducted outside of the currently defined project area, proposed easement boundaries, or ancillary areas, it is recommended that:

    a. An appropriate heritage assessment and impact mitigation process should be completed prior to any disturbance occurring. This process should be outlined within any Construction Environmental Management Plan or relevant Heritage Sub Plan or equivalent.

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1 Introduction

Roads and Maritime Services (RMS) propose to upgrade 11.6 kilometres of the Princes Highway between Toolijooa Road north of Foxground and Schofields Lane south of Berry, in New South Wales (NSW) (the project), to achieve a four lane divided highway (two lanes in each direction) with median separation. The project includes bypasses of Foxground and Berry.

The project would form part of the Princes Highway upgrade to four lanes from Waterfall to the Jervis Bay Road Junction, Falls Creek. The upgrade of the Princes Highway would improve road safety and traffic efficiency, including for freight, on the NSW south coast.

This working paper was commissioned by AECOM and presents an assessment of the potential environmental impacts on Aboriginal cultural heritage. It supplements the environmental assessment for the project as required under Part 3A of the *Environmental Planning and Assessment Act 1979*. The Aboriginal cultural heritage assessment included Aboriginal consultation, field survey and a program of archaeological subsurface testing.

1.1 Project description

The project comprises the following key features:

- Construction of a four lane divided highway (two lanes in each direction) with median separation (wire rope barriers or concrete barriers where space is constrained, such as at bridge locations).
- Bypasses of the Foxground bends and the Berry township.
- Construction of around 6.6 kilometres of new highway where the project deviates from the existing highway alignment at Toolijooa Ridge, the Foxground bends and the Berry township.
- Provision for the possible widening of the highway (if required in the future) to six lanes within the road corridor and, in some areas, construction of the road formation to accommodate future additional lanes where safety considerations, traffic disruption and sub-optimal construction practices are to be avoided.
- Grade-separated interchanges at:
  - Toolijooa Road.
  - Austral Park Road.
  - Tindalls Lane.
  - East of Berry at the existing Princes Highway, referred to as the northern interchange for Berry.
  - West of Berry at Kangaroo Valley Road, referred to as the southern interchange for Berry.
- A major cutting at Toolijooa Ridge (around 900 metres long and up to 26 metres deep).
- Six lanes (two lanes plus a climbing lane in each direction) through the cutting at Toolijooa Ridge for a distance of 1.5 kilometres.
- Four new highway bridges:
  - Broughton Creek bridge 1, a four span concrete structure around 170 metres in length and nine metres in height.
  - Broughton Creek bridge 2, a three span concrete structure around 75 metres in length and eight metres in height.
  - Broughton Creek bridge 3, a six span concrete structure around 190 metres long and 13 metres in height.

  - A bridge at Berry, an 18 span concrete structure around 600 metres long and up to 12 metres in height.
- Three highway overbridges:
  - Austral Park Road interchange, providing southbound access to the highway.
  - Tindalls Lane interchange, providing southbound access to and from the highway.
  - Southern interchange for Berry, providing connectivity over the highway for Kangaroo Valley Road along its existing alignment.
- Eight underpasses including roads, drainage structures and fauna underpasses:
  - Toolijooa Road interchange, linking Toolijooa Road to the existing highway and providing northbound access to the upgrade.
  - Property access and fauna underpass in the vicinity of Toolijooa Ridge at chainage 8400.
  - Dedicated fauna underpass in the vicinity of Toolijooa Ridge at chainage 8450.
  - Property access underpass between Toolijooa Ridge and Broughton Creek at chainage 9475.
  - Combined drainage and fauna underpass in the vicinity of Austral Park Road at chainage 12770.
  - Combined drainage and fauna underpass in the vicinity of Tindalls Lane at chainage 13320.
  - Dedicated fauna underpass in the vicinity of Tindalls Lane at chainage 13700.
  - Property access underpass between the Tindalls Lane interchange and the northern interchange for Berry in the vicinity of at chainage 15100.
- Modifications to local roads, including Toolijooa Road, Austral Park Road, Gembrook Road, Tindalls Lane, North Street, Queen Street, Kangaroo Valley Road, Hitchcocks Lane and Schofields Lane
- Diversion of Town Creek into Bundewallah Creek upstream of its confluence with Connollys Creek and to the north of the project at Berry.
- Modification to about 47 existing property accesses.
- Provision of a bus stop at Toolijooa Road and retention of the existing bus stop at Tindalls Lane.
- Dedicated u-turn facilities at Mullers Lane, the existing highway at the Austral Park Road interchange, the extension to Austral Park Road and Rawlings Lane.
- Roundabouts at the southern interchange for Berry and the Woodhill Mountain Road junction with the exiting Princes Highway.
- Two culs-de-sac on North Street and the western end of Victoria Street in Berry.
- Tie-in with the existing highway about 75 metres north of Toolijooa Road and about 440 metres south of Schofields Lane.
- Left in/left out only provisions for direct property accesses to the upgraded highway.
- Dedicated public space with shared pedestrian/cycle facilities along the southern side of the upgraded highway from the playing fields on North Street to Kangaroo Valley Road.
- Ancillary operational facilities, including permanent detention basins, stormwater treatment facilities and a permanent ancillary facility site for general road maintenance.

The project area and the key features of the project are shown in **Figure 1.1**.

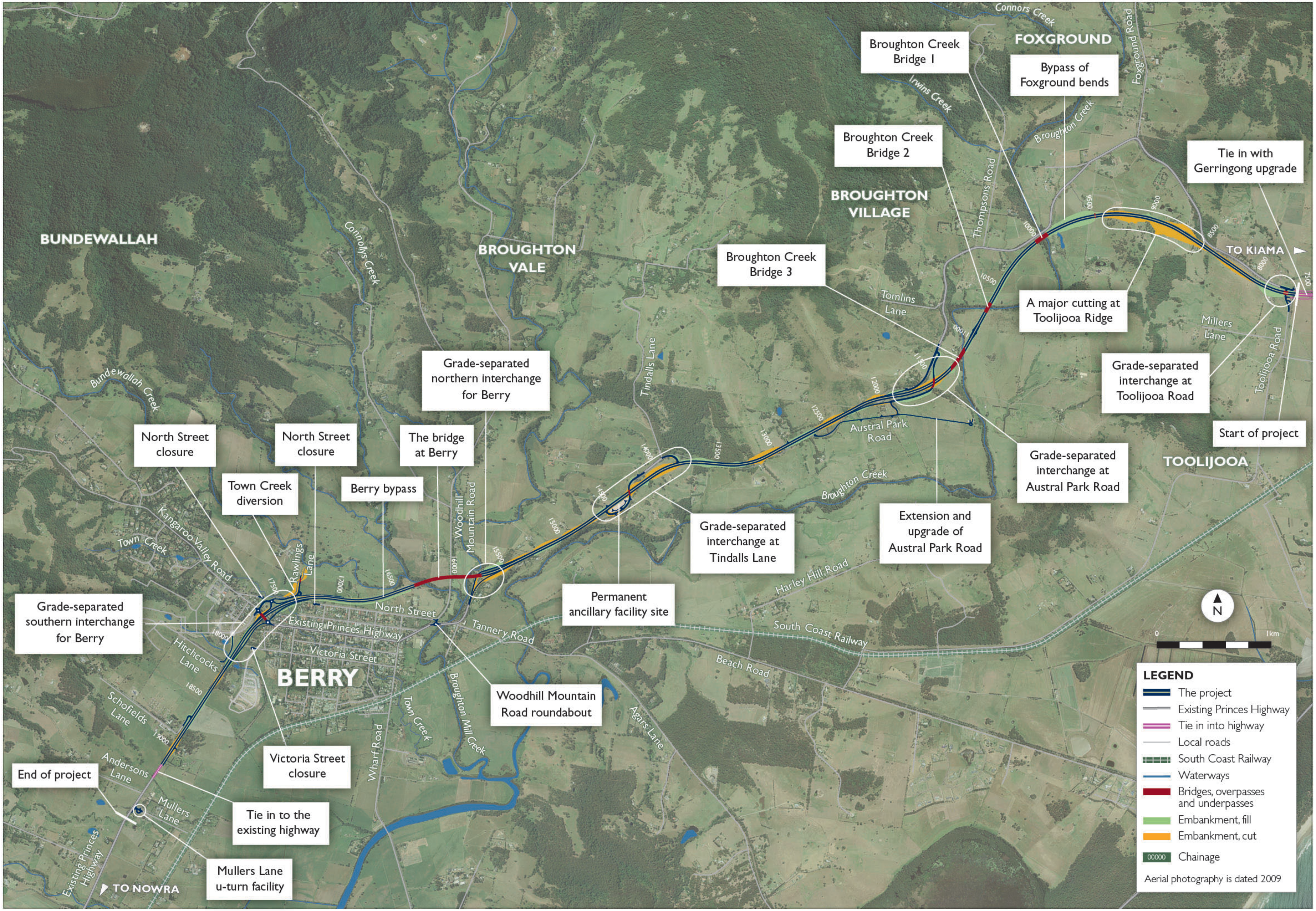

Figure 1-1: Foxground and Berry bypass project area

1.2 Background to assessment

Maunsell (now AECOM) was engaged by the RMS in December 2006 to carry out an Options and Route Selection Study, Concept Development and Environmental Assessment (EA) for the upgrading of the Princes Highway between 42.6 kilometres to 74.6 kilometres south of Wollongong.

The cultural heritage assessment program for the project includes two main assessment streams, a cultural assessment and an archaeological assessment, as specified by Department of Environment, Climate Change and Water (DECCW) (now the Office of Environment and Heritage (OEH)), and RMS policy.

The following cultural heritage assessments/studies and Aboriginal consultation have been conducted to date:

- *A preliminary Aboriginal and non-Aboriginal heritage assessment*

  This study involved literature and heritage database reviews; mapping of known sites; and provision of a predictive model for Aboriginal and historical heritage sites (Navin Officer Heritage Consultants (NOHC) 2007).

- *A preliminary landscape review*

  The review comprised: archaeological survey of limited ground surface exposures (most of which occurred within the existing road reserve), and a predictive assessment of subsurface archaeological potential (NOHC 2008).

- *An oral history of non-Aboriginal residents along the upgrade route*

  This study involved: literature and heritage database reviews; interviews with local informants; and compilation of gathered information in an oral history (NOHC 2009a). Some informants had recollections of early Aboriginal residents.

- *An Aboriginal cultural values study*

  This study involved:

  – A series of Aboriginal Focus Group (AFG) meetings conducted throughout the project components listed above (which would continue for the duration of the project).

- A series of meetings with (individual) Aboriginal stakeholders where they had an opportunity to provide relevant information regarding known cultural heritage values and places, issues, and potential constraints and opportunities concerning the route selection study and the project.

  – A site walkover which included visits to selected areas and some limited field survey. The site visit facilitated stakeholders in gaining an appreciation of potential cultural significance with regard to the short listed route options.

  – Compilation of this information in an Aboriginal cultural values report (NOHC 2009b).

  – Utilisation of this data, where applicable, in the formulation of the subsurface testing methodology.

- *A program of (Aboriginal) archaeological subsurface testing for the Gerringong upgrade*

  This study involved: excavation by machine of one hundred and thirty seven test pits within Potential Archaeologically Sensitive Areas (PASAs) 32-39 in the Gerringong upgrade; one hundred and forty six (146) stone artefacts were recovered from 42 pits and five PASAs (31-33, 37, 38 and 39), comprising 20 different assemblage elements (NOHC 2010, 2011a).

- *A program of Aboriginal archaeological salvage for the Gerringong upgrade*

  This study is ongoing and has to date involved: hand excavation of fifty eight 50 x 50 centimetre salvage pits and twenty one 200 x 200 centimetre salvage pits at sites A7 and A9; and machine excavation of fifty six test pits and five thirty metre salvage grader scrapes at site G2B A12 (PASA31), (NOHC 2011b in prep.).

- *Previous Aboriginal stakeholder consultation*

  The RMS has undertaken Aboriginal community consultation and investigation consistent with the *Interim Guidelines for Aboriginal Community Consultation* (Department of Environment and Conservation (DEC) 2005) and the RMS *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI, June 2008) for prior Gerringong to Bomaderry Princes Highway upgrade project components.

  For the Foxground and Berry bypass project, the RMS has undertaken Aboriginal community consultation and investigation consistent with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010).

  A list of registered Aboriginal stakeholders is provided in **Appendix A**.

  In addition to the consultation conducted for the Aboriginal cultural values study the RMS has conducted 13 Aboriginal Focus Group (AFG) meetings to date.

  A bus trip and field inspection was conducted in June 2009 with nominated representatives from the AFG, as appointed by the AFG, to visit and review areas where investigative works are proposed.

  The aim of the bus trip was specifically to discuss and provide feedback on a previous draft of this proposed methodology (written for a Gerringong to Bomaderry project area). This trip was undertaken after registered stakeholders had been provided with a copy of the previous draft and allowed time to review the methodology.

  As a result of comments received from attendees of the June 2009 bus trip, three additional archaeological test locations were added to the proposed test excavation program (PASA40, 41 and 44), two of these occur within the project area (PASA40 and 41). Written responses to the previous draft were received from:

  - Jason Davison.
  - Gwenda Jarrett (Yunimyna Industries and Logistics).
  - Sharralyn Robinson (Illawarra Local Aboriginal Land Council).
  - Aaron Broad and John Padgett (Illawarra Local Aboriginal Land Council).
  - Graham Conolly (Jerrinja Consultants Pty Limited).
  - Adell Hyslop (Nowra Local Aboriginal Land Council).

  These responses were addressed and presented in the Gerringong upgrade methodology (November 2009) which formed part of the Aboriginal Heritage Impact Permit application for that project. Apart from differences in the location of testing, and an increased test pit interval of 50 metres in some contexts, the methodology conducted for this test program is the same as the previously approved Gerringong upgrade test methodology.

- *Aboriginal stakeholder consultation regarding the methodology followed for this program*
  With the exception of a longer test pit interval of 50 metres in some circumstances, the methodology followed for this test program is consistent with approved by the Aboriginal stakeholders for the Princes Highway Gerringong upgrade test excavation program.

  A copy of the proposed methodology was posted to all registered Aboriginal stakeholders by the RMS on the 8 July 2011 with an invitation to provide a written response by the 5 August 2011. By the end of this period, no written responses from stakeholders had been received by either the RMS or NOHC.

  An AFG was duly convened and held by the RMS on the 14 July 2011, at the Gerringong Town Hall. Invitations to attend the AFG were circulated to all registered stakeholders. An agenda item discussed at this meeting was: (5) Comments on the draft test excavation methodology for the project.

  A brief outline of the methodology was presented at the AFG. The following issues were raised in subsequent discussion:

  - The advantages and disadvantages of machine excavation:
    - One speaker favoured the use of by-hand excavation, others supported the machine methodology.
    - The reasons for the use of machine excavation were outlined (namely the stage one (test excavation) status of the program, and the ability to maximise the number and spread of test pits within a limited period of time and using finite resources.
    - It was also pointed out that the methodology included a by-hand excavation contingency in the event that high value archaeological features are encountered.
  - Test pit sampling intervals:
    - The variable 50 and 20 metre test pit frequency was explained, and it was noted that valley floor traverses across areas related to ethno-historical information retained a 20 metre test interval.
    - The limitations of any sampling frequency were discussed, especially in relation to burial remains.
    - It was noted that the testing regime proposed could not adequately test for burials (i.e. even though no burials may be encountered in the test pits this would not mean that burials are not present within the tested deposit).
    - It was concluded that management of the risk of encountering burials would be one of the subjects of the conclusions of the test excavation report.
  - The role and origin of the nineteenth century ‘meadows’ with regard to Aboriginal site location in the Southern Illawarra, and how the predictive model accommodates this variable.
    - It was noted that there was little archaeological information about the potential role of the ‘meadows’ (natural clearings in the coastal plain forests, probably related to intermittent wetlands) in local patterns of traditional Aboriginal occupation. Some of the selected PASA locations reflect this possible relationship. One speaker suggested that the meadows were the result of Aboriginal burning practices.

    The minutes note that the AFG was in agreement with the extent, frequency and location of the test excavation methodology.

- Participation of Aboriginal stakeholders in fieldwork program

  Aboriginal stakeholders have been involved in all of the archaeological subsurface testing and salvage programs conducted to date for the upgrade of the Princes Highway between Mount Pleasant ridge and Bomaderry (NOHC 2010, NOHC 2011 in prep).

  A team of field workers, selected by the RMS from nominated stakeholder applications, participated in the current test excavation program for the project. The names of those who took part are acknowledged in section 2.6 below.

1.3 Legislative approval and requirements

The project is being assessed under Part 3A of the *Environmental Planning and Assessment Act 1979*. The Director General's requirements (DGRs) for the project were issued on 11 February 2011 by the Department of Planning and Infrastructure (DP&I) and must be addressed in the environmental assessment. The DGRs relevant to Aboriginal cultural heritage are provided in **Table 1-1** and are addressed in this report.

Table 1-1: DGRs for Aboriginal cultural heritage

Director-General's requirements
The environmental assessment must include an assessment of Aboriginal Heritage – including but not limited to:
• An assessment of the project on Aboriginal cultural heritage consistent with the draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC, July 2005), specifically considering artefacts, potential archaeological deposits and landscape cultural values. The EA must demonstrate effective consultation with indigenous stakeholders during the assessment and in developing mitigation options (including the final recommended measures). The EA must describe the actions that will be taken to avoid, mitigate or offset impacts.

1.4 Report outline

This report:

- Provides an outline of consultation with local Aboriginal organisations carried out in the course of the cultural heritage assessments.
- Describes the environmental setting of the project area.
- Provides a background of local and regional archaeology and history for the project area.
- Describes the results of field survey.
- The archaeological subsurface testing program.
- Provides mitigation measures based on the results of the investigation and the anticipated impacts of the project on Aboriginal cultural heritage.

1.5 Copyright

Copyright to this report rests with RMS except for the following:

- The Navin Officer Heritage Consultants logo and business name (copyright to this rests with NOHC).
- Generic content and formatting which is not specific to this project or its results (copyright to this material rests with NOHC).
- Descriptive text and data relating to Aboriginal objects which must, by law, be provided to DECCW for its purposes and use.
- Information which, under Australian law, can be identified as belonging to Indigenous intellectual property.
- Content which was sourced from and remains part of the public domain.

1.6 Restricted information

None of the information provided by Aboriginal stakeholders and presented in this report has been specifically identified as requiring access restrictions due to its cultural sensitivity.

Information relating to the exact location of Aboriginal archaeological sites has been removed from the general release version of this report in order to minimise the potential for vandalism to sites. A restricted release version of this report has also been produced in which all locational information is included. A note has been inserted into the text to identify all instances where information has been removed.

1.7 Confidentiality

No information in this report has been classified as confidential.

2 Study methodology

2.1 Literature and database review

A range of archaeological and historical data was reviewed for the project area and its surrounds. This literature and data review was used to determine if known Aboriginal sites were located within the area under investigation, to facilitate site prediction on the basis of known regional and local site patterns, and to place the area within an archaeological and heritage management context. The review of documentary sources included heritage registers and schedules, local histories and maps, and archaeological reports.

Aboriginal literature sources included the Aboriginal Heritage Information Management System (AHIMS) maintained by the OEH, associated files and catalogue of archaeological reports and theses held in the library of the School of Archaeology and Anthropology, the Australian National University.

Searches were undertaken of the following heritage registers and schedules:

- Aboriginal Heritage Information Management System (AHIMS) (NSW OEH).
- World Heritage List.
- The National Heritage List (Australian Heritage Council).
- The Commonwealth Heritage List (Australian Heritage Council).
- Section 170 Heritage and Conservation Register(s) compiled by the RMS.
- Heritage Schedule(s) from the Shoalhaven and Kiama Local Environmental Plans.

2.2 Consultation with statutory authorities

Community and stakeholder engagement for this project commenced in March 2006, during the route option development process for the Princes Highway upgrade from Gerringong to Bomaderry. Following the announcement of the preferred route in June 2009, community consultation for the project has included meetings with government agencies including NSW OEH, DP&I, and the Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) (which incorporates the Department of Primary Industries (DPI), the NSW Office of Water (NOW) and Southern Rivers Catchment Management Authority (CMA)).

In April 2010, the OEH published the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010). These replaced the *Interim Guidelines for Aboriginal Community Consultation* (DEC, 2005). In consultation with OEH, RMS transitioned to and has substantially complied with the 2010 guidelines since their commencement.

Throughout the life of the project, RMS has notified a variety of organisations about the project including and specifically, the Planning and Aboriginal heritage section of OEH. Invitations have been extended to OEH for a representative to attend each of the AFG Meetings conducted to date for the FBB project.

2.3 Field survey and project area

The area subject to survey and assessment (the project area) consisted of the study corridor of the preferred project alignment (**Figure 1-1**), and the additional area of investigation, declared by the RMS in August 2011, for the refinement of the project alignment north of Berry (**Figure 2-1**).

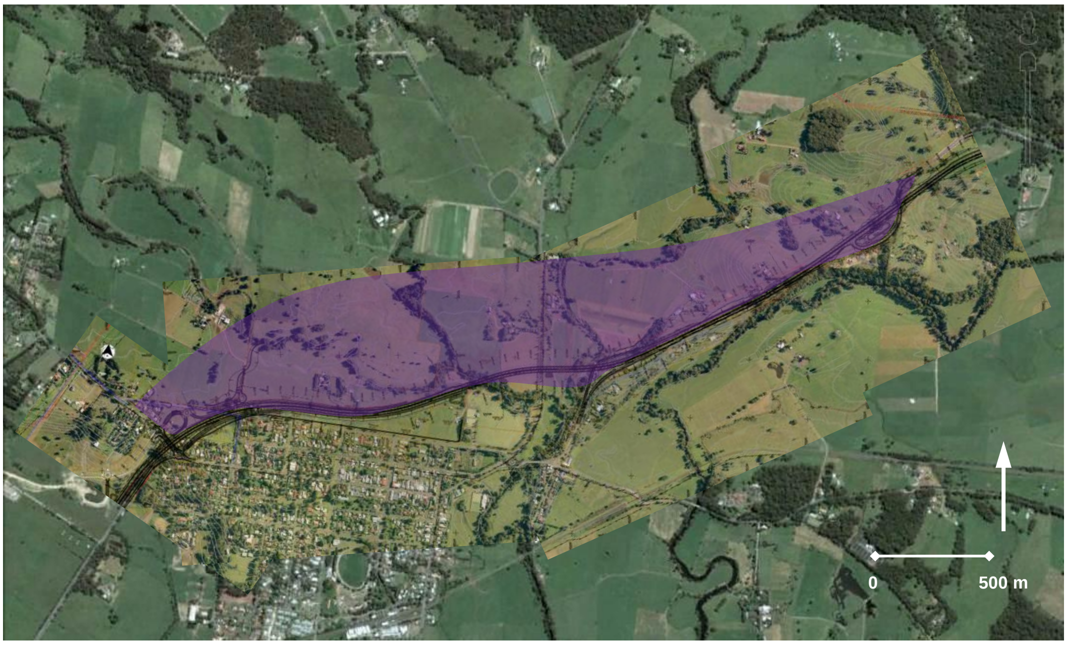

Figure 2-1: Location of additional area of investigation and assessment declared by RMS in August 2011 for the refinement of the project alignment north of Berry (Base image from Google Earth Pro 2012 (image date 30/1/2006)

Field survey was conducted over a period of two months (February to April 2009) in multiple survey events across the Gerringong to Bomaderry Princes Highway upgrade area according to property access availability and local weather conditions. Field survey of the project area to refine the Berry bypass preferred option was conducted in the context of the archaeological subsurface testing program (August 2011).

Survey of a proposed ancillary area at the eastern end of the project was conducted in March of 2012 as part of a separate assessment for the neighbouring Gerringong upgrade portion of the Princes Highway (NOHC 2012). The results of this assessment, where relevant to the FBB project area, have been incorporated into this report.

Survey involved inspection both on foot and via vehicle, depending on property access and ground visibility constraints. The field assessment involved the detection of any surface archaeological material, and an assessment of the potential for subsurface archaeological material. Further detail on survey coverage and visibility is provided in **Section 6.3**.

Site recording parameters are provided in **Appendix B**.

2.4 Subsurface testing program

2.4.1 Rationale for subsurface testing program

The preliminary landscape review, which included some archaeological survey, found that ground surface exposures across the project area were very limited in both area and occurrence, and could not provide a reliable basis for the identification and assessment of the likely archaeological resource. As a consequence, a program of subsurface archaeological investigation was required to test and assess potentially occurring archaeological deposits.

2.4.2 Potential archaeologically sensitive areas (PASA)

A review of previous archaeological assessments across the southern Illawarra coastal plain found that the conduct of subsurface testing programs as part of environmental assessments has not been consistent across the landforms within the plain. Most excavations have been conducted in rock shelters or within sand bodies along coastal and estuarine margins, and little information existed for the hinterland and basal slopes adjacent to the escarpment. The limited data reported from an archaeological testing program conducted for the Eastern Gas Pipeline is a notable exception.

A predictive model was constructed for the project area based on the limited corpus of subsurface results, combined with surface site data, and community and ethno-historic information (refer **Section 5.4**).

The model predicted that zones of archaeological sensitivity would be associated with riparian corridors, the elevated margins of wetlands and the valley floor, and the crests of major ridges and spurs. There are many unknowns associated with the model, especially the effect of formerly dense rainforest vegetation on the location, formation and preservation of Aboriginal occupation sites, and similarly, the intensity of occupation, and how this may affect the density and distribution of archaeological material.

Using the predictive model as a basis, archaeologically sensitive landforms were identified within the project area. These have been termed PASA. The use of this term is deliberately distinct from potential archaeological deposit (PAD). In the context of the present investigation, the identification of a PASA is more tentative, and based on a less tested regional model, than for a PAD.

The implications of the results of the Gerringong upgrade testing program (NOHC 2011a) have been considered in the current testing program, and where appropriate, the scope of proposed testing has been modified accordingly.

2.4.3 PASA selection parameters

The identification of PASAs has been based on:

- The predictive model - developed in the route options assessment stage of the project, and refined as a result of the Gerringong upgrade test excavation results.
- Ethno-historical information.
- A review of landscape characteristics relative to known archaeological site patterning and landscape disturbance.
- Locations suggested by local Aboriginal community representatives.

2.4.4 Locations for archaeological subsurface testing

Forty four PASAs have been identified across the whole length of the Princes Highway between Gerringong and Bomaderry (PASAs 1-29 and 31-44). Twenty three of these PASAs occur within the project area. (Appendix C). Some of these areas share defining landscape characteristics with previously tested PASAs in the Gerringong upgrade investigation.

An initial proposition of the archaeological test excavation program for the Princes Highway program was that the testing of the PASAs could be based on representative samples. This would have meant that PASAs in similar landscape contexts were grouped together and the test results from one of the areas could be used to assess the group as a whole. There are a number of factors which largely reduced the value of this approach for the project:

- Many of the PASAs incorporate the potential for archaeological remains based on ethno-historical information, such as the reported battle ground at 'Dicky Wood's Meadow'. Despite the fact that some of the PASAs in this category include landform contexts which are repeated, and/or have already been tested in the Gerringong upgrade test program, the potential for historic period Aboriginal occupation, and/or burials provided a strong basis for conducting a comprehensive rather than sample-based approach to testing.
- The OEH expressed a desire for the test program to be inclusive across the project areas. This allowed for the application of Aboriginal Heritage Impact Permits across the whole construction footprint of the development (when not subject to a Part 3A assessment), and also gave greater certainty in the development of impact mitigation programs.
- Some of the PASAs with shared and repeated landform characteristics were specifically selected by Aboriginal stakeholders for archaeological testing.

The results of the Gerringong upgrade test excavation program have been applied in the current methodology by increasing the testing interval from 20 metres to 50 metres across the valley floor deposits in PASAs 12 and 13. An exception to this was PASAs 20 to 27, where the valley floor occurred within the potential area of interest related to the Dicky Wood's Meadow battle ground.

Two PASAs were excluded from the test program owing to the fact that anticipated construction impact would avoid the PASA, or impact would only occur within already substantially disturbed deposits (such as from previous highway upgrade works). These are PASAs 17 and 19.

An additional area for the investigation of a bypass alignment north of Berry was proposed by the RMS during the course of the subsurface testing program (refer **Figure 2-1**). This resulted in the identification of two new PASAs (43 and 44) and the extension of three PASAs (12, 13 and 41) to cover additional areas of archaeological sensitivity within the alternative bypass alignment options.

Taking into account the above considerations, twenty one PASAs were selected for archaeological testing across the project area. These are PASA12, 13, 14, 15, 16, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 40, 41, 42, 43 and 44.

It should be noted that, due to the continuity of the landforms involved, nine of the PASAs are grouped as follows, and were tested as continuous areas:

- PASA12/13.
- PASA21/22/23/24.
- PASA 25/26/27.

One of the PASAs within the project area (PASA42) is associated with nearby recorded surface Aboriginal artefacts (G2B A3).

2.4.5 Number and arrangement of test pits

Wherever possible, test pits were situated within the anticipated 'footprint' (area subject to direct impact) associated with the project.

Test pits were arranged in straight line transects, which in most cases were aligned according to the confines of the development footprint. This meant, that in most cases transects were positioned approximately along the proposed bypass centreline, or parallel to it, depending on ground disturbance and micro-topographic variables. In test areas away from the bypass alignment (such as in the additional investigation area north of Berry), transects were aligned strategically to sample both high potential micro-topographic features and broad area cross sections.

The distance between test pits was either 20 metres or 50 metres. The fifty metre interval was used at PASAs 12 and 13, based on the low rate of detecting artefacts along similar valley floor contexts in the Gerringong upgrade test excavation program. Regular test pit intervals were maintained except in the following circumstances:

- Where the avoidance of an erosional or other disturbance feature required a one-off larger or smaller interval.
- Where an on-site appreciation of landform and archaeological potential indicated that a larger or smaller interval was necessary.
- Within 60 metres of a drainage line – test pits were always placed at 20 metre intervals.

Where possible, within the confines of the footprint, transects were positioned according to an appreciation of natural micro-topographic characteristics, and any corresponding variation in archaeological potential. In this way transects were preferentially situated along spurline crests or creek banks.

Where a test pit fell within an area of:

- Large stone cobbles or tors (with maximum linear dimensions greater than 300 millimetres).
- Outcropping bedrock.
- Highly disturbed or eroded ground.
- Substantial vegetation (with stem diameter of 500 millimetres or greater).

The location of the test pit was amended to the nearest location which avoided the constraint/s listed above.

Test pit locations and transects for each selected PASA are shown in **Appendix D**.

Pit data and descriptions of soil profiles for each pit are provided in **Appendix E**.

The number of test pits conducted at each PASA is provided in **Table 2-1**.

Table 2-1: Number of test pits conducted at each PASA

PASA	No. of test pits
12	46
13	28
14	12
15	7
16	6
17	0
18	8
19	0
20	23
23 (incl. 21 and 22)	20
24	7
25	9
27 (incl. 26)	15
28	17
29	22
40	17
41	13
42	6
43	33
44	9
Total	**298**

2.4.6 Field methodology

Two excavation methodologies were implemented for the Aboriginal subsurface testing program:

- Mechanical test pit excavation using an excavator.
- By-hand test pit excavation.

The mechanical test pit methodology was followed for all test pit excavations with the provision that where there was evidence to indicate that the mechanical method should be suspended a by-hand excavation methodology would be adopted.

A by-hand methodology was followed in one area: pit 20 in PASA 20. This pit was located on a small knoll situated between two creek lines. The machine methodology was suspended in this case and a by-hand methodology was conducted as a result of this location, where access to this area by the excavator was not feasible.

Mechanically excavated test pits

The following excavation methodology was followed.

1. The required locations of mechanical excavation pits were marked out and recorded.

2. Turf was removed by excavator and the pit was excavated.

   Two hundred and ninety seven (297) pits were excavated by excavators using straight-edged toothless buckets. Two machines had 900 millimetre buckets; one machine had a 1000 millimetre bucket.

   The intended depth interval for each spit was 100 millimetres. In some cases, unforeseeable deposit characteristics, such as large cobbles or sudden changes in consistency, caused the excavated spit depth to vary. This is an unavoidable consequence of the machine methodology and in most cases, involved variation of 40 per cent or less (i.e. up to or less than 40 millimetres).

   Machine excavated pits had a final length of between one metre and three metres. The width of the pit generally corresponded to the width of the bucket plus up to 200 millimetres (depending on the width of any material systematically removed from the side of the pits (refer below). The final length of the test pit was dependent both upon the final depth achieved in the test pit, and the nature of the deposit.

   The following machine excavation sequence was followed (refer **Figure 2-2**):

   - Where necessary, top vegetation was removed by scraping the surface with the edge of the machine bucket.
   - Spit one was excavated along an interval ranging between 0.7 and 1.5 metres in length. A sample of spoil was removed from machine bucket for sieving, and the remaining spoil set aside.
   - Following the removal of spoil from the bucket, a 50-100 millimetre wide strip was removed from (normally) one or (sometimes) both sides of the pit and the spoil set aside in a ‘mixed provenance’ pile. This was done where the sediment was loose or friable. This pit modification was conducted to make the pit marginally wider than the bucket so that on the next spit excavation, the sides of the bucket did not contact the pit sides and dislodge material into the bucket from upper levels.
   - Following the removal of the machine bucket from each spit excavation, loose surface material or other sediment was removed either manually or using the mechanical bucket (depending on the risk of contamination from upper levels) prior to the commencement of the following spit excavation. This spoil was incorporated with the corresponding spit material unless it was considered that contamination from upper levels was likely, in which case it was set aside in the ‘mixed provenance’ pile.
   - Notable and representative areas of the base of the spit were manually cleaned with a hand trowel and inspected for stratigraphic and pedological characteristics.
   - Excavation of spit two (and all subsequent spits) began approximately 20-100 millimetres from the far end of the previous spit, this is done to create a 'clean' wall and to prevent contamination from loose sediments at the start of the pit. The bucket was tilted and drawn up and away from the near end of the pit to minimise the risk of contamination from previous spits. The removal of a strip from one or both sides of the pit was conducted as for spit one, as was the manual or mechanical clean-up of the base of the spit prior to the next spit excavation.

- Following spit two (and after all subsequent spits), the near end of the pit was extended by up to 300 millimetres in order to remove any fallen sediment from upper levels and to provide a 'clean' end point for the backhoe bucket.
- Following each spit excavation, a consistent sample of the excavated sediment was recovered for sieving. The size of the recovered sample, if necessary, varied according to the depth of the spit so that the volume was equivalent to the in situ deposit which was recovered from an excavation area of 1000 x 500 millimetres[1].

These varying sample sizes are shown in **Table 2-2** (below). In the case of a spit with the preferred depth interval of 100 millimetres, the sample size was 5.5 x 10 litre buckets.

The material for sieving was preferentially taken from the middle of the backhoe/excavator bucket, prior to the emptying of the bucket. This minimises the potential for contamination from sediments falling to lower levels from the pit sides. All material remaining in the bucket after recovery of the sample for sieving (if any) was set aside in a separate pile.

A larger sample for sieving was recovered from this separate pile, if an in-field assessment of results indicated that a larger sample would be beneficial.

All sieving was conducted with the aid of pressurised water from a water truck. All material was sieved through 4 x 4 millimetre mesh, with the use of a top 10 x 10 millimetres or larger mesh when required by the presence of large gravels.

All identified or suspected cultural material recovered from sieving was retained, bagged and labelled.

3. Following cessation of excavation, the face of one or both sides of the pit was cleaned and the stratigraphic and pedological characteristics of the soil profile described and checked with the separately documented incremental spit descriptions. The soil profile was photographed, and where appropriate, also drawn and measured.

4. Excavation ceased according to an on-site appreciation of the vertical distribution of the archaeological deposit or when one or more of the following were encountered:

   - Bedrock.
   - Massive clay substrate.
   - Large cobbles or gravels preventing further effective excavation.
   - The water table.
   - Material considered to pose a health or safety risk to field personnel.

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[1] This sample volume has been determined over a number of field programs as the most effective in providing a consistent sample within the constraints of a backhoe/excavator methodology. These constraints include necessary pit dimensions to allow access and recovery at depths of potentially 1.5 metres or more, and to allow for the discard of contaminated materials. 55 litres of loose sediment represents about 50 litres of *in situ* sediment (allowing for 10 per cent expansion following excavation). 50 litres of *in situ* sediment represents an *in situ* volume of 50,000 cubic centimetres or 50 per cent of a 100 x 100 x 10 centimetre spit volume.

5. Where sterile sediment was reached (sterile in this context means the absence of artefactual material), and an assessment is made that further archaeological material was unlikely but that exploratory excavation into deeper deposits would aid geomorphological interpretation of the deposit, subsequent spits of variable depth were conducted without sieving of the spoil, and with basic recording only (this generally occurred only within massive clay substrate).

6. All pits were backfilled with the remaining excavated and sieved spoil. Topsoil was placed in the correct position. (All pits were backfilled at the end of each day, to avoid the potential danger to livestock or people).

Table 2-2: Sample size of sediment recovered from each spit relative to spit depth

Vertical Spit interval (cm)	No. of 10 litre buckets*	Loose volume (litres)	Equivalent *in situ* volume (litres)
2.5	1.4	13.7	12.5
5	2.8	27.5	25.0
7.5	4.1	41.2	37.5
10.0	**5.5**	**55.0**	**50.0**
12.5	6.9	68.7	62.5
15.0	8.3	82.5	75.0
17.5	9.4	94.0	85.5
20.0	11.0	110.0	100.0
22.5	12	120.0	108.0
25.0	13.3	133.3	120.0

**Multiply spit depth (cm) by 0.535 to get no. of required 10 litre buckets*

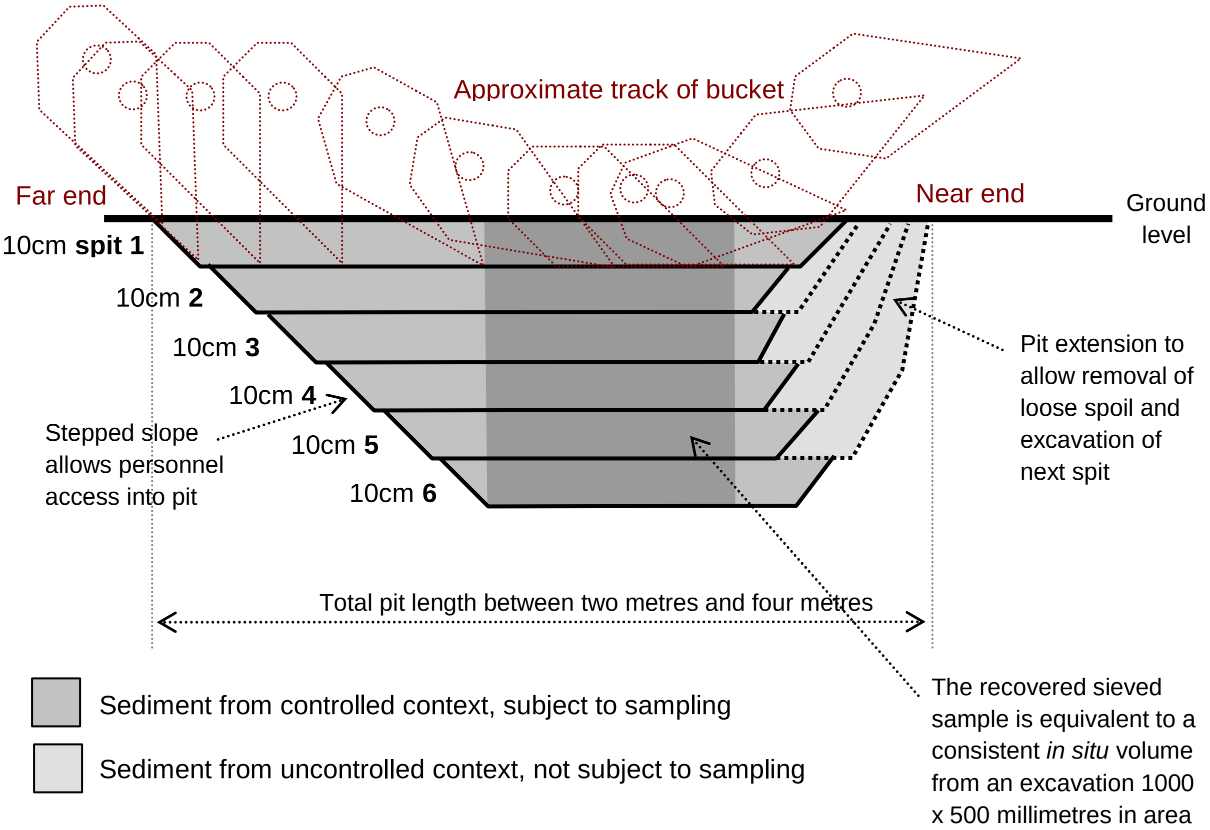


Figure 2-2: Indicative pit profile (not to scale) showing sampling methodology and sequence for mechanical pit excavation

Hand excavated test pits

One pit was excavated by hand (Pit #20 in PASA 20). Pit location was marked out and recorded. The size of the pit was 500 x 1000 millimetres. This size ensured that each hand dug spit sample (100 per cent of each spit was sieved), was equivalent to the machine dug spit samples (where only a sample of the spit spoil was sieved, equivalent to a 500 x 1000 millimetre area of the excavation).

The pit was excavated by shovel and trowel using standard by-hand archaeological methodologies including vertical and horizontal recording of spit levels and sedimentary, cultural and stratigraphic features. Spit intervals were 100 millimetres.

All excavated archaeological deposit was sieved with the aid of pressurised water from a water truck. All material was sieved through 4 x 4 millimetre mesh, with use of a top larger mesh (10 x 10 millimetres) where appropriate.

All identified or suspected cultural material recovered from sieving was retained, bagged and labelled.

The pit was backfilled with the remaining excavated and sieved spoil (following construction requirements).

2.4.7 Lithic analysis

Analysis of the recovered stone artefacts first involved the macroscopic inspection and classification of all stone artefacts into techno-typological classes. The approach to classification adopted here first orders artefacts resulting from conchoidal fracture into cores, flakes and retouched flakes. This scheme views these three categories as mutually exclusive, chronologically distinct stages in the reduction of stone materials (Clarkson and O'Connor 2005).

Cores are defined as artefacts possessing only negative conchoidal scars. Eight types of cores are identified in the classificatory scheme: single platform, multiplatform, bidirectional, bifacial, discoidal, faceted radial and uni- and multi-directional bipolar cores.

Flakes that have been spalled along their lateral margins are recorded as burinate cores as well as retouched flakes.

Flakes are defined as artefacts possessing one or more of the following fracture features: ring-crack, platform, eraillure scar, waves of force, or a clearly discernible ventral and dorsal surface. Flakes that remove old platform edges are termed 'redirecting flakes'.

Retouch is defined as any scar longer than two millimetres deriving from the lateral margins that were formed subsequent to the creation of the ventral surface. Scars less than two millimetres are classified as edge-damage.

Artefacts that clearly derived from conchoidal fracture but lacked the distinguishing features of flakes or cores listed above are recorded as flaked pieces.

Several categories describe artefacts at least partly manufactured by processes other than flaking, such as ground implements (edge ground axes), fabricators (hammerstones and anvils), and artefact fragments created by heat fracture (pot lids, flaked pieces, and fire-cracked rocks).

The completeness and cause of breakage (egg cone-split, transverse snap or heat fracture) is recorded for all artefacts and only those features present are recorded for broken fragments. Percussion length (or maximum length in the case of cores and flaked or non-flaked pieces) and weight are taken as an indication of size for all artefacts whether complete or broken.

A range of dimensions are also taken on complete flakes (proximal, medial and distal width, platform width and thickness, platform angle, the old platform angle on redirecting flakes etc.), and dimensions and fracture features are also recorded on remaining portions of flakes when appropriate. The amount, type and location of cortex is also recorded for each artefact.

Platform type (single or multiple conchoidal, focalised and single or focalised and multiple, cortical and crushed) and the presence/absence of platform preparation is recorded for cores and flakes. The length and width of the largest flake scar found on cores is also recorded. Termination types are recorded for all complete and distal sections of flakes.

The height and perimeter of retouch is recorded for retouched flakes and the degree of retouch is calculated using Kuhn's (1990) Geometric Index of Unifacial Reduction (GIUR) and Clarkson's (2002a) Index of Invasiveness (II). The mean edge angle and curvature of the retouched edge is also recorded for retouched flakes, as is the location and orientation of retouch (e.g. left distal, dorsal only etc.) (Clarkson 2002b).

For hammerstones and anvils, size, weight and location of pitted areas are recorded.

Several formal retouched and ground artefact forms are recognized. These conform to implement types commonly found in southeastern Australian assemblages. These are symmetric and asymmetric backed artefacts (i.e. Bondi points, geometric microliths and eloueras), ground edge hatchets and bifacial hatchet blanks, burins and burin spalls, burrens and various forms of retouched flakes traditionally called 'scrapers', but here referred to according to the location of retouch and the presence of notches (i.e. side, end, double side, double side and end, double side and double end, double end and notched). These typological categories are entirely morphologically defined according to retouch location and type, and no assumptions are made about artefact function. It is recognized that various types may form arbitrary divisions of morphological continuums or stages within a reduction sequence (Clarkson and O'Connor 2005).

Raw material type is recorded for each stone artefact, however, no attempt is made to identify varieties of stone beyond broad categories such as 'quartz' 'basalt', 'silcrete', 'chalcedony', 'chert' etc. Artefacts made from raw materials that were more difficult to identify were classified as either 'fine-grained-sedimentary' or 'fine-grained-volcanic' stone.

Attributes for each artefact in the assemblage are entered into a relational database (Lotus Approach) and digital photographs are taken of selected artefacts. Information for each specimen recorded in the analysis can be found in **Appendix F**. A glossary of the descriptive terms used is provided in **Appendix G**.

2.5 Map references

Unless stated otherwise, all map grid references presented in this report relate to Zone 56 of the Map Grid of Australia and have been generated using the WGS84 datum.

2.6 Project personnel

Field survey was conducted by archaeologists Kelvin Officer, Kerry Navin and Deirdre Lewis-Cook.

The subsurface testing program was directed by Kelvin Officer, Rebecca Parkes, Sam Harper and Nicola Hayes.

Field assistance was provided by Glenda Hyde, Phil Price, Jo Dibden, Carmen Sarjeant, Mirani Litster, Emily Cobbold, Alexis Schlegal, Samantha Keats, Rochelle Coxon (AECOM) and Luke Atkinson (AECOM).

Aboriginal field representatives are listed in **Table 2-3**.

Table 2-3: Aboriginal field representatives

Name of site officer	Organisation
Broad, Aaron	Workforce International Pty Ltd
Carpenter, Nathan	Jerrinja Local Aboriginal Land Council
Charles, Paul	Kulilla Site Consultants
Glover, Pam	Workforce International Pty Ltd
Gray, Leroy	Jerrinja Local Aboriginal Land Council
Little, Leslie	Jerrinja Local Aboriginal Land Council
Maher, Ali	Kulilla Site Consultants
Maher, Maria	Kulilla Site Consultants
Moore, Anthony	Workforce International Pty Ltd
Pagett, John (Jnr)	Workforce International Pty Ltd
Pagett, John (Snr)	Workforce International Pty Ltd
Stewart, Jodie	Workforce International Pty Ltd
Thulin, David	Workforce International Pty Ltd
Wellington, Brett	Jerrinja Local Aboriginal Land Council
Wellington, Craig	Jerrinja Local Aboriginal Land Council
Wellington, James	Jerrinja Local Aboriginal Land Council

Lithic analysis was conducted by Dr Chris Clarkson.

This report was prepared by Kelvin Officer, Kerry Navin, Nicola Hayes, Sam Harper and Chris Clarkson.

2.7 Aboriginal consultation

A draft copy of this report was provided to all registered Aboriginal stakeholders on 20 October 2011 with an invitation to comment by 21 November 2011.

An AFG meeting was convened on Thursday 10 November 2011 to discuss the draft report and its findings. The meeting lasted from 10am to 1pm. Minutes of the meeting are presented in **Appendix A**.

The findings and recommendations of the draft report were presented in summary.

The role of the Aboriginal stakeholders in providing information to RMS regarding the Aboriginal cultural values of the places and items identified was stressed, as was the desirability of providing written responses to the draft report and on proposed site management.

Discussion revolved around a number of issues, including:

- The Aboriginal significance of all artefacts.
- The management of artefacts which remain on site after archaeological salvage is completed.
- The need for Aboriginal representatives to monitor construction impacts and recover artefacts.
- The RMS policy which does not support monitoring of construction works.
- Whether Dick Wood Meadow Battle ground should be described as a Massacre site.
- The impact of the proposed Toolijooa Ridge cutting.

A question was raised regarding the identification of a green frog which had been encountered and photographed during the test excavation program. Was it an endangered species such as a Green and Gold Bell Frog? Subsequent to the AFG, the frog in the photographs has been identified as an Eastern Dwarf Tree Frog (*Litoria fallax*) (email from Josie Stokes, RMS, 22/12/11). This species is not endangered.

Three resolutions were made at the AFG. These are:

- That as little damage as possible be incurred at Toolijooa Ridge and Dicky Wood's Meadow, [these places] should be protected at all costs.
- It was strongly recommended that RMS reconsider its monitoring policy [in favour of] requiring monitors on-site during activities resulting in ground disturbance.
- That there is a fair and equitable distribution of Aboriginal workers across the project.

Apart from the AFG discussion and resolutions, only one response to the draft report was received. This was prepared by the Jerrinja Local Aboriginal Land Council (LALC) and dated 18 November 2011. A full copy is presented in Appendix H. The Jerrinja LALC commented that:

- Jerrinja LALC feel there is inadequate participation of Aboriginal sites officers in the preliminary site excavation by RMS on new road construction.
- Jerrinja LALC propose that during the removal of the first 500 millimetres – 1000 millimetres of topsoil on new road construction, Aboriginal sites officers be present at all times to inspect for artefacts.

Subsequent to the Aboriginal stakeholder review of the draft report, a number of design changes have been made. These consist of:

1. Diversion of Town Creek on either side of Rawlings Lane into Bundewallah Creek, Berry.
2. Revised Austral Park Road interchange including the removal of the formerly proposed Austral Park Road Heavy Vehicle Rest Area.
3. Replacement of the formerly proposed roundabout at the intersection of Tannery Road and the current highway, with a roundabout at the intersection of Woodhill Mountain Road and the current highway.
4. Revised pier arrangement supporting the Bridge over Broughton Mill and Bundewallah Creeks.
5. Revision of the noise barrier running adjacent to Berry township to include Ha-ha treatment (a gentle embankment on the town side of the barrier).
6. Revised Berry southern interchange, including the extension of the northbound off-ramp under the Kangaroo Valley Road overpass and a longer overpass span.

Of these, only 1, 2 and 3 include changes to the previously proposed construction footprint. None of these extensions however, present a significant potential for impact to Aboriginal archaeological and cultural values, outside of those impacts already identified and subject to review. The Town Creek diversion (1), would fall within the 2011 additional area of investigation area (refer **Figure 2-1**), and as such, the potential for construction impact was anticipated and considered in the Aboriginal stakeholder review.

The Austral Park Road interchange (2) includes a new connecting access road, approximately 140 metres in length, which would traverse spurline mid-slopes adjacent to an existing trackway. The landform which would be subject to impact has low archaeological sensitivity (based on its gradient and distance from water), and occurs within an area of comparable mid slope topography, much of which was included in the draft report and subject to Aboriginal stakeholder review.

The proposal for a new roundabout at the intersection of Woodhill Mountain road and the existing highway (3) is situated within a much larger area that constitutes recording G2B A39. This is an area within which historical Aboriginal encampments may have been situated (refer sections 4.4.3 and 6.2.3). The roundabout proposal has been designed so that the construction footprint falls within previous zones of road construction disturbance (refer **Appendix I**). This has the consequence that the roundabout works would not pose a risk of impact to any potentially occurring archaeological remains belonging to recording G2B A39.

3 Landscape context

3.1 Broad scale context

The project area consists of an 11.6 kilometres traverse across the valley floors and fringing spurs and slopes of the Southern Illawarra Coastal plain.

The coastal plain consists of the rolling hills, littoral zone and valley floor topography situated downslope and downstream of the basal ranges and spurs of the Cambewarra Range (a southern extension of the Illawarra Escarpment). The boundary between the foothills and the coastal plain is not distinct and an approximate cut-off would be the 100 metres to 140 metres contour (AHD).

The basal slopes bordering the coastal plain have formed from the Berry Formation (siltstone, shale and sandstones), the Broughton Tuff (tuff and tuffaceous sandstone), and the Bombo Latite. The former two are metamorphic sedimentary formations, the latter a series of igneous lava flows. The Bombo Latite has formed the watershed ridges and higher ground that subdivide the various catchments and valley floors in the Kiama and Gerringong region. It dominates the higher relief of the eastern Project area, notably the crest and upper slopes of Toolijooa Ridge and the mid-range of the western slopes of the Broughton Creek valley adjacent to Broughton Village. The lower slopes of Toolijooa Ridge are comprised of the Kiama Tuff (trachytic tuff). Elsewhere across the western half of the project area, basal slopes and watershed ridges have formed from the Berry formation.

The valley floor of the coastal plain presents a low relief topography of quaternary fluvial sedimentary deposits which typically includes a suite of depositional landforms such as colluvial fans, flood plain, terrace sequences, current and former streambeds (including palaeochannels), wetland basins and old delta deposits. Across the project area quaternary fluvial deposits are encountered on the floor of the Broughton and Broughton Mill Creek valleys.

The majority of the fluvial valley deposits were laid down some 20,000 to 30,000 years ago and the high terrace levels probably date to around 29,000 years ago (Walker 1962). There has been a marked increase in water runoff and the rate of sediment discharged from major Illawarra streamlines in the last 100 years (Wollongong City Council 1976). The increase in sedimentation is attributable to the great disruption of vegetative cover, and the consequent erosion caused by European clearing and agriculture. A consequence has been the deposition of sediment layers across the surface of the plain’s basins and fans, causing pre-historic land surfaces to be buried and obscured. Another impact is increased rates of erosion and bank failure.

The town of Berry is situated at a point where the fluvial deposits of the Broughton Mill Creek valley (including Bundewallah Creek) interface with the former estuary embayment of the lower Shoalhaven. Upon entering the estuary, these streams would have dumped their sediments, and formed a small delta which extended progressively from north south into the embayment, prior to its infilling by about 4000 years ago (Wearne 1984:Fig 6.1, Woodroffe et al. 2000).

The sedimentary facies of the coastal margin are dominated by marine and aeolian sediments deposited as a result of prograding coastlines after high sea levels. These consist of estuarine deposits, as well as former sand barriers, dune and beach ridges. Around 8000 years ago, the sea was more than 10 metres below the present level, and reached its present level between 6000 to 6500 years ago. This is known as the post glacial marine transgression (Roy 1994, Thom and Roy 1985, Woodroffe et al. 2000).

Following stabilisation of former, and the current sea level, sand barriers formed across drowned valley embayments, creating a series of estuarine environments along the eastern seaboard, which subsequently and variously filled with sediment (Roy 1994). The plains of the lower Shoalhaven River are a large scale example of this process. They demonstrate an evolution from a brackish water estuarine environment to freshwater alluvial plains. When the sea reached its present level, most of the plains were flooded to form a large coastal embayment. Following the incipient formation of a sand barrier (of which Comerong Island is an evolved remnant), a coastal lagoon and estuary, similar in extent to Lake Illawarra must have been formed. This lagoon received fluvial input from Broughton Creek to the north and the Shoalhaven River to the west. The gradual infilling of the estuary then proceeded, with a pattern characterised by sedimentation around the periphery and gradual infill in the centre of the flood basin. Most of the plains adjacent to Broughton Creek were infilled between 5000 and 4000 years ago. Infill of the estuary basin was largely complete by 3000 years ago (Woodroffe et al. 2000).

During the last 2000 to 3000 years, the Shoalhaven River appears to have been channelized within levee deposits for most of its course across the plain. Isolated flood basins have persisted to the north and south. (Woodroffe et al. 2000).

3.2 Small scale context

The project traverses a series of ridge and spurline slopes, interspersed by valley floor flats and fringing toe slopes. The far eastern end consists of a traverse of the east facing slopes of the Toolijooa Ridge. This forms the watershed between the Crooked River and Broughton Creek catchments, and is the highest point in the project area reaching approximately 100 metres AHD. The ridge is a locally dominant, bedrock based, topographic feature which bisects the coastal plain. It extends from Currys Mountain (around 320 metres AHD), two kilometres to the north of the project area, to within one kilometre of Seven Mile Beach, four kilometres to the south-east.

West of Toolijooa Ridge, the project traverses obliquely across the basal slopes and floor of the Broughton Creek valley. Broughton Creek is a major drainage line and the largest catchment of the southern Illawarra coastal plain north of the Shoalhaven. The project traverse crosses the creek three times. The localities of Broughton Village and Broughton are situated within this valley, along the historical corridor of the highway. Broughton Village remains a loose concentration of residential buildings and small lot farm holdings, which boasts a history with a higher population and former public and community buildings.

From Tindalls Lane, the project area follows the crest of a low spurline which forms the watershed between Broughton Creek to the east, and Broughton Mill Creek to the west. The Project traverse of this spurline descends from around 50 metres, to less than 10 metres AHD, at the crossing of Broughton Mill Creek.

The project area then traverses the fluvial sedimentary deposits, flats and palaeochannels of the Broughton Mill Creek, and Bundewallah Creek (a tributary of the former), to the north of the Berry township, before crossing a low bedrock formed spurline at the western end of the town (Berry Mountain Road). From this point the project area turns south-west, paralleling the current highway corridor and traversing a series of unnamed minor tributary drainage lines and low interfluve spurs, which drain 800 metres downslope (south-east) to a former wetland basin which form part of the lower flood plain of Broughton Creek.

4 Aboriginal cultural context

4.1 Ethno-historical context

References to the Aboriginal history of the Illawarra district can be found in a large corpus of historical and ethno-historic documentary sources, however, most written references tend to be incidental in nature and vary in accuracy or perceived bias.

Complementing (and sometimes also contradicting) the written record is an often rich body of oral history. Aboriginal oral histories relate to both distant and near past events and include references to places in the context of Aboriginal tradition as well as from archaeological perspectives. Places which remain within remembered tradition include nineteenth century and later camps and settlements, hunting, fishing and gathering grounds, burial grounds and story places. Reports of the locations of Aboriginal sites have also been provided by local European people with a long-term interest in the Aboriginal occupation and archaeology of the region. Various Aboriginal groups and individuals (some now sadly departed) have generously shared their knowledge of the region over the years with interested researchers.

The very nature of oral history means that it is an ever-changing and dynamic body of information. The core sources of tradition are constantly being reviewed and re-contextualised according to the motivations of the tellers and listeners. This means that the 'truths' or facts related in oral histories may not necessarily transpose accurately back to the transformed modern physical world. Place names and the meanings of words or actions change over time. As a consequence, the information can often only ever be considered 'indicative' or anecdotal until demonstrated otherwise. Often the confirmation of oral or written references is impossible due to the disparate or limited nature of potentially corroborative information. Despite these limitations, references to places in Aboriginal history and story tradition form a valuable corpus of information which has the potential to illustrate the Aboriginal cultural landscape which has largely been ignored by other forms of the historical record.

Places and events known from the oral record are often of considerable and continuing importance to the local Aboriginal community. Places identified from the historic written sources have sometimes fallen out of the oral tradition and provide a valuable means of re-identifying places of historical significance.

4.2 Tribal boundaries and social structures

Based on the gaps, inconsistencies and lack of detail within surviving records, it is now difficult to be certain about the location and nature of linguistic and tribal boundaries.

Tindale conducted a comprehensive review of boundary information across Australia in 1974 (Tindale 1974). Based on Tindale's work, the project area falls within the tribal area of the Wodi Wodi people. Tindale found that the Wodi Wodi occupied an area which extended from approximately Stanwell Park in the north, to the northern bank of the Shoalhaven River in the south, and west as far as Picton, Moss Vale and Marulan. In keeping with his view that natural topographic boundaries were likely to coincide with cultural ones, Tindale considered the Shoalhaven River to form the boundary between the Wodi Wodi and the Wandandian people to the south.

These groups are distinguished by different languages, with the Wodi Wodi speaking Dharawal (Thuruwal) and the Wandandian speaking Dhurga. Howitt, however, refers to the language of the Shoalhaven area as Gurungada (Howitt 1883, 1904). Dharawal was spoken as far north as the southern side of Botany Bay (Eades 1976). Both the Dharawal and Dhurga languages form part of the Yuin linguistic group which extends southward from Sydney to almost the Victorian border (Schmidt 1919).

Contrary to Tindale's river boundary, ethnographers and other historic sources have tended to describe the Aborigines and linguistics of the lower Shoalhaven in terms of a single cultural character, one district, and one dialect (Capell 1963:S36; Dixon in Eades 1976:4). There is no mention of differences amongst the 'Shoalhaven Aboriginals' according to which bank of the Shoalhaven River they came from. In all references, the Shoalhaven tribes are treated collectively. It seems, therefore, more probable that the tribal boundary on the coastal plain was further south, and concomitant with linguistic evidence, adjacent to Jervis Bay. A boundary in this region would roughly be equivalent with the Shoalhaven-Jervis Bay watershed (Sefton 1980, Officer 1991a).

The term Wodi Wodi is first recorded by Ridley in 1875, who based it on the testimony of Lizzy Malone, the daughter of a woman of the Shoalhaven tribe. She stated that Wodi Wodi was the name of the language spoken by the Aboriginal people of the Illawarra (Ridley 1875, Organ 1990:xlii). Janet Mathews noted the name ‘Illawarra Tribe’ in 1960 stating that ‘old inhabitants around the lake swear that their tribe was called this, and it was bounded by the shores of the lake’ (Mathews c1960:1). She adds that ‘their language appears to be Dharawal, but the Aborigines never use or have heard of that word. They say there was a separate tribe at Shellharbour but that cannot be checked as they appear to have been extinct there for some time (Mathews c1960:1).

Many modern researches use the term Dharawal or Tharawal to refer to the tribal group within the Illawarra. Amongst contemporary local Aboriginal people the term Wodi Wodi is often preferred. However, some groups now identify the Illawarra tribe(s) as the Elouera, possibly guided by early references to the pronunciation of Illawarra as 'Eloura' or 'Ellowera' meaning a pleasant place (Thornton's 1896 word list in Organ 1990:358, also McCaffrey's notebook 13, 1910-1930 in Organ 1990:486). The Aborigines of the Nowra region refer to themselves as the Wandiwandian people (pers. comm. Sonny Simms 2007).

Within these broad language and tribal groupings were smaller social divisions, perhaps consisting of different family groupings, which appear to have been associated with local areas or home territories. European observers tended to identify these groupings as ‘tribes’ and associated them with localities which may have related to home territories. Examples from the Gerringong to Bomaderry Princes Highway upgrade area include the Shoal Haven (Nowra and the adjacent area south of the Shoalhaven River), Murro (Meroo Meadow region), Broughton Creek (lower Broughton Creek and coastal plain north of the Shoalhaven River) and Gerongong (Seven Mile Beach hinterland to Gerringong) (Egloff, Navin and Officer 1995:41, Organ 1990:c.f. 190).

Howitt records the name of the Yuin 'clan' inhabiting the Lower Shoalhaven District as Gurungatta-manji (Howitt 1904:82).

Generally speaking, the term 'tribe' is employed to describe a large group of people who, for the most part, speak a common language and occupy a broad tract of land within which 'clans' consisting of loosely-related families own the land, and smaller groups referred to as bands perform the daily tasks of group maintenance. Matthews and Everitt described the clan organization of the Shoalhaven as consisting of related males with married women joining the band of their husband but maintaining an affiliation with their clan of birth. Children belong to the father's clan, with both sons and daughters receiving the totem of their father's clan (Matthews and Everitt 1900:264).

Bands frequently change composition in what is referred to as a 'fusion and fission' model of local group organisation. The Aboriginal people of the Shoalhaven banded together for specific activities, were together for a time, and then split apart; later they formed new groups which most likely had at their core a number of closely-related families. Leadership was assigned to experienced elders with the males being predominant. Alexander Berry (1838: letter 2, in Andrews 1979:6) described a band which was camping near his house as 'natives who were all sitting in groups with their different families'.

Boundaries between local bands and clans were flexible and permeable, allowing groups to move about (Poiner 1976). Where resources, food or materials, were particularly rich, it is likely that use of those goods was controlled and permission had to be obtained from the custodians of that place. Where resources were widely distributed across the landscape, movement of people was less controlled. Disputes did occur, particularly between the coastal people and the mountain groups, but the nature of these arguments is not well recorded; generally speaking, conflict was ascribed to clashes by men over possession of women. It is known that there was armed conflict in the Shoalhaven district, but it is not certain how this impacted on Aboriginal patterns of land use (Egloff, Navin and Officer 1995).

It is likely that Aboriginal groups were able to maintain their structure throughout the early period of European settlement. Later responses may have included seeking refuge and establishing camps either at a distance or close to European properties, being partially integrated into maritime or pastoral activities, or dwelling on the fringes of European communities. As the land-use patterns of the new colonists intensified, there would have been a demand on natural resources, and the food sources of the Aboriginal people would have diminished radically. In the 1840s and 1850s, the introduction of dairy farming (Bell 1960) further reduced the availability of game in the Shoalhaven District. The issuing of rations by the government encouraged a clustering of people into camps, which would have caused some breaking down of the previous marriage patterns where polygamy (male having more than one wife) was the economically preferred strategy. It is thought that rations were issued to discourage multiple partners (Andrews 1979:9).

New camps frequently were situated close to towns, and most likely contained members of a number of different clans and bands. The camps became more or less permanent, much more fixed on the landscape than the hunting and gathering camps which had provided the primary locus in previous times. In the Shoalhaven district, camps were found at Bilong, near Currambene Creek, and at Coolangatta Mountain on the Berry property.

Camp life, with a mixed population from a number of groups, broke down established patterns of local organization. As the numbers of children with white fathers being born to Aboriginal women became more common, the practice of the offspring being absorbed by the mother's clan increased. Descent came to be reckoned through both lines and support for child-raising was more likely to come from the mother’s family. Ceremonies and group activities which once bonded together the clan groups began to weaken and take on new forms. The institution of Christmas was of particular importance, not for its religious connotation, but more for the social meetings which were permitted during the times when other kinds of gatherings of Aboriginal people for more traditional activities were actively discouraged. (Egloff, Navin and Officer 1995).

Mobility, particularly among males seeking employment, increased as kinship ties became more extended through inter-clan marriages. Bell (1960) reported an incident which occurred in 1878 when a group of Aborigines from the South Coast camped in a disused structure at Circular Quay. When asked to leave, twenty-six people stated that they wished to remain. They formed the nucleus of the La Perouse settlement in Sydney.

By the 1880s, it appears as if most of these arrangements were weakening and Aboriginal people were being pressed into reserves or missions. Although the missions provided places for ration distribution they also may have been inappropriately sited or offered constraints and other forms of control such as the infamous removal of mixed-blood children (Egloff, Navin and Officer 1995).

4.3 Historical overview

The first European sightings of the Shoalhaven region were made by Captain Cook in April of 1770. He noted a protected bay which would later be named Port Jervis, and on April 26 'several smokes along shore before dark'. This observation may relate to Aboriginal campfires in the vicinity of Bass Point.

The earliest contacts between Europeans and local Aborigines were amicable (Grant 1801). He recorded large numbers of unarmed Aboriginals whom he described as 'more robust than Sydney Blacks'. Friendly relations continued and in 1811 Governor Macquarie recorded that the population was numerous and disposed to trading for biscuits and tobacco.

First reference to interaction between the Shoalhaven tribes and Europeans comes from the recollections of survivors of the wreck of the 'Sydney Cove' who walked up the south coast from Gippsland to north of the Illawarra before being picked up. As the exhausted party came towards the Shoalhaven they met with 'unfriendly natives, at whose hands it is thought some of the exhausted ones lost their lives' (Cambage 1916).

In 1805 James Meehan reached the Shoalhaven River on an exploratory trip and noted the existence of considerable stands of red cedar along the lower reaches (Antill 1982). The cedar getters, both legal and illegal, quickly followed and were almost certainly the first Europeans to venture into the coastal escarpment of the Illawarra Range. The first official shipment of cedar from the Shoalhaven, cut from its lower reaches, was in 1811. A year later seven ships were engaged in the trade.

An undocumented and probably violent story of culture contact and exploitation followed the cedar cutters. The conduct of the cutters was mostly beyond the control of Colonial Officials. There is evidence to suggest that the Shoalhaven Aborigines were not friendly toward the newcomers. The timber getters were obliged to fell their timber near the river banks, not only due to transport limitations, but partly for fear of the natives who were described as never having been 'otherwise than inimical to us' (Perry 1954:30).

It is possible that conflict between the cedar getters and the Aborigines led Governor Macquarie in 1814, to forbid vessels to enter the Shoalhaven to cut timber, a directive which appears to have been ignored. Such conflict is hinted at in a statement by Macquarie referring to the 'abuse' occasioned by cedar getters while logging and extracting timber:

> "There being reason to believe that the Indulgence which has occasionally been granted to Masters and Owners of Vessels to resort to and bring Timber from Shoalhaven is subject to considerable Abuse...' (Sydney Gazette 3/12/1814)'."

Shortly afterwards, in 1815, a party of three cedar cutters were found to have been murdered by natives 'soon after their arrival at Shoal Haven' (Perry 1954:30). One body was eventually located. This incident made the new white inhabitants afraid of the Aborigines for ten years (Bayley 1975).

Breton tells of an early Shoalhaven incident where 'Three natives persuaded a convict servant to accompany them in search of cedar...' The natives pushed him over a precipice and cut out the dead man's tongue in the hope that eating it would enable them to speak English (Breton 1834:168).

On 4 June 1816, Governor Lachlan Macquarie issued a proclamation which prohibited Aborigines from approaching towns or farms if they were armed or if in a group of more than six. All large gatherings were forbidden regardless of their proximity to any British settlement. This proclamation was seen as sanctioning actions of colonists in allowing them to fire on groups of Aborigines. Prisoners could be taken and those who refused could be shot and their bodies hung in 'public' places. These rules applied to men, women and children (Cleary 1993).

In 1812 the surveyor George Evans made the first recorded European explorations on the Cambewarra and Illawarra Ranges. Following completion of a survey of the Jervis Bay foreshores, Evans intended to return overland to Appin. The difficulty of his party's ascent of Good Dog Mountain changed his mind, but before descending to the coast he camped overnight on Tapitalee Mountain. Evan's exploration was assisted by a local Aboriginal he called Bundle (Griffith 1978:12).

In 1818 Charles Throsby and Deputy Surveyor James Meehan were commissioned to locate an overland route between Sydney and Jervis Bay. They were accompanied by Hamilton Hume. The party split into two groups after encountering the barrier of the Shoalhaven Gorge. Throsby, and two others returned to Bundanoon Creek accompanied by two Aborigines 'a native boy' called Broughton and Bundle (probably Evan's guide). There they met two Aborigines both known to Throsby from Lake Illawarra, one called 'Mamaa' the other 'Timelong' (letter from Mrs Brooks 1827 quoted in Griffith 1978:13). The two Illawarra Aborigines guided Throsby's party into Kangaroo Valley via Meryla Pass to a place on the Kangaroo River identified as Yarranghaa.

During 1819, John Oxley and Meehan were returning from Jervis Bay to the Shoalhaven with the aid of a local guide, Broughton:

> 'We fell in with five natives who were friends of our guide, Broughton, and at his request they joined us, and when we had recrossed the waterfall, guided us to a high conical forest Hill, being the highest of the tract of country lying between Shoalhaven River and Jervis Bay [Nowra Hill], the country in its immediate neighbourhood, better clothed with grass, heavily timbered, the soil a stiff mould, with abundance of Indigofera and various species of Acacias. On the top of this hill was a native tomb, decorated with boughs; Broughton informed us it contained an infant daughter of his' (Cambage 1916:9).

The surveyor Throsby returned to the Shoalhaven from Kangaroo Valley in 1821 and went to a place he called 'Nou-woo-ro', now known as Nowra (Griffith 1978).

Early in 1822, on returning from verifying the existence and source of the Clyde River, Alexander Berry spent several days exploring the Shoalhaven River, up as far as Burrier. Six months later Berry returned with the aim of establishing a permanent settlement. He was in receipt of a government grant of 10,000 acres on the Shoalhaven River, and a labour force of nineteen convicts. This marked the start of permanent European settlement in the Shoalhaven River valley.

Berry chose an area of elevated ground at the foot of a hill variously referred to as Coolungatta, Cullengatty, Coloomgatty for the site of his settlement (Antill 1982:10, Bayley 1975:24, 27), and Cooloomgatta (Mitchell 1834 NSW Map). The name was recorded by Surveyor James McBrien in 1824 as Aboriginal, meaning 'high hill' (Antill 1982:10). It is now known as Coolangatta. Howitt records the name of the Yuin 'clan' inhabiting the Lower Shoalhaven District as Gurungatta-manji (Howitt 1904:82). 'Coolangatta' may therefore be a derivation of the name used by the original Aboriginal social groups who lived in the Nowra region.

Berry’s selection of this location was apparently treated with apprehension by the local Wodi Wodi. Berry notes that in June of that year, during construction of a hut and a canal near the Shoalhaven Heads a native called Wagin (a local chief), confronted the workers and claimed the ground where they had been working (in Jervis 1942:235). This action falls into context when it is acknowledged that the Coolangatta Mountain was a place of ancestral significance to local Aboriginal people.

Another early project of Berry's was the cutting of a track from Illawarra in order to drive cattle from Bong Bong to the Shoalhaven. It is probable the track traversed the Saddleback Ridge, which forms the eastern spur extending from Barren Grounds (Bayley 1975:24).

Berry's settlement grew steadily with the immediate introduction of herds of cattle and the establishment of plant crops at Numbaa. Berry initially considered the local Aborigines to be ferocious and his timber workers tried to drive them away.

For several years potatoes and maize was 'stolen' from the fields (Bayley 1975). Several weeks after Berry's arrival a party of twenty Aborigines camped near his settlement. Berry notes that there were two chiefs, Wagin, chief of Numba (Lower Shoalhaven), and Yagen chief of Jervis Bay. He also describes Brogher (or Broger), the brother of Broughton (an Aboriginal guide employed by Berry), as a native chief (probably of area north of Coolangatta). These probable band groupings suggest that most of the Aboriginal population was centred on the more fertile coastal plains.

In 1824 Berry employed seven men to cut cedar from the Broughton Creek (Berry) and Morow (Meroo) regions to supply the growing market demand in Sydney (Antill 1982).

Other grants followed including the first land grants within the Kiama hinterlands in the early to mid 1820s (Jervis 1942). From this period, settlers furnished brief descriptions of Aborigines in the Shoalhaven particularly those which settled on pastoral properties and gained employment (Berry 1834). Aboriginal people also gained employment in fledgling local industries such as the failed whaling station at Jervis Bay.

The population of the local Aboriginal groups was estimated in 1826-27 to be 68 for the 'Bundgong' (or Bridgong) and Shoalhaven (the lower Shoalhaven River), and 71 for Kangaroo Ground (Evidence given to Committee of Enquiry into Immigration 1841, in Ellis 1989, Science of Man 4(4):71).

In 1826, the majority of the cedar arriving in Sydney came from Kiama, and the 'Long Brush', an area rich in cedar stretching ten kilometres from Jerram (just west of Kiama), to Jamberoo. Equally abundant were the gullies feeding Broughton Creek in the Jasper's Brush district (Griffith 1978).

In 1829, a cedar cutter engaged by Berry named John Rivett, was reported as murdered at Broughton Creek by Broger (Brogher) a local Aboriginal 'chief' (Antill 1982).

In 1830 Alexander Berry testified in the trial of Broger, who was a brother of his long-standing friend Broughton. It was alleged that Broger, offered to show a party of cedar cutters some trees and then killed John Rivett, an employee of Berry. The trial took place in Campbell Town, and was reported in the Sydney Gazette of 26 August 1830 (Organ 1990:159). A plea of self-defence was entered by the defendant, which was also held to be common knowledge shared amongst the local Aboriginals, but this did not mitigate the sentence, and Broger was convicted of murder and subsequently hanged in Sydney.

In 1831 Robert Anderson applied for 'two sections of land in the district of Shoalhaven known by the native name of Nowry' (Jervis 1942:246).

In 1835, a number of European settlers complained of the 'great and grievous losses' they had suffered from the depredations of the blacks at Kiama. Whole acres of corn were removed in one night and two of the complainants had lost twenty pigs in three months (Sydney Morning Herald, August 20, 1835).

There are a number of historical accounts of enmities in the early to mid nineteenth century between tribal groupings of the northern and southern Illawarra Dharawal speakers. These consist of clashes between the ‘Illawarra’ tribes and apparent northward offensives of the Bong Bong, Broughton Creek, Kiama and Shoalhaven tribes. This has been interpreted as a consequence of changes in social order, resource distribution and political alliances brought about by the European settlement and occupation of tribal lands (DEC 2005:16).

Examples are the battle of Fairy Meadow in 1830 between the Bong Bong and Illawarra groups (involving 1500 participants and 100 deaths), and a battle at Albion Park in around 1842 between the Broughton Creek and King Hooka's Illawarra tribes. (DEC 2005:18).

The Albion Park battle occurred somewhere in the area between the present Albion Park railway station and Albion Park township. The battle involved more than 400 individuals and was reportedly precipitated when the 'Coolangatta blacks' moved into the Illawarra with the intention of attacking the white settlements. The Coolangatta force was repelled after a day of combat and the death of many participants, including King Hooka who was reportedly buried in a variety of locations around Lake Illawarra (Young in Organ 1990:375, Dollahan in Organ 1990:492 & 494, Thomas 1975:12).

In 1836, James Backhouse toured the Australian Colony and passed through the study region, travelling from the Five Islands (Wollongong), through Colomgatta (Berry's estate on the Shoalhaven), and Kangaroo Ground (Kangaroo Valley) to Bong Bong (Backhouse 1843). Backhouse encountered many parties of Aborigines, often describing them as partly clothed in European clothes and subsisting according to both traditional and European sources of food and materials (Backhouse 1843:435).

On the 1st October Backhouse's party crossed the Shoalhaven 'with John and William Berry being rowed by three blacks, one of whom named Lewis recognised us, having met us at John Batman's in Van Diemans Land. He is one of those who were employed in collecting the natives of that Colony and was dressed in an old suit of Colonel Arthur's clothes'.

Backhouse goes on to recount that 'A Black came from a sawing establishment of Alexander Berry's where he had learned to work and said he had cleared a piece of land and sowed some pumpkins. He asked also for some seed potatoes to plant, and said he thought it much better to have settled habitation than to lead a wandering life like his countrymen. Alexander Berry was much pleased with this spontaneous attempt on the part of the Black to settle, having often in vain tried to persuade some of these people to adopt such a course' (in Organ 1990:205, and in Egloff, Navin and Officer 1995:37). This passage is revealing for its indication of Aboriginal employment in the Berry estate industries, and the provision of space for vegetable gardens tilled by Aboriginal employees.

At the foot of the Cambewarra Mountains, he met a group of six aborigines dressed in blankets and old European clothes. 'These people were accoutred with hunting and fishing spears, and weapons of war' including a death spear barbed with 'pieces of glass' and a shield painted in white with red lines (Backhouse 1843:433).

On the Kangaroo Ground (Kangaroo Valley) Backhouse noted an assembly of about two hundred Aborigines. It seems probable from his description that he observed the end of a ceremonial gathering amongst some of the southern groups of the Wodi Wodi people:

> "Three tribes of Blacks were assembled here last night; one belonging to the neighbourhood, and the others to Shoal Haven and Bong Bong. There were forty men in one of these tribes: they were going to Cow-Pastures, [Camden district] to learn a new song, that had been invented by some of their country people there! All the men had undergone the ceremony of having one front tooth knocked out, on being admitted to the privileges of manhood; and they had the cartilages of their noses perforated, and bones, the thickness of a quill, and about four inches long, through them. They wore fillets of net-work around their heads, and beads, formed of short pieces of reed, around their necks' (Backhouse 1843:435)."

Perhaps in response to his need for cheap manual labour, Alexander Berry conducted a census of Aboriginal people in the immediate proximity to his estate in 1838. He remarked that the numbers had decreased in the last sixteen years.

His collation identifies the individual bands in the region:

Gerongong Tribe	21	Broughton Creek	26
Uurro Tribe	24	Shoalhaven Tribe	39
Numba Tribe	25	Wooragee Tribe	45
Jervis Bay	62		

(Burton Papers NSW Archives, in Egloff 1981:13).

> By the late 1830's the majority of the lower coastal plain between Gerringong and the mouth of the Shoalhaven River had been taken up as land grants. By 1840 the Coolangatta Estate had a population of 270 people.

Through the 1840s and 1850s Aboriginal communities were increasingly impacted by the spread and consolidation of European settlement. In response, Aboriginal people either settled on the pastoral stations, in ‘fringe camps’ adjacent to European settlements, or were forced into adjacent rough and mountainous country. In the mid 1840s it was recorded that there were five Aboriginal camps in Kangaroo Valley, 'each camp in a separate gully' (Griffith 1978:9). Egloff (1981) concludes that by the 1840s the Shoalhaven Aborigines had been reduced to remnant groups either wandering large tracts of the coast, or subsisting at the edge of the now permanent European settlements.

Reports from the 1850s onwards suggest a trend in Aboriginal occupation and subsistence such that camps and most food gathering and hunting became concentrated along the coast. This pattern was shaped by European settlement which pushed Aboriginal people onto country unsuitable for agriculture, notably the coast and the adjacent wetlands (DEC 2005:25). Permanent Aboriginal camps became established on Broughton Creek (Berry), Crooked River (also referred to as Black Head or Gerongong), around Jervis Bay (notably Bilong on Currambene Creek), and in a gully on the northern side of the Coolungatta Mountain on the Berry Estate (Egloff 1981). The Coolangatta camp had grown with the Berry Estate, and a number of the residents there were employed as labourers and to grow vegetables (Egloff 1981).

Other encampments known from the latter half of the nineteenth century include the banks of Broughton Creek at Broughton Village (Donlon 1991a:12), and the banks of Broughton Mill Creek adjacent to Berry (Barbara Timberry in DEC 2005:39-41).

In 1850 a newspaper article on the Shoalhaven region noted that:

> “Bacchus has many more votaries than he used to have and aboriginal tribes have become great drunkards, yet there is only one public house in the neighbourhood' (Sydney Morning Herald Oct 5 1850, in Jervis 1942).”

By the 1860’s the potential refuge posed by the remaining mountainous and forested slopes was being eroded by closer European land settlement and consequential reductions in bush foods and game from forest clearance and the pasturage of herds of cattle and sheep.

In 1867, the death of an Aborigine known as 'Commodore' or 'Commandant' was noted 'from the effects of exposure and want' at the Aboriginal encampment on the Minnamurra Estuary, on the then Eureka Estate. 'Commandant', or Jaunda, had been listed in the 1837 blanket return at Shoalhaven (Coolangatta) as a member of the Gerongong tribe, then aged 14 (in Organ 1990:214, 321). This is suggestive of considerable movement of Aborigines between the main encampments in this part of the Illawarra, namely between Coolangatta (on the Berry Estate), Crooked River, and the Minnamurra River Estuary.

Reclamation of the Shoalhaven wetlands began on a major scale from 1873. By 1909 a total of 600 km of drains had been constructed. The draining of the wetlands effectively alienated the last terrestrial wild food areas open to the remaining local Aborigines.

Following cholera and typhoid epidemics in the Coolangatta camp in the late 1890's, The Board for the Protection of Aborigines moved residents to a newly proclaimed Reserve at Roseby Park (Orient Point) in 1900 (Antill 1982, Bayley 1975).

The last remembered initiation ceremony staged in the region was conducted in the late 1880's by 'the Shoalhaven River tribes' on the southwestern side of Moeyan Hill, a low hill to the north of Coolangatta Mountain (Mathews 1896).

Aboriginal groups responded to the dispossession of their lands in a variety of ways including fostering camps close to pastoral properties, as well as at places of refuge away from settlement. Some people moved into areas of settlement and communities grew on the edges of rural towns. In response to moves into areas of settlement, the New South Wales government established a system of Aboriginal reserves in the 1880’s.

In 1881 a Protector of Aborigines was appointed. The Report of the Protector' George Thornton provides the first comprehensive census since the blanket issue returns of the 1840s. It gives the following information with respect to the people of Shoalhaven and Jervis Bay (Thornton cited by Organ 1990:339-341).

> “Shoalhaven - Most of the half casts are employed. The Jervis Bay people live by fishing and Government rations. The Jervis Bay blacks get Government rations. This is necessary as there are few white people in that locality. Three boats in the district - one at Terrara, one Broughton Creek, one Jervis Bay. All in good order. Provided by Government. About thirty half-cast children are at school at Coolangatta, five at Jervis Bay and three blacks. [Blanket] issue necessary and not in any way misappropriated. [Supply of clothing needed] at Jervis Bay. A number of them given to drink. But since the Act of 1882 came into force drunkenness has ceased. [Medical] own expense.”

The Protector was replaced in 1883 by the Aborigines Protection Board which by the turn of the century had established 133 reserves across the State. Aboriginal reserves were sited to allow for the exploitation of natural resources (marine and estuarine) at a distance from white rural centres (Goodall 1982).

The Aborigines Protection Board was also responsible for the infamous policy which resulted in the removal of thousands of Aboriginal children to the Cootamundra Girls Home, the Kinchela Boys Home, and in the lower Shoalhaven, the Bomaderry Aboriginal Children’s Home (Read n.d.). The Bomaderry Aboriginal Children’s Home was established in 1908 when it received seven 'native' children, six orphans and one baby (Bayley 1975:176).

Missionaries were allowed to live on many of the reserves and in popular terms Aboriginal people came to refer to the reserves as 'missions’. Reserves to which managers were assigned were referred to as 'stations'. Like the many small reserves created in the nineteenth century these places were regarded by the government as temporary arrangements to be altered or closed on the advice of the Board.

Prior to 1890 at least two petitions were presented to the government of NSW requesting a reserve within the Shoalhaven district and at Jervis Bay (Egloff et al 1995:46). These were refused by the Government.

The pattern of later nineteenth century Aboriginal occupation on the lower Illawarra coastal plain can be characterised by an early evolution of non-government or mission-aided encampments, and later enforced translocation onto government reserves and mission institutions.

Prior to the establishment of government reserves, most Aboriginal settlements developed around the remaining access to coastal resources such as at Crooked River (Gerrongong), or sources of employment and/or provisions such as Berry's Coolangatta Estate, and towns such as Broughton Creek (Berry). All of these areas of encampment appear to have been established or continued, despite the alienation of the lands to European freehold owners. Their location may have been determined by a variety of factors, including established seasonal camping locations, proximity to food resources, friendly (or non-hostile) white settlers/landholders, and proximity to European settlements, rations and employment.

Toward the latter part of the nineteenth century, government authorities placed pressure on Aborigines to re-settle within government reserves. This effectively removed local Aboriginal groups from freehold and crown lands, and concentrated the remaining populations onto reserve lands. Reserves were often situated on marginal land, away from people's traditional lands and forced peoples of differing tribal affiliation into close contact. Despite this, the occupation of coastal and fringe camps continued, especially as part of the required movement of people looking for seasonal work.

In 1899 a government Aboriginal reserve of 43 acres was established near the northern end of Seven Mile Beach. The reserve was revoked in January 1953 (AR 29911, McGuigan nd:39). Although the exact nature of Aboriginal occupation on this reserve is not well documented, its location and duration supports the documentary evidence for a historical focus of Aboriginal occupation in the Crooked River (Black Head/Gerringong) area.

In a census conducted by the Commonwealth in 1901 the Aboriginal population of the Illawarra was distributed across seven camps with 33 at Port Kembla, 13 at Minnamurra River, 8 at Dapto, 18 at Bombo, 20 at Gerringong, 3 at Jamberoo and 3 at Kiama, giving a total of just 98 (DEC 2005:24). Noted by the census at Coolangatta were the Amatto, Ardler, Ferguson, Judson, Methven, Nipple and Steel families. Families at Roseby Park were Bundle and Carpenter (State Archives NSW in DEC 2005:25).

In 1903 there were 100 people living at Roseby Park. Other local Aboriginal camps and Reserves included: Bilong on Currambene Creek at Jervis Bay, Beecroft Peninsula, Orient Point, and Wreck Bay. The old Wreck Bay and Orient Point reserves are now Aboriginal-owned land.

From 1940 to 1969 the Aborigines Protection Board vigorously pursued a policy of assimilation. Reserves were reduced in size or were revoked (Long 1970). Houses and facilities were allowed to deteriorate in an attempt to force Aboriginal people to move off the reserves.

Goodall considered that the pattern of reserve establishment reflected changes in European landuse more than it does the distribution of the people they were supposed to be servicing (Goodall 1982:58):

> "South Coast Guris continued in the 1900s to use both reserved and non-reserved land as a residential base. Some gained casual or seasonal work with white dairy or crop farmers while others were employed in the continuous work of the timber industry, either felling or in saw mills. Many South Coast Guris, however, continued to support themselves fishing, some at a subsistence level but others increasingly selling their catch in competition with white fishermen. A total of 37 Board-provided boats were in use by the turn of the century; more than half had been supplied to South Coast Guris who used them for fishing ..."

In 1935 the Shoalhaven Council received a petition signed by 64 citizens requesting that the Aboriginal people who had established 'shanty' dwellings in the public reserve be removed to Roseby Park. It was claimed that the living conditions were unsanitary. The Board responded that it could not force the people to move to the reserve.

By March of 1937 all informal dwellings, those erected without Council approval, had been demolished throughout the township and the squatters removed to the reserve. Further complaints were lodged by town citizens against an Aborigine who had erected a dwelling with Council approval (Antill 1982:104 in Organ 1990:381, Goodall 1982:306), but the Council did not to heed the citizens demand for removal (Egloff, Navin and Officer 1995).

A Directorate was established in 1969 to control reserves and an advisory council with Aboriginal members was appointed. In 1979 the New South Wales Aborigines Welfare Board, the successor to the Aborigines Protection Board, was abolished and the reserves transferred to the Aboriginal Lands Trust. To meet the new policy of self-determination, steps were then taken to consolidate, revitalise and upgrade reserves. Reserve ownership has for the most part been transferred to LALCs.

Today, Aboriginal people live throughout the Illawarra and South Coast as residents of the larger towns and cities - Bega, Nowra, and Wollongong, as well as maintaining communities on former reserves, and are found throughout the region in family groups. Communities of Aboriginal people are located at La Perouse, Orient Point (Jerrinja), Wreck Bay, and Wallaga Lake, as well as on 'informal reserves' such as Browns Lane near Nowra and Murray's Flats outside of Bega.

4.4 Places of reported historical and cultural Aboriginal significance

This section provides information on known or reported places which have, or may potentially have, historical and cultural significance to the local Aboriginal community. This information has come from previously prepared heritage assessment reports and other published material, including local histories and some recent compilations of oral histories.

Four places occur within the project area; these are the historical encampments at Broughton Village and Berry, the “Little Mountain” or “Dicky Wood’s Meadow” battle ground, and the Toolijooa Ridgeline. The general location of these places relative to the bypass is shown in **Figure 4-1**.

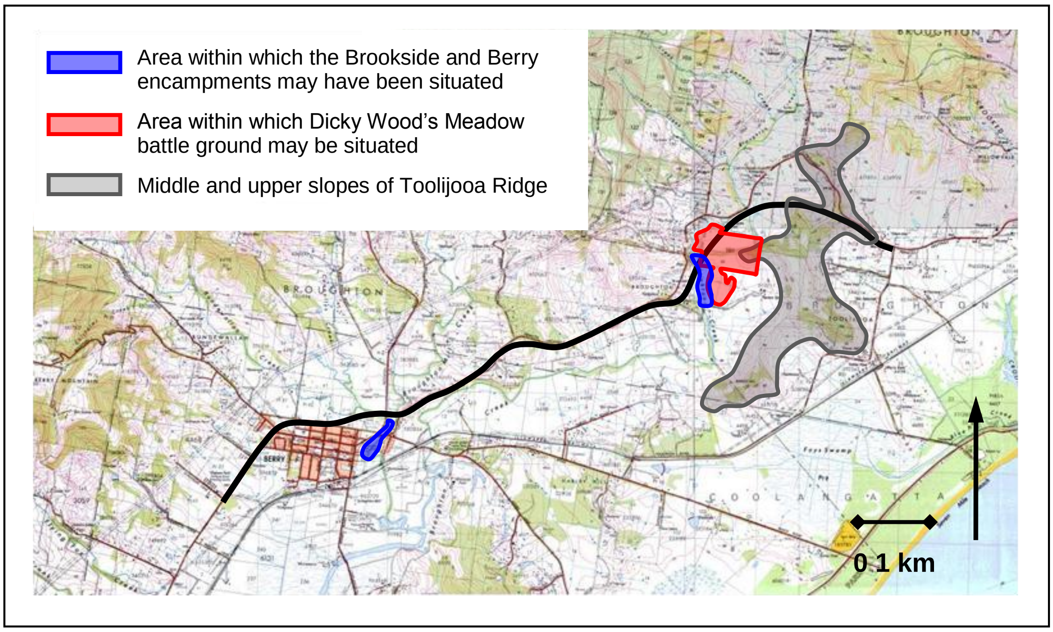


Figure 4-1: General location of three Aboriginal culturally significant places relative to the bypass

4.4.1 Aboriginal encampment at 'Brookside' (Broughton Village) (G2B A14)

Information collected from a local community questionnaire conducted by Donlon in 1991 for a previous highway upgrade option analysis revealed a local oral tradition that 'Aboriginal people were known to have camped along the banks of Broughton Creek in the vicinity of 'Brookside' at Broughton Village until at least the turn of the century' (**Figure 4-2**). It was added that 'artefacts have been observed and collected in this area in the past', suggesting that this location also was occupied in prehistory (Donlon 1991a:12).

An area up to 200 metres from the eastern bank of Broughton Creek, and 350 metres up and downstream of the Brookside homestead has been identified as an area within which the Aboriginal encampment may have been situated (refer Appendix C.1).

Figure 4-2: View of '*Brookside*' and the adjacent flats of Broughton Creek, at Broughton Village, looking north-east. The creek banks were recorded to be the site of historical Aboriginal encampments

4.4.2 The '*Little Mountain*' or '*Dicky Wood's Meadow*' battle ground (G2B A13)

An Aboriginal battlefield is recorded within the project area, in the vicinity of Broughton Village. This information comes from notes made in 1900 by Archibald Campbell from various interviews with a Shoalhaven Aborigine known as Buthring (in Organ 1990:470).

Campbell writes 'Buthring says that one of the main battle-fields the blacks used in the olden times was 'The Little Mountain" or "Dicky Wood's Meadow" beside the creek, on the east side of Broughton Village. He said the different tribes from all directions used to fight there – mostly about women matters. "Lots" of blacks were killed there in battle, and buried here and there about'.

Richard Woods (or Wood), of Shoalhaven, purchased portion 181 in 1842 for £400. This is a 100 acre portion of land situated on the floor of the Broughton Creek valley, just southeast of the Broughton Village subdivision (**Figure 4-3**).

The property is referred to in Land Title Records as 'Finns Valley or the Little Meadow" (Land Title records Bk 9 No.203, but see also Elliott 2009, and McCaffrey 1914 in Caldwell 1999). '

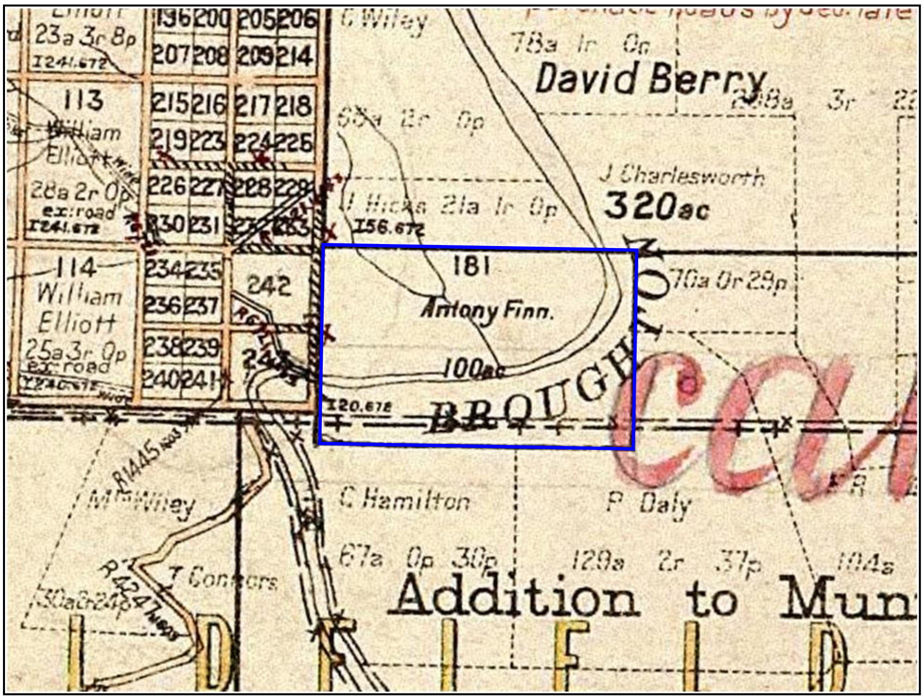


Figure 4.3: Extract from 4th Edition parish map for Broughton, County Camden, showing the location of Portion 181, an original land grant of 100 acres to Antony Finn, and subsequently purchased by Richard Woods (or Wood) (Map dated 1893, cancelled 1902, Parish map preservation project ID no. 10353801)

Dick Woods was employed at one time as a cook on one of the boats owned by the Berry and Wollstonecraft partnership. He was joined by his brother William, a carpenter, who is reported to have built the second house erected in Goulburn (McCaffrey 1914 in Caldwell 1999). Dick Woods was remembered to have bred dairy cows and horses on the property and was considered an 'excellent horse doctor". Both of the Woods brothers had been transported to New South Wales, and neither married (McCaffrey 1914 in Caldwell 1999).

In 1866 Richard Woods of Broughton Vale, farmer, sold Lot 181 to George Tate, also of Broughton Vale, farmer, for £2000 (Land Title records Bk 100 No.853). A mortgage of £1000 was subsequently discharged from Woods to Tate in 1870 (Land Title records Bk 100 No.855; Bk119 No.124). McCaffrey notes that following the death of William Woods, Richard sold the farm to George Tate for £1000.

Using Campbell's description of the location of the battlefield 'beside the creek' and 'on the east side of Broughton Village', and the knowledge that Richard Wood owned portion 181 for the period 1842 to 1866, it is now possible to be more specific regarding the possible location of Dicky Wood's Meadow, and the approximate area in which the battlefield may have been located.

If the reference to a meadow relates to a natural clearing within the forest, it is probable that it corresponded to a wetland or intermittent wetland basin. There are two low lying areas, within or near to portion 181. Both were probably permanent or intermittent wetland basins prior to the cutting of drainage channels by Europeans to drain and basins for agriculture. One is situated, north of Broughton Creek, across the north western corner of the portion, and forms the lower catchment of a small tributary streamline.

The other is situated just south and outside of the portion and forms the upper catchment of a small tributary draining the valley floor. Either of these may have supported a natural 'meadow' community and could have been associated with Woods' occupation of the valley floor. The northern basin, being situated mostly within Woods' property is therefore the most likely of these two options (**Figure 4-4** to **Figure 4-9**).

If the meadow reference is to a man-made clearing in the forest, then it probably refers to a cleared area on Wood's 100 acres. In this case, somewhere in close proximity to the site of the former homestead would be the most likely location. A number of remnant pine trees marks the location of a former homestead on this portion, and is located just south of the Broughton Creek, on the low gradient basal slopes.

The boundary of portion 181, and the location of the two former wetland basins, and the homestead site are shown in **Figure 4-10**. Taken together, they provide an area of potential, near to, or within which, the Aboriginal Battle ground is likely to have been located. If a buffer of 200 metres is allowed for, this area of potential consists of 136.6 hectares.

Together with the intangible cultural values of this place, there is an associated potential for archaeological remains in the form of burials.

Figure 4-4: Looking east along a drainage channel within a former wetland basin in the northwestern section of Richard Woods' land holding. This is a possible location for a natural 'Meadow' on Dicky Woods' property

Figure 4-5: Looking south towards Broughton Creek at the location of a proposed bridge crossing on the bypass alignment. This part of the alignment is situated within Dicky Woods' former land holding (portion 181)

Figure 4-6: View looking south from Thompson Road towards Harley Hill. The former wetland basin in Richard Woods' land holding is in the middle distance. Was Harley Hill the 'Little Mountain'?

Figure 4-7: A more distant view, looking south-east, of the same proposed bridge crossing site shown in Figure 4-4 (above). Note former wetland basin in middle left of picture

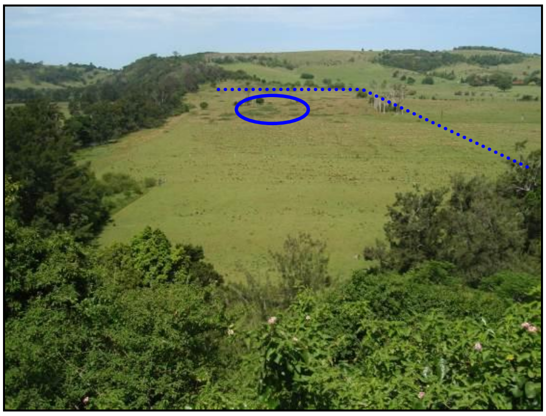
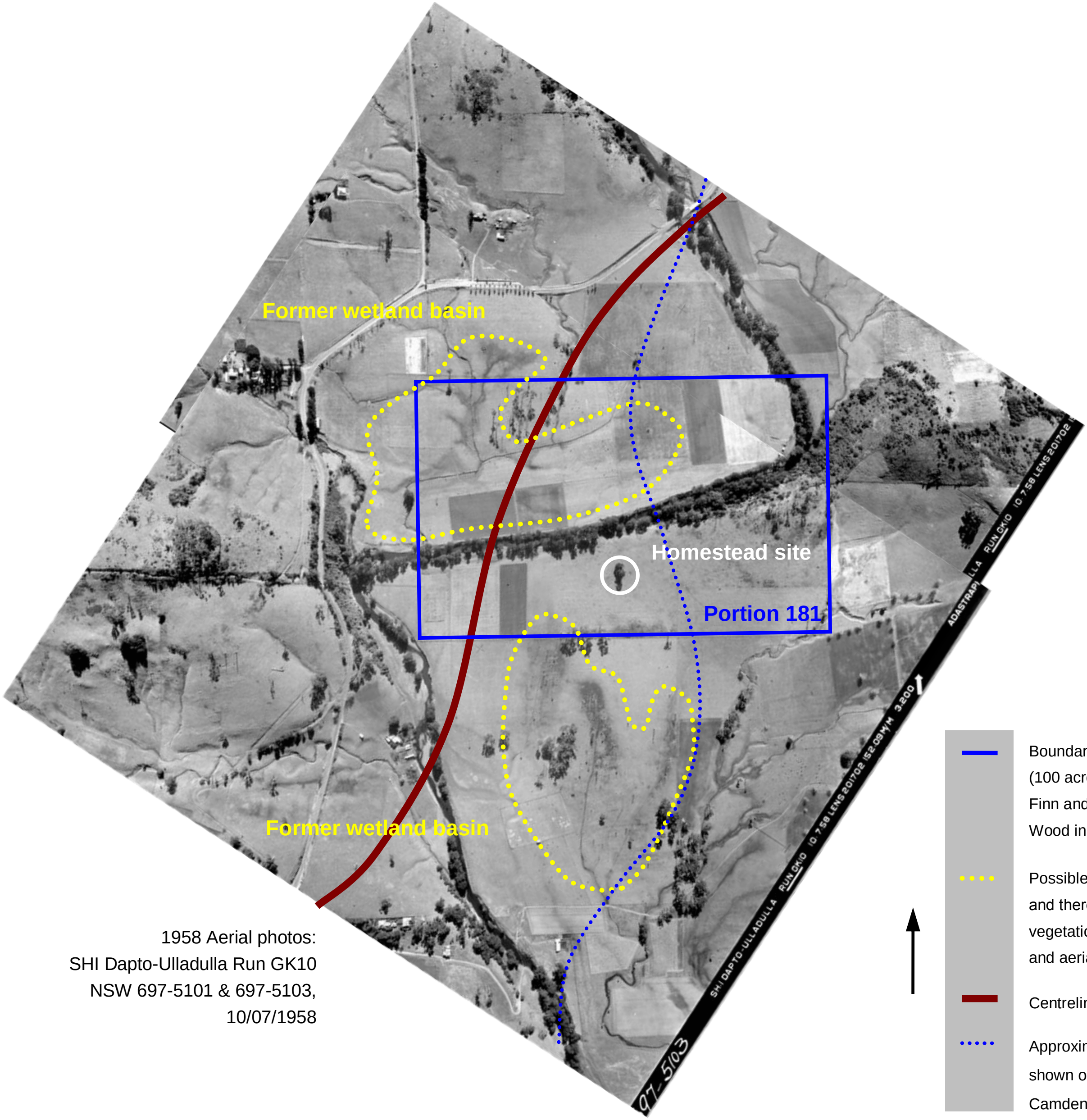


Figure 4-8: View from the current highway, looking east towards that part of portion 181 situated south of Broughton Creek. The southern boundary is shown as a dotted blue line and the former homestead site is circled. If Dicky Woods' Meadow was a man-made forest clearing it was probably situated on these flats adjacent to the homestead.

Figure 4-9: View from the current highway looking south-east towards the former wetland basin situated to the south of Dicky Woods' land holding.



1958 Aerial photos:
SHI Dapto-Ulladulla Run GK10
NSW 697-5101 & 697-5103,
10/07/1958

Boundary of portion 181 (100 acre land grant to Antony Finn and purchased by Richard Wood in 1850 (Elliott 2009))

Possible former wetland basins and therefore former "meadow" vegetation (based on contours and aerial photo interpretation)

Centreline of preferred project

Approximate location of track shown on 1866 County of Camden map

Figure 4-10: The possible locations of Dicky Woods' Meadow can be determined based on the potential for former natural wetland basins and the location of Woods' former land holding (portion 181)

4.4.3 Historical Aboriginal encampments at Berry (G2B A39)

The documentary and oral evidence indicates that there were at least two phases of Aboriginal encampment in the Berry area since the establishment of the Berry Estate. The first was the Boongaree encampment, noted in the 1820s and centred on a ‘Meadow’ on the north side of the junction of the Broughton and Broughton Mill Creeks. The second was the establishment of temporary seasonal encampments by Aboriginal crop pickers, in the middle decades of the twentieth century on the Broughton Mill Creek flats on the eastern margin of Berry (NOHC 2009b).

The proposal to construct a roundabout at the intersection of Woodhill Mountain Road and the current highway, places the project within the potential areas of these two encampment phases. It is a possibility that nineteenth century Aboriginal occupation, related to the Boongaree encampment, may have extended upstream along the Broughton Mill Creek flats as far as the Pulman Street spurline. The same flats, in the general area of the Berry bowling club, are remembered as the site of seasonal pickers camps.

The area within which Aboriginal encampments from either of these phases may have been situated in the relative proximity of the project area has been identified as recording G2B A39 (refer section 6.2.3).

***Boongaree* Aboriginal Encampment**

Historical research conducted by local historian Keith Campbell has revealed a number of reliable nineteenth century documentary sources indicating that an Aboriginal encampment known as Boon-ga-ree, existed on a semi or permanent basis during the 1820s on a clear area or ‘meadow’ at the junction of Broughton and Broughton Mill Creeks. The information presented here is based on notes kindly provided by Campbell (refer Appendix J). The camp was situated on the north side of the junction, between the two creeks and presumed to have extended northwards to where Pulman Street is today (**Figure 4-11**). The clearing was surrounded by thick brush (rainforest).

This area, adjacent to the creek junction, was also the location in November 1825, where the first Broughton Creek settlers, seven free sawyers employed by Alexander Berry, made their camp. A wharf, known as the ‘Double Wharf’, was later established at the creek junction to service the European community at Broughton Creek (Lidbetter 1993:3).

The Boongaree Aboriginal encampment is known to have been the birthplace of two historically important local Aboriginal identities, Broger (or Brogher) and Toodwick, who are recorded to be brothers. Toodwick, who was known to the European population as Broughton, established a strong friendship with Alexander Berry and was well respected by many other Europeans in the district. Broughton Head and Broughton Creek are named after Toodwick, the latter also being the original name for the township of Berry.

Broger was especially noted for being attached to Boongaree, and widely known for calling it ‘his place’ (refer Campbell’s notes in Appendix J).

Broger was found guilty of the murder of a local cedar sawyer John Rivett, and was subsequently hanged in Sydney in 1829 (Organ 1990: 159-161). Research by Campbell suggests that the circumstances surrounding the death of Rivett may have been complex and a consequence of previous conflicts between the Aboriginal community and the local sawyers (lecture presented by Keith Campbell, Nowra 2007). Brogers Creek is named after Broger.

Of relevance to Aboriginal encampments in the vicinity of Pulman St is the report of the discovery of an Aboriginal gorget in the bed of Broughton Mill Creek after a heavy flood in the vicinity of John Stewart’s residence (‘Mananga’) in 1925. The gorget is described as crescent shaped, with a chain, and bearing the legend ‘Neddy Noora Shoal Haven 1834’ (The Shoalhaven Telegraph, Nowra, July 10 1925, Organ 1990:389).

Neddy Noora is recorded as a 'chief' of the Shoalhaven tribe who acted as a guide (together with Broughton) to the Surveyor-general John Oxley when he explored the Shoalhaven and Jervis bay areas in 1819. The discovery of the gorget in the creek bed next to Stewart's residence, lends support to the contention that nineteenth century Aboriginal encampments may have extended as far as the vicinity of Pulman Street, possibly acting as 'fringe' encampments on the floodplain and situated close to the resources and employment offered by the mid nineteenth century European settlement on this ridgeline.

If the hypothesis that nineteenth century Aboriginal camps extended upstream this far, and in deliberate association with the European settlement, then it is worth noting that the twentieth century encampments at Berry (refer below) would represent an extension of this Aboriginal occupation pattern.

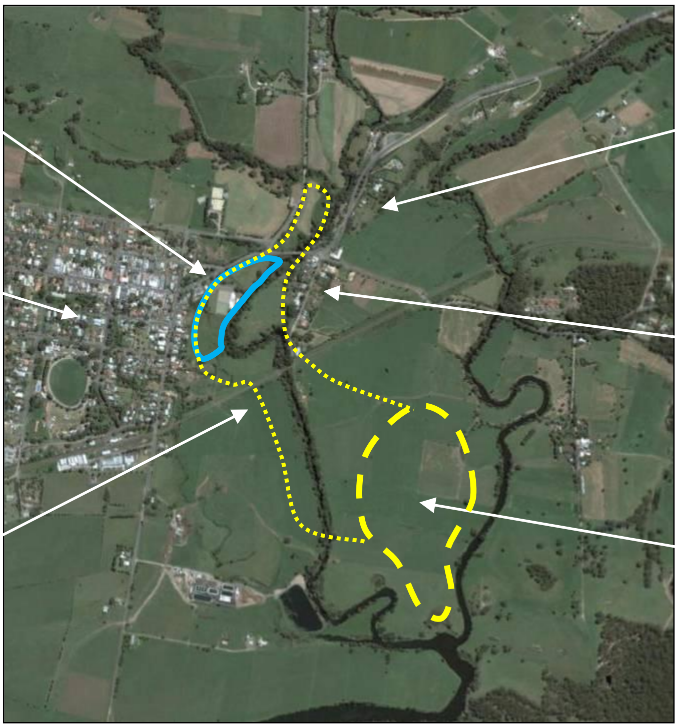


Figure 4-11: Aerial photograph with the approximate location of the twentieth century Pickers' encampments (blue line), and the nineteenth century Aboriginal encampment *Bongaree* (dashed yellow line). The dotted yellow line shows the conjectured possible extension of Aboriginal camping from Boongaree to the flats adjacent to the Pulman Street ridge, where early to mid nineteenth century European settlement was focused. (base image from Google Earth 2009).

Berry Pickers Encampments

A variety of oral histories corroborate the presence of seasonal encampments by Aboriginal crop pickers along the Broughton Mill Creek flats (DEC 2004, NOHC 2009b, RTA 2009). These memories span from the 1930s up to the 1960s and possibly later.

Barbara Timbery was born at Roseby Park in 1913. She recalls camping at the Berry Camp and being employed to pick beans on the local farms. The camp was situated on Broughton Creek, just before you get to the town, 'That's where we camped. There near the creek. That's up where the hospital is, across the bridge there. There's a club there now, but that's where we camped back then' (Barbara Timbery in DEC 2004:41). Her reference to the club indicates that the camp was situated on the western flats of Broughton Mill Creek, where the Berry Bowling Club is now situated (**Figure 4-12**).

Mary Lidbetter (born 1938), local historian and Berry resident since 1956, recounts that “the Aboriginals would come over here [to Berry] pea picking, and they would be brought in from Bomaderry Mission and left in town for the pea-pickers trucks to come [in from various farms in the area] and pick them up …”. At the end of each day they would be brought back to Berry. The ladies would wander into Mary Lidbetter’s shop for “their reel of cotton or stickybeak or what have you” and the men would congregate in Tom Lidbetter’s saddlery shop. Apparently, the men were told by their elders, “While you’re waiting for the truck, you do not hang around the street, you do not go to the pub, you go to Lidbetter’s shop”. “…. one of their later sites, this is after farming and people moving in and all the rest was the site of the bowling green, Berry bowling green.”

Lily Toohey (born 1914), Berry resident since 1934, can remember Aboriginal people camping annually in an old shed on the flats below Pulman Street. “Where the ground goes down towards the railway station there was an old shed down there and the Aboriginals used to come from further down to pick peas and beans and all that sort of thing.” “…all that top where those houses are now on Pulman Street Mr Watson grew all peas and beans there in season and he used to hire these Aboriginals to come and pick his peas and beans and that was on that side [the east side of Pulman Street] and we were the only house on that side.

Figure 4-12: The flats where the Berry Bowling Club is now situated is the reported location of a former Aboriginal historic encampment. View looking south from the Princes Highway.

4.4.4 Toolijooa Ridge Aboriginal cultural landscape (TRACL)

Toolijooa Ridge is a locally prominent ridgeline which extends across the coastal plain, southwards from Currys Mountain, (east of Foxground), to Toolijooa and Harley Hill in the south, (adjacent to Foys Swamp) (**Figure 4-13**).

Information collected in 1991 from a local community questionnaire by Donlon revealed a local oral tradition that ‘an old cattle trail now running along Toolijooa Ridge and down towards the coast actually follows an old Aboriginal trail which had its origins in Foxground.

In addition, 'on Toolijooa Hill, close to this trail, there is thought to be a fairly open area associated with a stand of Lilli Pilli trees, a stone arrangement and bora ring. Stone artefacts have also been found by locals on the north saddle close to this trail' (Donlon 1991a:13).

The location of the reported stone arrangement and bora ring is not known.

This information is supported by a note on the Department of Environment and Conservation (DEC) site card for site 52-5-0399 compiled by Stuart Huys in 1999 during the Eastern Gas Pipeline investigations. He notes that artefactual deposits identified on the [Toolijooa – Harley Hill] spur are probably representative of 'sporadic movement' by Aboriginal people utilising the spurline as an 'occasional walking route from the coastal hinterland down to the coastline around Gerroa' (DEC site card site card no. 52-5-0399).

The crest and prominent slopes of the ridgeline are recognised as having cultural significance by contemporary local Aboriginal groups, both for the ridge's significance as an Aboriginal pathway, and its ecological importance as a wildlife corridor.

Figure 4-13: Panoramic view of Toolijooa Ridge, looking west. Bellawongarah Mountain is located in the upper far distance.

4.4.5 Large and old growth fig trees

Many of the Aboriginal stakeholders who have participated in the consultation program have stated or concurred with a view that large and old growth fig trees within the Illawarra region are of high Aboriginal cultural value (**Figure 4-14**). The reasons for, and justification of this stated value varies across the different stakeholders. The validity of some justifications was disputed by varying stakeholders, and in other cases the informant's right to speak for, or on the issue was also debated.

In summary some of the stated reasons for the significance of the trees are:

- The well developed buttresses of the mature trees were used by Aboriginal people as shelter and weather breaks, and often therefore used as camp sites. This is a practice remembered to occur well into the twentieth century.
- Fig trees were a good source of food, including figs in season, and the animals that lived on them (possum, fruit bats).
- The trees are associated with the spirit of the Yaroma. The Yaroma is a creature resembling a man but of greater size and strength, with longer teeth and hair all over their body. The Yaroma is described as a strong and dangerous creature that may be concealed within a fig tree and which may ambush unsuspecting passers-by. For ethnographic accounts of the Yaroma see R.H. Mathews (1904:361; 1907:26), A. Mackenzie (1874:250-251), and J. Mathews (1994:132-133). In some cases, marks evident in the tree bark are explained as the result of Yaromas sharpening their long teeth.
- Mature fig trees are associated with birthing and women's lore (not described here due to cultural sensitivity). In some examples, notches were made along limbs to signify births into a tribe or family group.

Figure 4-14: A large mature fig tree (MFT15) on the eastern bank of Broughton Creek (Broughton Village)

5 Aboriginal archaeological context

5.1 Regional overview

The New South Wales South Coast and its hinterlands has been the subject of extensive archaeological research and impact assessments over the last forty years, much of it concentrated along the coastline and estuaries. These include studies conducted within an academic research framework, recordings by interested amateurs and surveys and assessments of areas under consideration for development.

The results of these surveys vary according to macro and micro topographic and environmental factors, ground surface visibility and the degree of previous landscape disturbance. Site types recorded in this region include rock shelters with art and/or cultural deposit, grinding grooves, artefact scatters, scarred trees, coastal and estuarine middens and burials.

The majority of archaeological sites located in this region date from the last 6,000 years, following the stabilisation of the sea level to approximately the present level (the Holocene Stillstand). Stable sea levels promoted the formation of estuaries, mangrove flats and coastal sand barriers which in turn increased the biomass, ecological diversity, and resource predictability for the Aboriginal residents of the coast and hinterland.

It is likely that this evolution of coastal environments promoted higher population densities and more intensive exploitation patterns. In contrast, occupation in the same areas during the late Pleistocene, that is prior to 10,000 years BP (before present), may have been sporadic and the Aboriginal population relatively small. However, Boot suggests that coastal hinterland sites older than 6000 years BP are more common than previously suggested, and that Pleistocene occupation may not have been as sporadic as previously thought (Boot 1996a).

Sites older than 6,000 years are rarely detected by archaeologists and are mostly limited to deep deposits surviving either in rock shelters or stable aggrading landforms. Occupation in these times may similarly have focused on the coast, which was then lower and situated further east. Sites relating to this occupation have now either been destroyed by rising seas, or are now submerged. To date, two coastal sites, Bass Point (Bowdler 1970) and Burrill Lake (Lampert 1971), provide evidence of Pleistocene Aboriginal occupation of the south coast dating to 17,000 and 20,000 years BP (Before Present) respectively. Prior to the rise in sea levels these sites would have been located some 14 kilometres inland. Excavation of rock shelters near Currarong provided potential occupation to 7,000 BP (Lampert 1971).

Investigations into the occupation of the coastal hinterland have been undertaken with major studies such as those by Bindon (1976), Poiner (1976), Byrne (1983), Sefton (1984), Officer (1991a), Boot (1993, 1994, 1996a, 1996b) and Knight (1996). Boot (1994) concluded that all areas of the hinterland were accessed, but that the major river valleys were favoured over other environments. Major ridgelines were also the focus of activity. He argues that the character of this early inland occupation on the NSW south coast was based on long-term residence rather than “fleeting forays” from the coast.

The most frequently encountered site types in the coastal hinterland are small surface scatters of stone artefacts, referred to sometimes as 'open camp sites' and more recently as surface artefact occurrences. A growing corpus of evidence from archaeological test excavations indicates that most surface scatters are indicative of larger subsurface artefact occurrences. Both surface and subsurface artefact occurrences are closely related to locally elevated, well-drained and low gradient ground adjacent to freshwater sources.

Based on present evidence, the most common lithic materials utilised by the Aborigines of the southern Illawarra and Shoalhaven districts were chert, quartz, silcrete, silicified wood and ‘indurated mudstone’ (the latter rock type has often been misidentified in the past, and most recordings are probably a form of tuff).

5.2 The local area

Seventy four Aboriginal sites had been recorded in an area 26 x 19 kilometres, around and including the Gerringong to Bomaderry upgrade study area, prior to the commencement of the Gerringong to Bomaderry upgrade cultural heritage studies. Sites comprised 32 artefact scatters, 19 shell middens, seven isolated finds, seven rock shelters with art and/or deposit and/or rock engravings, one natural mythological site, one bora/ceremonial site, one midden/artefact scatter, one PAD, four axe grinding groove sites, and one Aboriginal Place at Foxground.

A review of previous studies conducted in close proximity to the project area is provided below.

5.2.1 The Gerringong to Bomaderry Princes Highway upgrade

A number of cultural heritage assessments have been conducted for the upgrade of the Princes Highway between Gerringong and Bomaderry. Of particular relevance to the current study are the results of the Gerringong upgrade archaeological subsurface testing program.

The program of archaeological collection and subsurface testing was undertaken in 2010 by NOHC. One hundred and thirty seven test pits were excavated by machine within PASAs 32-39 in the Gerringong upgrade. One hundred and forty six stone artefacts were recovered from 42 pits and four PASAs (32-33, 37, 38 and 39), comprising 20 different assemblage elements. No artefacts were recovered from PASA36 or PASA34/35.

Flakes dominated the lithic assemblage at 56 per cent, while flaked pieces were far less common (12 per cent). Microblades and backed artefacts each made up five per cent of the assemblage. The combined 10 per cent of the assemblage comprised on these objects suggests in situ backed artefact production may have taken place at some of the locations investigated during the test excavation program. Most of the remaining artefact types made up less than three per cent of the assemblage.

Chert was the dominant raw material at all sites. Chalcedony and banded chert were rarer. Silcrete was also common, making up a quarter of the assemblage. Quartz and quartzite were present but uncommon, while volcanic stone and sandstone was rare.

Comparison of the relationship between assemblage size and the diversity of artefact types (or ‘richness’) for 40 eastern Australian sites indicated that all PASA assemblages except PASA39 had higher than average richness. High assemblage richness implies a greater range of technological activities were carried out in these areas than is typical for eastern Australian sites, suggesting that base camps with diverse subsistence and technological activities were present in the Gerringong upgrade corridor.

The positioning of PASAs 32-33, PASA37, and PASA38 next to watercourses and wetlands and on terrain well-suited to habitation is consistent with this interpretation. The positioning of PASA 39 on the crest of a spurline in a mid-valley context some distance from water and presumably in a location of lower resource richness than the other locations, may explain lower than average richness.

The strongest conclusion that could be drawn from the test results from the Gerringong upgrade study area was that the archaeological resource of the Illawarra coastal plain can only be effectively identified and assessed through the combined application of archaeological excavation and the progressive development of predictive modelling.

Although the study area constitutes a very limited sample of the topographies of the coastal plain, there was a strong indication that relatively high archaeological sensitivity could be associated with locally elevated micro-topographies within a 200 metre margin around former wetland basins. Examples include low gradient basal slopes and the crests of low spurs.

5.2.2 Foxground

Caryll Sefton carried out an archaeological survey for a proposed extension to a gravel quarry on Free Selectors Road at Foxground located three kilometres north of the project area (Sefton 1988). No archaeological sites were identified in Sefton's survey.

Officer (1991b) conducted a detailed recording of the Foxground engraving site. The Foxground engraving site is situated on the Illawarra Escarpment, to the north of the project area, and consists of two shallow rock shelters which have formed by cavernous weathering in the sides of a large sandstone tor.

At least 81 art graphics have been recorded at the site, many are now faded or indistinct (**Figure 5-1**). Seventy four of the graphics consist of engravings (shallow surface carvings) with the remainder made using pigment. All of the engravings consist of animal track motifs including kangaroo, emu, and smaller bird and hopping animals. Many of the motifs are arranged as tracks and shown in 'hopping' pairs. The pigment art consists of hand stencils and other mostly indeterminate fragments (Officer 1991b).

The site is considered to have high cultural significance by the local Koori community. The rarity of the site and the isolated location suggests a ritual and restricted purpose. The physical form of the site and the nature of the art are considered to be suggestive of a burial cave and initiation area (Officer 1991b).

The Foxground site is of high regional archaeological significance. This is based on the rarity, and stylistic characteristics of the art it contains, and the future research potential of both the art and archaeological deposits (Officer 1991b).

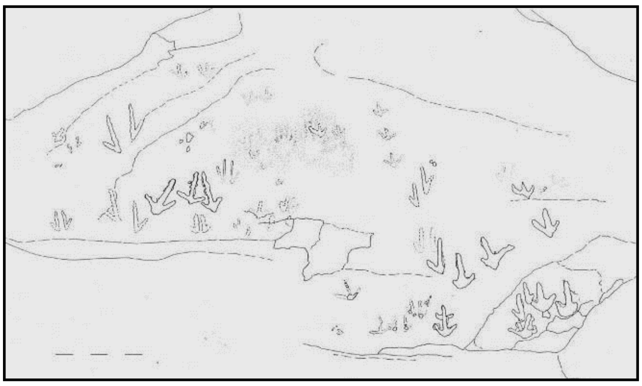


Figure 5-1: A panel of engraved and pigment rock art from the Foxground engraving site (scale interval is 5 x 10 cm) (Officer 1991a and 1991b)

5.2.3 Berry

Four archaeological sites were recorded by Corkill in the vicinity of Berry during fieldwork associated with her thesis on the lower Shoalhaven Valley (Corkill 1986). Three were situated in the area of Moeyan Hill and consisted of an artefact scatter of ten small flakes, a grinding groove and a scarred tree. Another site was identified approximately one kilometre north of the town on Connolly's Creek. This was described as an open camp site consisting of five flakes found in disturbed contexts in an area 100 metres x 30 metres.

In 1991 Donlon conducted a preliminary archaeological survey of the proposed routes for the upgrading of the Princes Highway between Gerringong and Berry (Donlon 1991a). Targeted survey was conducted along portions of the route options considered to be archaeologically sensitive. One site, an isolated find (a hammerstone) was identified in an upper gully on Toolijooa Ridge.

An isolated find was recorded by Kuskie (1998) during the survey of a proposed subdivision on the southwestern margin of Berry. The find was located on a spoil heap adjacent to a channelised and unnamed ephemeral watercourse.

Paton carried out an archaeological study for the Berry sewerage overflow development in 1999. No sites were located during the study (Paton 1999).

Surveys for the Environmental Impact Statement (EIS) for the Eastern Gas Pipeline (EGP) were conducted to the north and west of Berry in 1995 (Kuskie, Navin & Officer 1995). An artefact scatter, NPWS site #52-2-308, was recorded near Connollys Creek in the course of the survey.

Subsequent works relating to the Eastern Gas Pipeline were conducted by Australian Archaeological Survey Consultants (AASC). These included extensive archaeological survey, subsurface testing and salvage. However little or no information is available documenting these works and the OEH states that final reports for the subsurface investigation and salvage programs for the EGP have not been provided (pers. comm. Dr Phillip Boot, OEH February 2007). Consequently data tends to be cursory, preliminary in nature, and inconsistent in the variables reported.

Of the eight EGP subsurface testing locations within the broader Gerringong to Bomaderry route selection study area, all but two returned subsurface artefacts. Test sites consisted almost exclusively of locally elevated topographies adjacent to major creek lines. A test excavation was also conducted on the Toolijooa Ridge crest. The test locations which did not reveal artefacts were located on the bank of Ooaree Creek on Omega Flat, and the bank of Broughton Creek near Broughton Village. Most of the archaeological deposits encountered appeared to consist of very low to low density distributions of stone artefacts, situated within or near riparian corridors. Low density artefact occurrences were also revealed on major ridge crests, such as Toolijooa Ridge.

In 1998 ERM Mitchell McCotter prepared an EIS for a North Berry bypass (1998 draft). An archaeological survey was conducted for the study, however, no Aboriginal sites were identified and this was considered to be a product of poor ground surface visibility. It was concluded that there was moderate to high potential for Aboriginal sites to remain undetected in the study area.

In 2000 NOHC undertook a survey of Woodside Park, a dairy farm of 120 ha located to the east of the township of Berry. One Aboriginal site, a very low density scatter of stone artefacts (referred to as 'Woodside Park 1'), was located in the course of the survey. The artefacts were visible on an unformed farm track on the upper slopes and crest of a major spurline.

No Aboriginal sites were identified in the course of an archaeological survey for the proposed upgrade of the intersection of the Princes Highway and Tindalls Lane, just north of Berry (NOHC 2006).

Table 5-1 provides a list of previously recorded Aboriginal sites within the general region of the project area.

5.3 The project area

5.3.1 Recorded Aboriginal archaeological sites

No Aboriginal sites had been recorded within the project area prior to the commencement of the Gerringong to Bomaderry Princes Highway upgrade project.

5.3.2 Reported Aboriginal sites and places

Information collected from a local community questionnaire for a previous highway upgrade option analysis (Donlon 1991:12-13) revealed the following anecdotal information:

- Aboriginal artefacts have been observed and collected along the banks of Broughton Creek in the vicinity of 'Brookside', Broughton Village.
- A stone arrangement and bora ring is reportedly located in a 'fairly open area associated with Lilli Pilli trees on Toolijooa Hill. The location of this reported site is not known.

Table 5-1: Information relating to Aboriginal sites and archaeological subsurface investigations recorded within the general region of the project area
(Note: map references have been removed from this table to protect site locations)

OEH site number	Site name	Site type	No. of surface artefacts pre-construction	No. of test pits	No. artefacts recovered from test pits (permit docs)	No. of recovered artefacts (OEH site card)	Comments	OEH permit/ consent ID
Recordings made during survey and salvage programs for the Eastern Gas Pipeline								
52-5-0308	EGP 3-29, Connollys Creek	Surface artefact occurrence	5					
52-5-0399	TPA9 [Toolijooa Ridge]	Subsurface artefact occurrence		18	0 (but see site card note)	Site card states low density subsurface material present	Site card states artefacts were recovered from the flat spine of a spur, and that low density *subsurface* artefactual material was present along 100 metre section of route across spur This is the spurline between Toolijooa and Harley Hills	SZCHU0037
52-5-0395	TPA7 Duke 8 [Gembrook]	Surface and subsurface artefact occurrence	8	39	1		Artefacts exposed along vehicle track on small spur adjacent to Broughton Creek	SZCHU0039
52-5-0410	TPA6 [Broughton Mill Creek]	Subsurface artefact occurrence		12	6		Site content information on site card has been lost	SZCHU0041
-	TPA8 [Broughton Creek]	Not a site		6	0		A test pitting location on the west of Broughton Creek near Broughton Village	SZCHU0043
52-5-0396	TPA4 [Bundewallah Creek]	Subsurface artefact occurrence		pits on both creek banks		10	Site card states pits dug on the northern and southern banks of Bundewallah Creek	
52-5-0426	Test Pitting Area 9 (TPA9), northern section [Toolijooa Ridge]	Subsurface artefact occurrence				6 salvaged from surface after pipeline trenching		

OEH site number	Site name	Site type	No. of surface artefacts pre-construction	No. of test pits	No. artefacts recovered from test pits (permit docs)	No. of recovered artefacts (OEH site card)	Comments	OEH permit/ consent ID
Recordings made during other investigations								
52-5-0351	Berry 1	Surface isolated find	1				Located on spoil heap adjacent to excavated creek channel	
52-5-0380	Woodside Park 1	Surface artefact occurrence	6				Located on spurline crest to east of Broughton Creek, Berry	
-	Isolated Find [Toolijooa Ridge]	Surface isolated find	1				A hammerstone located on an eroded bank above a dry gully, on the western side of Toolijooa Ridge; Information from Donlon (1991)	

5.4 Site location model

5.4.1 Influencing factors

The existing Aboriginal site database for the southern Illawarra coastal plain and escarpment slopes is dominated by the visually obtrusive and more eroded sites associated with coastal margin sand bodies and the active littoral zone (primarily middens), and is largely silent regarding hinterland sites.

A review of previous archaeological assessments across the southern Illawarra coastal plain reveals that the conduct of subsurface testing programs as part of environmental assessments has not been consistent across the landforms within the plain. Most excavations have been conducted in rock shelters or within sand bodies along coastal and estuarine margins. Relatively little information exists for the hinterland and basal slopes adjacent to the escarpment.

However, based on the results of previous archaeological investigations within the Gerringong to Bomaderry upgrade study area, the Gerringong upgrade study area, the broader region and comparable landforms elsewhere on the NSW south coast, a set of predictive statements can be made about the nature and incidence of the Aboriginal archaeological resource within the project area.

The following model is necessarily broad, and tends to be inclusive and generic. However, the results of the Gerringong upgrade subsurface testing program have facilitated refinements to the model that was presented in NOHC 2007.

The strongest conclusion that can be drawn from the test results from the Gerringong upgrade study area is that the archaeological resource of the Illawarra coastal plain can only be effectively identified and assessed through the combined application of archaeological excavation and the progressive development of predictive modelling. Based on the results, the relative absence of site recordings from the hinterland can be reliably explained as a consequence of low ground surface visibility rather than a low intensity of Aboriginal activity.

Although the Gerringong upgrade study area constitutes a very limited sample of the topographies of the coastal plain, there is a strong indication that a relatively high archaeological sensitivity can be associated with certain micro-topographies within a 200 metre margin around former wetland basins. The Omega Flat basin has relatively well defined boundaries, which makes the identification of this sensitive zone relatively straightforward. Elsewhere across the plain, the identification of this zone could be more problematic where in some cases there is a low gradient interface between the former wetland and the upstream valley floor alluvium. It is probable that in such contexts archaeological potential would be limited to locally elevated micro-topographies.

The conclusion regarding wetland basin margins has implications for the role of the natural ‘Meadows’ in the Aboriginal habitation of the Southern Illawarra coastal plain. The ‘meadows’, which were an early attraction for Europeans seeking natural pastures for their stock animals, appear to have been a consequence of natural patterns of permanent or intermittent inundation. As such they were probably wetland basins, and may not have been limited to infilled estuaries, such as Omega Flat, Coomonderry Swamp or the Lower Broughton Creek floodplain. The ethno-historical recording of ‘Dicky Wood’s Meadow’ at Broughton Village is one example where a ‘Meadow’ may have occupied a valley floor with no prior estuarine origin. The identification of potentially archaeologically sensitive landforms within the margins of the former meadow lands will be an objective of future archaeological assessment across the Southern Illawarra.

Based on the Gerringong upgrade results, the archaeological sensitivity of the alluvial flats that dominate the valley floor must be considered to be low. The only artefact finds within this category were low in incidence and only where a higher order drainage line (three or greater) was within 50 metres, or where locally elevated basal slopes with archaeological deposits were situated just upslope. Possible reasons for this may include cold air drainage, the presence of dense vegetation, and poorly drained or damp ground.

The predicted increased archaeological sensitivity associated with the riparian zones of higher order streams was, however, not strongly supported by the Gerringong upgrade results. The absence of sites in these areas may partly be explained by the potential periodic loss of the upper profile from flood scouring, however this is not a compelling argument on its own. Further investigation of higher order riparian corridors is required to better define the model in this area. One possible factor is the downstream distance to a wetland basin margin. Most of the higher order streams in the Southern Illawarra drain to a still active or former (now drained) basin prior to discharging into the sea. If the margins of the basins were a focus for Aboriginal occupation (as evidenced by the results of the Gerringong upgrade study), then it could be expected that an associated zone upstream and upslope of this focus may have been correspondingly underutilised for activities such as base and interim camping. This may have been despite the presence of high amenity camping locations.

Along the Eastern Gas pipeline, a relatively consistent correlation emerged for subsurface artefact occurrences in association with most crossings of larger order streams (various unpublished records, reported in NOHC 2007). Although this superficially appears contrary to the riparian corridors tested in the Gerringong upgrade study area, an important difference may be the substantial distance between the majority of the pipeline easement and the lower streamline reaches and their associated wetland basins. Most of the tested riparian corridors were many kilometres from the wetland basins of the coastal plain.

Other factors influencing site location may have been the use of watersheds and other prominent or strategic spurlines as cross-country travel routes. Spurlines may have served as convenient travel routes from the coastal plain to the tops of the ridges and the lowlands beyond.

The following implications were drawn from the results of the Gerringong upgrade study:

- Valley floor contexts, on alluvium and which are not in the proximity of higher order (3rd or greater) riparian zones are likely to have low archaeological sensitivity. Testing within this landform need not be extensive and could be limited to a small number of test pits separated by long intervals along transects.
- Locally elevated, well drained and low gradient micro-topographies situated within the valley floor (such as terrace edges), may be an exception to the low sensitivity of the valley floor alluvium and should be subject to testing.
- Riparian corridors associated with higher order streams require testing to better define archaeological sensitivity and possible geographical determinates of artefact incidence.
- Locally elevated, well-drained and low gradient micro-topographies within 200 metres of known or predicted former wetland basins are likely to have high archaeological sensitivity and should be tested.
- The archaeological sensitivity of ridge and spurline crests and slopes requires further investigation, especially with regard to variables such as possible cross-country travel routes and distance from lower catchment wetland basins.

5.4.2 Micro-topographic variables

Aboriginal archaeological material is likely to be present in varying densities across all broad topographic zones. This material commonly consists of surface or subsurface stone artefacts, but may also include other occupational remains, such as shell midden or hearth material.

Sites where camping or food and other resource processing occurred are often characterised by higher densities of archaeological material and the location of such sites can be predicted by the presence and combination of specific micro-topographic traits. These may include:

- Low gradient or relatively level (valley floor) ground in proximity of higher order (3rd or greater).
- A sheltered context from prevailing harsh weather conditions, such as wind or heat.
- The absence of significant surface rock or gravels.
- Proximity to a freshwater source.
- Proximity to resource zones (such as a littoral or freshwater shoreline).
- A well drained and locally elevated context.

The following landforms are consistent with some or all of these traits and can be classed as archaeologically sensitive:

- Low gradient basal slopes (including colluvial deposits and alluvial fans) adjacent to the valley floor.
- The lower elevation or terminal section of major spurs and ridgelines where they adjoin or traverse the valley floor.
- Level or low gradient ground on the crests of spurs and ridgelines.
- The downslope margin of alluvial terraces.
- The banks of rivers and creeks where they are locally elevated and well drained.
- The locally elevated margins of wetland basins.
- Locally elevated sand bodies outside of coastal barrier or dune systems, such as fossil beach ridges on the margins and flats of infilled estuaries, and source bordering dunes.

5.4.3 General site locations trends and patterns

Due to dense grass cover and low ground surface visibility, most archaeological deposits present within the project area will not be evidenced by visible surface artefacts.

Most Aboriginal archaeological sites tend to be situated at or close to ecotones – the boundaries where different environmental zones meet. This probably relates to the need to find amenable campsites with access to water, and to minimise distances to exploitable resources.

Ridges and spurlines which due to their length, elevation, gradient and alignment, provide effective through-access corridors within and across the coastal plain, are likely to have been used as pathways by travelling Aboriginal people.

As a consequence of transit and interim camping activity, level ground on the crests of these spurs and ridges are likely to include low to moderate density artefact occurrences. The larger and more dominant ridgelines (such as watersheds) are likely to contain more continuous and higher density artefactual material compared to lesser landform corridors. The incidence and density of archaeological material on ridge and spurline crests may increase with proximity to freshwater and the coastal plain.

The crests of ridgeline saddles are likely to contain artefact occurrences, especially where a saddle provides an efficient cross-country travel route due either to its low elevation, or strategic position relative to ridgelines.

The crests and basal slopes of low relief spurs which extend into and across the flood and wetland basins of the lower Shoalhaven valley were likely to have been a focus for Aboriginal occupation. This is due to their well drained and elevated context in close proximity to a range of resource zones and water sources. Sites most likely to occur in these contexts consist of stone artefact occurrences.

Older archaeological deposits including middens and artefact occurrences may occur subsurface on remnant or aggrading landforms such as dunes, fossil beach ridges and shoreline features, alluvial terraces and fans, colluvial slope deposits, and source bordering dunes. Where these deposits occur on or near the boundary between the valley floor and the adjacent bedrock slopes there is potential for archaeological deposits to date from the period when this boundary marked a coastal and then estuarine shoreline following the sea level rise between 6000 and 5000 years ago.

5.4.4 Site types

Artefact occurrences

Artefact occurrences may consist of a surface and/or subsurface distribution of artefacts, which in nearly all cases are limited to stone artefacts. In exceptional cases, (such as in swamp deposits) artefacts made of organic materials such as wood or bone may be present. Subsurface artefacts may be associated with features such as hearth remains. Surface artefact occurrences may be further categorised as isolated finds, or artefact scatters. Subsurface distributions of artefacts, by definition comprise an archaeological deposit. Artefact occurrences outside of rock shelters are sometimes referred to as open camp sites.

Artefact occurrences may occur almost anywhere that Aboriginal people have travelled and may be associated with hunting and gathering activities, domestic camps, or the manufacture and maintenance of stone tools. The density of artefacts represented in these scatters can vary considerably between and across individual sites.

Artefact occurrences, detectable as isolated finds, scatters of surface artefacts, or subsurface distributions (archaeological deposits), are likely to be the most common site type within the project area.

Of the six archaeological deposits with subsurface artefact distributions, investigated to date for the Princes Highway upgrade project, the average artefact incidence per site has ranged from 2.5 to 10.0 artefacts per square metre of tested archaeological deposit. The depth of the artefacts have ranged from the top 100 millimetres to a maximum of 700 millimetres, with most artefacts occurring between the surface and 400 millimetres (refer **Table 5-2**).

Artefact occurrences are most likely to occur on level and well drained ground, and situated adjacent to a source of freshwater (such as a river, creek or wetland), to a resource zone such as a marine or estuary shoreline, or along the crests of spurs and ridgelines.

Isolated finds can occur anywhere in the landscape and may represent the random loss or deliberate discard of artefacts, or the remains of dispersed artefact scatters. Given the low levels of ground surface visibility in the project area, an isolated surface find may be indicative of a larger and subsurface distribution within the underlying soil profile.

Table 5-2: Summary of artefact incidence across archaeological deposits tested to date for the Princes Highway upgrade project

PASA ID	Current site ID	No. of test pits	No of test pits with artefacts	No. of artefacts recovered	Overall artefact incidence (across area of all test pits) a/m^2	Artefact incidence (across area of only pits with artefacts) a/m^2	Depth interval of all artefacts mm	Depth of most artefacts
32-33	A11&10	36	11 (30%)	14	0.76	2.5	100-500	100-200
37	A9	15	8 (53%)	42	5.72	10.0	0-700	200-400
38	A7	44	18 (41%)	76	3.36	8.4	0-600	100-300
39	A8	10	5 (50%)	14	2.80	5.6	0-400	0-200
31	A12	10	5 (50%)	16	2.46	4.0	100-400	200-300

a/m^2 – Artefacts per square meter

Estuarine middens

Estuarine middens are defined as a concentration of artefactual debris that includes a substantial proportion of estuarine shell species. They are located mostly in close proximity to estuarine environments. These middens generally contain a restricted range of shell species and limited stone and faunal material (Navin 1987).

Estuarine middens are most likely to occur on locally elevated, well drained and low gradient, ground which was formerly, or is currently situated close to an estuarine shoreline, especially when in proximity to a freshwater source.

Burials

Burials consist of buried human skeletal remains. They may occur singly or in groups and may display a range of body arrangements, grave goods or associated features such as earth mounding or stone cairns. Some burials of high status individuals were associated with the creation of carved trees and particular grave goods.

Burials of Aboriginal people in the historical period may be associated with encampments, fringe settlements, and mission or reserve lands. European cultural influences may be seen in burial orientation, arrangement, and surface features such as marker stones and ground borders.

The remains of prehistoric burials are most likely to be found in locally elevated landforms with a relatively deep profile of soft sediments such as aeolian dunes, beach ridges, and alluvial deposits such as levees, terraces and creek or river flats. Burials may also occur in association with midden or rock shelter deposits and are mentioned in historic accounts as being placed in hollow trees. Burials are frequently encountered on the South Coast in sand deposits near the entrance to major estuaries.

Stone arrangements and ceremonial grounds

This site type includes the grounds and remains of ceremonial activities, an example being the bunan, a male initiation ceremony (Mathews 1896). This ceremony included the construction of two earthen ring mounds separated by a pathway, along which carved trees and ground sculptures were constructed to instruct the initiates.

The potential archaeological remains from an Aboriginal ceremony may consist of hearths, a low incidence of discarded stone artefacts or ochre, arrangements of stones, low-relief ground features such as ditches, earthen mounds or rings, and scarred or carved trees. All but the stone artefacts are fragile in nature and highly vulnerable to natural processes of erosion, fire, and to gross disturbance from European landuse practices such as logging, vegetation clearance, ploughing, fencing, and the clearing of surface rock from paddocks. All of these factors have resulted in the archaeological manifestation of these sites being very rare.

It is more common on the NSW south coast for ceremonial sites to be known and identified from oral history or documentary accounts, than from archaeological evidence. If evidence of a ceremonial ground were to survive to the present day it may take the form of an arrangement of stones (but only where that land had not been subject to vegetation clearance, ploughing, cropping or other than low intensity stock grazing), or traces of former ground relief features (such as ring mounds, either as ground relief or a subsurface feature manifest as a crop or pasture mark).

Based on ethno-historic accounts and oral tradition, ceremonial grounds in the Southern Illawarra and Shoalhaven regions were situated on a variety of landform types, including coastal dunes, river flats, sandstone rock platforms, spurlines at the base of hills and ranges, and the tops of mountains.

Historical occupation sites

These sites contain evidence of Aboriginal occupation since the time of European occupation and are typically manifest by the presence of camping and occupation debris in industrial materials such as metal, ceramic, and glass. Many of these sites would be indistinguishable from European sites in the absence of oral or documentary evidence.

Sites dating from the late eighteenth to early nineteenth century are sometimes called ‘contact’ sites. This term refers to the short period when traditional Aboriginal society encountered and interacted with the European community and responded with changes in social, economic and occupational patterns. This response included the use and adaptation of new materials, reacting to the loss of territory, resources, and population loss. Evidence from this period could potentially include Aboriginal flaking of glass, art motifs depicting European people or objects, burials with historic grave goods or markers, and debris from 'fringe camps'.

Historical occupation sites typically consist of the remains of encampments, some of which were located adjacent to early European towns or homesteads. Sometimes referred to as fringe camps, these settlements were generally sited adjacent to a fresh water source such as a creek line, and adjacent but separate to the European settlements.

6 Results – field survey

6.1 Summary

Twenty nine Aboriginal heritage items were recorded within the project area as a result of the archaeological field survey component. These, comprised 25 archaeological recordings (archaeological sites and potential archaeologically sensitive areas (PASAs)), and four non-archaeological recordings of places of Aboriginal cultural heritage significance.
The archaeological recordings comprised:

- Twenty three PASAs, (PASA12-29 and 40-44).
- One artefact scatter (G2B A3).
- An isolated surface artefact in association with a PAD (G2B A38).

The non-archaeological recordings comprised: three places relating to historical events or occupation (G2B A13, 14 and 39), and one cultural landscape, the Toolijooa Ridge Aboriginal cultural landscape.

Two generalised Aboriginal cultural heritage values were also recognised; large and old growth fig trees, and Aboriginal burial sites. Twelve large and old growth fig trees have been recorded in or near to the project area (MFT12 – 23).

As a consequence of the test excavation program, 18 of the 21 PASAs subject to testing were determined to contain archaeological deposits (refer section 7.0). Based on these test results and the revised predictive site location model, the two untested PASAs are predicted to also contain archaeological deposits (refer section 7.5). The test results and model have also been applied in the post-field-program identification of a potential archaeological deposit (G2B PAD1). This PAD is situated in a portion of the project which has been revised subsequent to the conduct of the test program (refer Section 7.6).

6.2 Descriptions

There were only two archaeological sites within the project area which were identified on the basis of surface artefacts (G2B A3 and G2B A38). All other archaeological recordings were identified based on predictive modelling, either initially as potential archaeological sensitive areas (PASAs), or as a potential archaeological deposit.

6.2.1 Artefact occurrences

G2B A3

MGA references: [not included in this report version]

The site consists of four stone artefacts exposed within a drainage ditch and an associated excavated platform and upslope embankment. The artefacts are situated on low to moderately graded, north facing slopes which form the lower slopes of a descending spurline off Toolijooa Ridge. Relative to the spur cross section, the artefacts are situated on mid to upper slopes.

The artefacts occur within an interval of 160 metres and have been exposed as a result of mechanical ground disturbance (**Figure 6-1** and **Figure 6-2**). No artefacts were noted outside of mechanical exposures. All artefacts appear to be associated with the upper 10 to 20 centimetres of the exposed soil profile.

At the time of survey (April 2009), the net area of ground surface exposure was around 600 square metres, with an exposure incidence of 90 per cent and an average visibility within those exposures of 95 per cent. Given the high degree of visibility, it is considered that the low areal incidence of artefacts encountered (1/150 square metres), is a reliable indication of the artefact occurrence occurring in adjacent deposits on similar slopes.

The crest of the spur is located approximately 60 metres to the south of this site and, based on the predictive site location model, could be expected to contain a subsurface artefact distribution at a higher areal incidence than encountered on the adjacent slopes. The crest would be subject to direct impact from the bypass and has been identified as PASA 42.

Figure 6-1: G2B A3 - Looking upslope along drainage ditch in which artefacts are exposed

Figure 6-2: G2B A3 – Looking across excavated platform, artefacts are exposed along upslope edge of embankment

G2B A38

MGA reference: Artefact at: [not included in this report version]

This site consists of a single surface stone artefact and an associated area of assessed archaeological potential. It is located within a property being considered for use as an ancillary area (NOHC 2012). The artefact was located on the crest of a south facing, descending minor spur, in a basal slope valley context. The site overlooks an unnamed tributary of the Crooked River (**Figure 6-3**, **Figure 6-4** and **Figure 6-5**).

The surface artefact comprises a large brown, fine grained quartzite retouched flake, 74 x 91 x 29 mm.

The artefact was located within an erosion scald, associated with cattle treadage and sheet wash, approximately 5 x 2 m in area and surrounding a gate. Exposure incidence across the site was approximately 30 per cent, and visibility within these exposures was approximately 50 per cent. Away from the gate exposure, the incidence of exposures and ground visibility dropped to nil.

Given the poor visibility and high archaeological potential of the ground surrounding the find (indicated by its locally elevated, low gradient nature, adjacent to the valley floor and a tributary streamline), an area of archaeological potential has been identified in association with the surface find. This area has approximate dimensions of 100 x 80 metres in area and has a moderate potential to contain Aboriginal objects.

Disturbance to this site includes sheet erosion, vegetation clearance, fence construction and use for grazing and pastoral purposes. Fragments of European ceramics and glass were also identified within the erosion scald at this site.

Figure 6-3: Looking across the location of isolated surface find (G2B A38)

Figure 6-4: Looking towards site G2B A 38 (at gate in middle of picture)

Figure 6-5: Looking from the valley floor towards G2B A38 and the associated basal slopes which constitute a surrounding area of archaeological potential

6.2.2 Potential archaeologically sensitive areas

Twenty three PASAs have been identified within the project area. These are PASAs 12-29 and 40-44.

One of these is associated with a nearby surface artefact distribution (site recording G2B A3 with PASA 42).

Descriptions of each PASA, together with landform and map grid references are presented in **Table 6-1**. The location of each recording is shown in **Figure 6-6**.

It should be noted that:

- Due to the continuity of the landforms involved, ten of the PASA recordings are grouped into three continuous areas.
- Identification of the area of the PASAs has not been attempted outside of the likely area of direct construction impact, as was determined at the time of the recording. In most cases, PASAs are likely to extend beyond the identified boundaries.

Table 6-1: Potential archaeologically sensitive areas (PASAs) within the Foxground and Berry bypass project area [Note that map grid references are not included in this report version]

ID		Location/landform	Representativeness/ Landform category	MGA references		
				Mid point	End point 1	End point 2
PASA12/13	PASA12	Alluvial flats and terrace formations either side of Bundewallah Creek, extending between Broughton Mill Creek and North Street, Berry	Valley floor flats and terraces on either side of 4th order drainage line (Bundewallah Creek - 21km^2 upstream catchment)			
PASA12/13	PASA13	Alluvial flats on either side of Broughton Mill Creek, including a levee deposit on the eastern side), to east of Woodhill Mt Road, Berry	Valley floor flats, and a levee deposit, on either side of a major 4th order drainage line (Broughton Mill Creek - 22.5km^2 upstream catchment)			
	PASA14	Remnant portion of prominent crest and upper slopes of major watershed ridgeline knoll, just S of Berry survey point ('Stewarts Hill')	Crest and upper slopes of major ridgeline knoll, prominent portion of watershed between Broughton Mill and Broughton Creek catchments			
	PASA15	Remnant portion of crest and upper slopes of major watershed ridgeline, just NE of Berry survey point ('Stewarts Hill')	Crest and upper slopes of major ridgeline watershed between Broughton Mill and Broughton Creek catchments			
	PASA16	Crest and upper slopes of a prominent ridgeline knoll, situated SE of Tindalls Lane, Broughton.	Crest and upper slopes of a prominent ridge top knoll, situated on major ridgeline watershed between Broughton Mill and Broughton Creek catchments			
	PASA17	Crest and upper slopes of a broad, east-west aligned spurline adjacent to Tindalls Lane, Broughton.	Crest and upper slopes of a broad spurline descending from major ridgeline watershed between Broughton Mill and Broughton Creek catchments			
	PASA18	Locally elevated ground formed by a minor spurline situated adjacent to an entrenched and minor (unnamed) drainage line (opposite RMS speed camera at Broughton)	Crest of a minor spurline adjacent to a second order streamline (0.2 km^2 upstream catchment). Broader context consist of south facing basal slopes of the Broughton Creek valley			
	PASA19	Alluvial flats and basal slopes on either side of an unnamed tributary draining the Glenvale property, Broughton.	Valley floor flats and adjacent (low spurline) basal slopes on either side of 3rd order streamline (1 km^2 upstream catchment)			

ID		Location/landform	Representativeness/ Landform category	MGA references		
				Mid point	End point 1	End point 2
PASA20/21/22/23/24	PASA20	Crest and slopes of an elevated spurline adjacent to Broughton Creek and forming basal slopes adjacent to valley floor (southern side of southern crossing)	Elevated spurline forming basal slopes adjacent to valley floor, and locally elevated ground adjacent to major, 5th order, stream (Broughton Creek - 31.2 km^2 upstream catchment), occurs within potential G2B A13 area			
	PASA21	Alluvial flats on either side of Broughton Creek, includes different terrace levels (southern crossing)	Fifth order streamline fluvial corridor (Broughton Creek - 31.2 km^2 upstream catchment), occurs within potential G2B A13 and G2B A14 areas			
PASA20/21/22/23/24	PASA22	Broughton Creek alluvial flats and valley floor (between middle and southern crossing)	Valley floor flats adjacent to major, 5th order, stream (Broughton Creek - 31.2 km^2 upstream catchment), occurs within potential G2B A13 and G2B A14 areas			
	PASA23	Alluvial flats on either side of Broughton Creek (middle crossing)	Fifth order streamline fluvial corridor (Broughton Creek - 31.2 km^2 upstream catchment), occurs within potential G2B A13 and G2B A14 areas			
	PASA24	Broughton Creek alluvial flats and valley floor, includes elevated terrace and terrace edge (northern side of middle crossing)	Valley floor flats and alluvial terrace adjacent to major, 5th order, stream (Broughton Creek - 31.2 km^2 upstream catchment), occurs within potential G2B A13 area			
PASA25/26/27	PASA25	Crest and slopes of a low spur forming basal slopes adjacent to valley floor (western side of northern crossing)	Low spurline forming basal slopes adjacent to valley floor, and locally elevated ground adjacent to major, 5th order, stream (Broughton Creek - 26.7 km^2 upstream catchment), occurs within potential G2B A13 area			
	PASA26	Alluvial flats on either side of Broughton Creek (northern crossing)	Fifth order streamline fluvial corridor, (Broughton Creek - 26.7 km^2 upstream catchment), occurs within potential G2B A13 area			

ID		Location/landform	Representativeness/ Landform category	MGA references		
				Mid point	End point 1	End point 2
	PASA27	Broughton Creek alluvial flats and valley floor, includes unnamed third order streamlines (eastern side of northern crossing)	Valley floor flats adjacent to major, 5^{th} order, stream (Broughton Creek - 26.7 km^2 upstream catchment), and associated 3^{rd} order streamlines (0.7 km^2 upstream catchment) , occurs within potential G2B A13 area			
	PASA28	Crest and Upper slopes of a ridgeline saddle (around 100 metres AHD) on Toolijooa Ridge, a major watershed aligned approximately N-S	Ridgeline saddle, ridgeline has Aboriginal cultural significance and was probable access route from Illawarra Range onto coastal plain, between swamp basins, to coastal margin			
	PASA29	Crest and upper slopes of a major, SE aligned (eastern fall) spurline shoulder, descending from Toolijooa Ridge	Spurline shoulder, spur is a likely access route onto and across Toolijooa Ridge			
	PASA40	Low banks and adjacent flats and slopes of unnamed tributary, just north of Hitchcocks Lane, both sides of the Princes Highway, Berry	Banks and adjacent valley floor flats and slopes adjacent to a minor 2^{nd} order stream ($0.6km^2$ upstream catchment), Identified as part of Aboriginal stakeholder consultation.			
	PASA41	Low banks and adjacent southern low gradient slopes of unnamed tributary ('Town Creek'), just south of the North Street alignment, Berry	Banks and adjacent low gradient slopes adjacent to a minor 1^{st} order stream (Town Creek - 0.6 km^2 upstream catchment), Identified as part of Aboriginal stakeholder consultation.			
	PASA42	Crest and upper slopes of a minor NW aligned (western fall) spurline, descending from Toolijooa Ridge	Spurline crest, spurline is a likely access route onto and across Toolijooa Ridge due to proximity of ridge top saddle			
	PASA43	Connollys Creek alluvial flats and valley floor	Banks and adjacent valley floor flats, flood channels and terrace features			
	PASA44	Broughton Creek valley floor alluvial flats and adjacent basal slopes on either side of flood channel	Alluvial flats and adjacent basal slopes adjacent to flood channel (former channel of Broughton Mill Creek)			

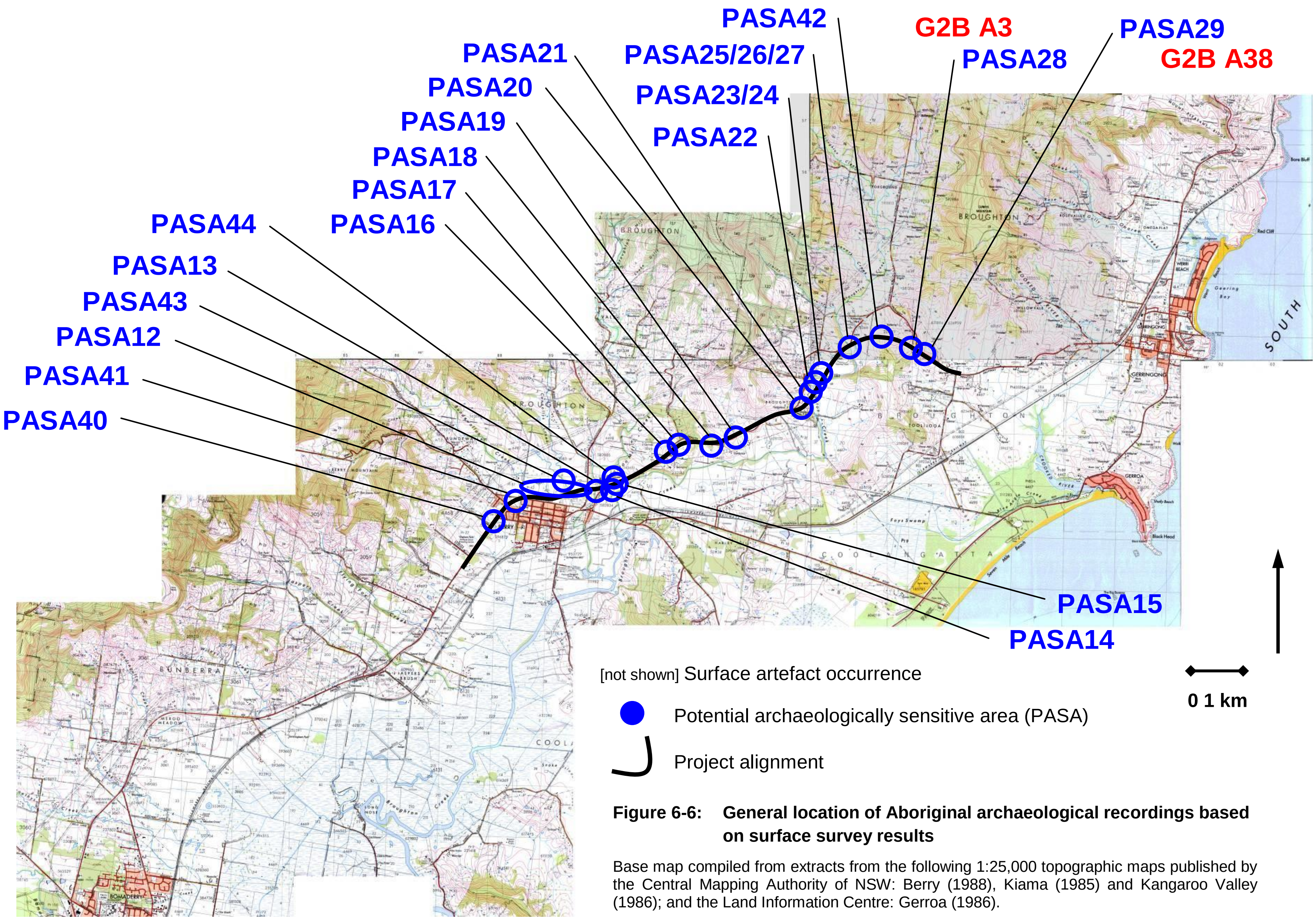


Figure 6-6: General location of Aboriginal archaeological recordings based on surface survey results

Base map compiled from extracts from the following 1:25,000 topographic maps published by the Central Mapping Authority of NSW: Berry (1988), Kiama (1985) and Kangaroo Valley (1986); and the Land Information Centre: Gerroa (1986).

6.2.3 Ethno-historical and oral tradition recordings

Four Aboriginal heritage recordings are based on oral tradition and/or ethno-historical documentation:

- Toolijooa Ridge Aboriginal cultural landscape (TRACL).
- The 'Little Mountain' or 'Dicky Wood's Meadow' battle ground (G2B A13).
- Aboriginal Encampment at 'Brookside' (Broughton Village) (G2B A14).
- Aboriginal Encampments at Berry (G2B A39)

Although each of these recordings may be found to include related archaeological remains, the status of these recordings as places of Aboriginal heritage significance is not dependent on the presence of such remains. Refer to Section 4.4 for detailed descriptions of these recordings.

The general location of these recordings is shown in **Figure 6-7** and **Figure 6-8**.

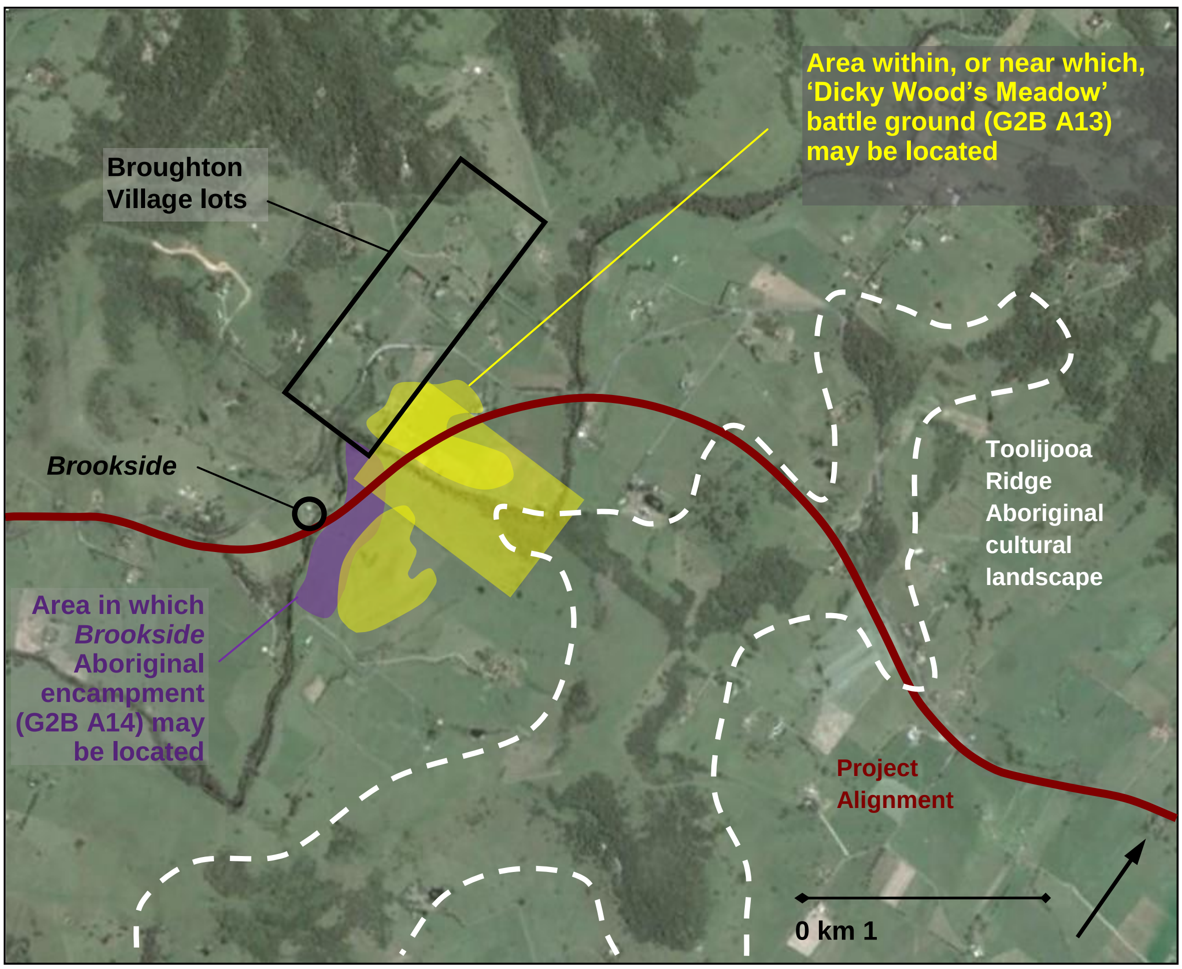


Figure 6-7: Location of ethno-historical and oral tradition recordings within the project area (base image (2006) Google Earth Pro 2011).

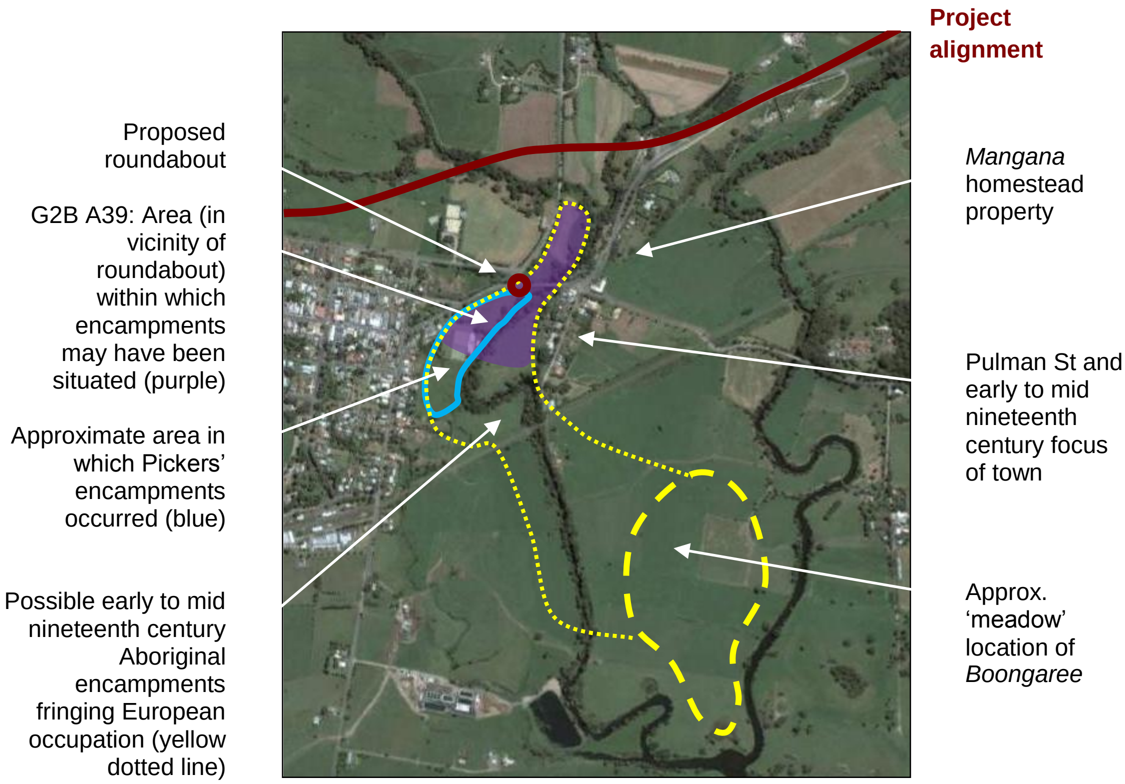


Figure 6-8: The location of recording G2B A39 (purple), the area (in the vicinity of the proposed roundabout at the intersection of Woodhill Mountain Rd and the current highway), within which Aboriginal encampments may have been situated. These may relate to the twentieth century Pickers' camps or to nineteenth century camps that may have been related to the *Bongaree* settlement.

The approximate lengths or area of the project interval across these recordings are:

- TRACL – 1.4 kilometres.
- G2B A13 – One kilometre (including a 200 metre buffer).
- G2B A14 – 220 metres (100 per cent overlap with G2B A13 including a 200 metre buffer).
- G2B A39 - Construction of roundabout to occur within an area of 90 x 60 metres (refer Appendix I).

If a 200 metre buffer zone is included around the potential area within which Dick Woods' Meadow may have been situated, the total area of potential is around 136.6 hectares. The project would be situated within 9.4 hectares, or 6.8 per cent of this area.

A 200 metre buffer is considered an appropriate addition to this area of potential in order to:

- Include potential burial locations situated on locally elevated and soft sediment micro-topographies which may be situated adjacent to the former meadow.
- Allow for error in identifying the edge of the former meadow, assuming it was a natural vegetation feature related to a swamp basin. Burials may have preferentially been placed on bordering and elevated ground, rather than the intermittently inundated and dense silts and clays of the meadow basin proper.

6.2.4 Large and old growth fig trees

Many of the Aboriginal stakeholders who have participated in the consultation program have stated or concurred with a view that large and old growth fig trees within the Illawarra region are of high Aboriginal cultural value. Refer section 4.4 for an outline of the cultural values associated with large and old growth fig trees.

To date, twelve large or old growth fig trees (MFT12 – MFT23) have been noted within or near the project area (**Figure 6-9** – **Figure 6-12**). With one exception, all of these are interpreted as trees which have grown and matured within an open grassland environment, after the clearance of the original high canopy forest. This assessment is based on the low and spreading nature of the trees and the absence of any evidence for an early epiphytic phase (i.e. early growth in the canopy branch of another tree and later strangulation of that tree). Based on the location of many of these trees at the sites of extant or former European homesteads, many of these examples are likely to have been planted (**Figure 6-11**).

The exception is MFT22, which, by its growth pattern and height, is clearly an old-growth remnant of a high canopy forest and certainly predates the arrival of Europeans (**Figure 6-10** and **Figure 6-12**).

Table 6-2 provides a summary of the large and/or old growth fig trees identified within or near the project area. The numbering follows consecutively from the Princes Highway Gerringong upgrade Mature Fig Tree (MFT).

Table 6-2: Summary of large and old-growth (mature) fig trees noted within or near the project area [Please note that map grid references are not included in this report version]

ID Code	Tree form	GDA grid reference	Comments
MFT12	Low and spreading		On Toolijooa Ridge crest, This tree has grown substantially since 1958, where it is evident in aerial photography as a relatively small tree
MFT13	Low and spreading		Old homestead site, paired with MFT14
MFT14	Low and spreading		Old homestead site, paired with MFT13
MFT15	Low and spreading		East bank of Broughton Creek
MFT16	Low and spreading		Old homestead site
MFT17	Low and spreading		In grounds of *Sedgeford* homestead paired with MFT18
MFT18	Low and spreading		In grounds of *Sedgeford* homestead paired with MFT17
MFT19	Low and spreading		In creek gully, unlikely to be associated with former homestead
MFT20	Low and spreading		Next to *Hillview* homestead, paired with MFT21
MFT21	Low and spreading		Next to *Hillview* homestead, paired with MFT22
MFT22	Tall and high canopy, clear epiphytic origin		Bundewallah Creek, pre-European forest remnant
MFT23	Low and spreading		In grounds of *Oakleigh*, Berry

Only one of these trees, MFT12, located on the crest of Toolijooa Ridge, is situated within an area of anticipated direct construction impact. A review of aerial photography reveals that this tree has grown substantially since 1958, where it is evident as a relatively small tree (**Figure 6-9**).

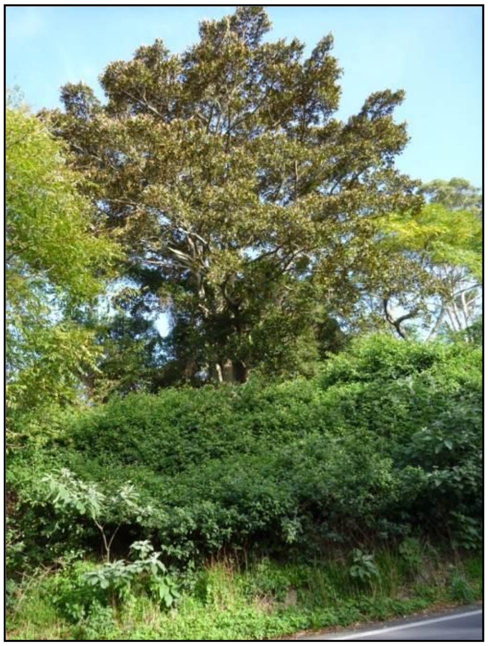


Figure 6-9: A low and spreading fig tree (MFT12) on the crest of Toolijooa Ridge. This is the only fig tree within the construction zone.

Figure 6-10: A tall and formerly epiphytic fig tree (MFT22) which is clearly a pre-European, tall canopy forest remnant Note human figure for scale.

Figure 6-11: A low and spreading fig tree which was probably planted as part of farmhouse development (MFT23)

Figure 6-12: View looking up MFT22, showing characteristic 'strangler fig' nature of the tall trunk.

6.2.5 Potential for Aboriginal burial sites

All Aboriginal stakeholders have expressed concern regarding the potential for encountering and impacting Aboriginal burials, both generally, and within areas with identified archaeological potential, or in areas remembered as sensitive in this regard, such as the historical Aboriginal battle ground: G2B A13).

6.3 Survey coverage and visibility variables

The effectiveness of archaeological field survey is to a large degree related to the obtrusiveness of the sites being looked for and the incidence and quality of ground surface visibility. Visibility variables were estimated for all areas of comprehensive survey within the study area. These estimates provide a measure with which to gauge the effectiveness of the survey and level of sampling conducted. They can also be used to gauge the number and type of sites that may not have been detected by the survey.

Ground surface visibility is a measure of the bare ground visible to the archaeologist during the survey. There are two main variables used to assess ground surface visibility, the frequency of exposure encountered by the surveyor and the quality of visibility within those exposures. The predominant factors affecting the quality of ground surface visibility within an exposure are the extent of vegetation and ground litter, the depth and origin of exposure, the extent of recent sedimentary deposition, and the level of visual interference from surface gravels. Two variables of ground surface visibility were estimated during the survey:

- A percentage estimate of the total area of ground inspected which contained useable exposures of bare ground.
- A percentage estimate of the average levels of ground surface visibility within those exposures. This is a net estimate and accounts for all impacting visual and physical variables including the archaeological potential of the sediment or rock exposed.

The obtrusiveness of different site types is also an important factor in assessing the impact of visibility levels. Sites based on rock exposures, such as rock shelters, open engravings and grinding grooves are more likely to be encountered than sites with no surface relief located on, or within, sedimentary matrices. In another example, artefacts made from locally occurring rock such as quartz may be more difficult to detect under usual field survey conditions than rock types that are foreign to the area. The impact of natural gravels on artefact detection was taken into account in the visibility variables estimates outlined above.

The natural incidence of sandstone platforms suitable for grinding grooves or engraving, together with the incidence of old growth trees, are important considerations in identifying both survey effectiveness and site location patterns outside of environmentally determined factors.

Two tables provided in Appendix K present visibility variable data. The table in M.1 summarises estimates for the degree to which separate landforms within the study area were examined and also indicates the exposure incidence and average ground visibility present in each case. The table in M.2 provides a summary based on landform divisions.

A graphic approximation of the survey traverses conducted for the archaeological survey, relative to landform categories, is presented in Appendix K 3.

An area of approximately 200 hectares (198.6 hectares) was the subject of archaeological survey. This area is in excess of the actual project area, due to the inclusion of:

- Areas adjacent to the project area which displayed greater potential for ground surface exposures within equivalent landforms.
- Areas adjacent to the project area which displayed an opportunity to increase coverage of archaeologically sensitive landforms also present within the project area.
- Relevant areas of archaeological survey conducted previously as part of the route selection study.
- Areas of archaeological survey conducted as part of further route-alignment assessments and reviews during the refinement of the concept design.

Thirty eight per cent of the area subject to survey was subject to direct inspection via pedestrian traverses (75.6 hectares).Taking into account survey coverage, archaeologically useable exposures, and visibility variables, the effective survey coverage (ESC) was 2.4 per cent of the total surveyed area. The ESC is a value required and defined by the OEH. The ESC attempts to provide an estimate of the proportion of the total study area that provided a net 100 per cent level of ground surface visibility to archaeological surveyors.

The ESC value per survey unit varies from 0.01 to 15.6, with an average of 1.83. The ESC values per landform category do not vary greatly from the overall project value, and range from 1.2 (mid slopes) to 3.5 (ridgeline crest) (refer table in Appendix K.2).

The ESC achieved is low in value, but typical for surveys conducted in predominantly rural lands on the NSW south coast. The high rainfall which characterises this region has the consequence that pasture grasslands present a dense surface layer of turf, and forest and shrublands include high levels of surface litter. These factors mean that ground surface exposures are typically very low in incidence and limited in extent. During the survey, greatest visibility and surface exposure was afforded by the following:

- Highway embankments.
- Rare instances of ploughed fields.
- Stock paths and associated erosion scalds.
- River and creek banks.
- Rough farm tracks.
- Construction related excavation.

A clear conclusion arising from the low ESC value is that the results of the surface survey cannot be considered to be a reliable indication of the potentially surviving archaeological resource within the project area. This finding supports the conduct, as part of the Foxground and Berry Bypass cultural heritage assessment, of a comprehensive assessment of the potential for subsurface archaeological material.

7 Results – subsurface testing program

7.1 Summary

- Twenty one PASAs were selected for archaeological testing across the project area.

  These were: PASA12, 13, 14, 15, 16, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 40, 41, 42, 43 and 44.
- Eighteen of the 21 PASAs subject to testing were determined to contain archaeological deposits.
- Two hundred and ninety eight archaeological test pits were excavated in the 21 PASAs in the project area.
  - Two hundred and ninety seven archaeological test pits were excavated by machine.
  - One archaeological test pit was excavated by hand.
- Two hundred and thirty six lithic artefacts were recovered from 18 PASAs and 92 test pits.
- The lithic assemblage is classifiable into twenty seven distinct types and seven raw materials.
- The lithic assemblage is dominated by flakes (58 per cent), and flaked pieces (19.1 per cent).
- Chert is the dominant raw material (71 per cent), followed by quartz (27 per cent), and minor occurrences of volcanic stone silcrete, chalcedony, mudstone, quartzite, sandstone, glass, ochre, and an unidentified sedimentary stone (<five per cent in total).
- The assemblage shows internal differentiation between PASAs, with differences evident in artefact abundance, activities represented, vertical distribution of artefacts, and assemblage richness.
- The project assemblages show higher than average regional assemblage richness and raw material richness.
- Three PASAs stand out as having higher than average richness: 25, 27 and 29, while four have lower than average richness: 13, 16, 23 and 28.
- PASA 12 has a large and diverse assemblage with abundant subsurface material. Flake manufacture and retouching also appear to be well represented at this location even though the site is not especially rich in comparison to other PASA in the study. These factors make PASA12 probably the most important location identified in the subsurface testing program.
- The assemblage is quite fragmented, with more than half the assemblage broken, and more than half of these by excessive heat. The assemblage nevertheless retains high identifiability and contributes to understanding regional stone procurement, stone artefact manufacture and other behaviours of regional significance such as implement manufacture and reduction.
- The assemblages are all small despite their high regional richness, and this will detract from their overall significance.

7.2 The project assemblage

This section of the report analyses the 236 artefacts recovered from the subsurface test excavation project. The analysis examines assemblage composition from the site/s and evaluates the information potential of the stone artefact assemblage, taphonomic processes, and the richness of the sites in a regional context. Some preliminary information is also provided about stone artefact manufacture and technological characteristics of the project assemblage.

Following sections consider variability in the spatial and vertical arrangement of stone artefacts from the test excavations, followed by a consideration of post-depositional damage and site formation. The site is then placed in regional context. Finally, some preliminary description is offered of the range of technological activities conducted at each site.

7.2.1 Stone artefact classes

The project lithic assemblage consists of 236 stone artefacts recovered from 92 test pits.

Table 7-1 and **Figure 7-1** and **Figure 7-2** show the numbers and percentages of different stone artefact classes recovered from the subsurface testing program.

The assemblage contains 27 different assemblage elements and is dominated by flakes (58 per cent) and flaked pieces (19.1 per cent) (**Table 7-1**).

Heat fragments are among the most numerous of the remaining artefact types at 5.9 per cent of the assemblage, followed by redirecting flakes (three per cent) and pot lids (2.1 per cent) and multiplatform cores (1.3 per cent).

A wide range of artefact types makes up the remaining small percentage of the assemblage.

Retouched artefact types include a single asymmetric backed artefact and several notched and laterally and distally retouched scrapers.

Cores are all of the rotated multiplatform kind. A large split cobble and a large core stand out in an assemblage that otherwise mostly consists of small artefacts.

The possible glass artefact was recovered from a pit which also included other broken bottle glass which provided no evidence for Aboriginal usage (PASA 41, pit 4). The pressure flaking evident on this glass piece could be explained as the result of a vehicle driving over it with rubber tyres/tread. It is less likely however, to be the consequence of impact from the excavator’s metal bucket, during the test excavation. In addition, the location of this PASA is consistent with a possible fringe camp location. There is not enough clear evidence to fully discount an Aboriginal origin and this item is thus included as a *possible* Aboriginal artefact.

Table 7-1: Breakdown of artefact classes in the project assemblage

Artefact class	No	%
Flake	137	58.1
Flaked piece	45	19.1
Heat fragment	14	5.9
Redirecting flake	7	3.0
Pot lid	5	2.1
Multiplatform core	3	1.3
Retouched flake fragment	3	1.3
Core	2	0.8
Hammerstone	2	0.8
Asymmetric backed	1	0.4
Bipolar core?	1	0.4
Bipolar flake	1	0.4
Bipolar flake?	1	0.4
Burin spall	1	0.4
Core fragment	1	0.4
End scraper	1	0.4
Fire cracked rock	1	0.4
Flake (split cobble)	1	0.4
Hammerstone and anvil	1	0.4
Microblade	1	0.4
Notch	1	0.4
Notched double side and end scraper	1	0.4
Ochre crayon	1	0.4
Possible glass artefact	1	0.4
Retouched flake	1	0.4
Retouched flaked piece	1	0.4
Ventral side scraper	1	0.4

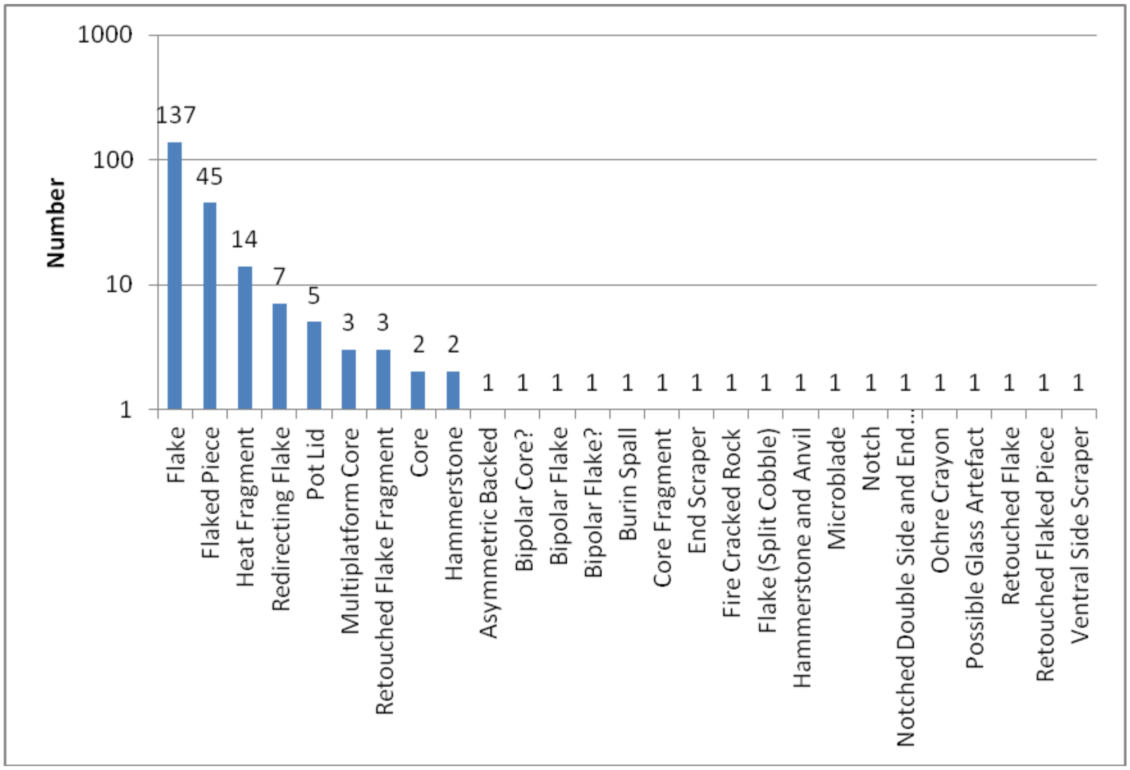


Figure 7-1: Number of items in each technological class from the project assemblage

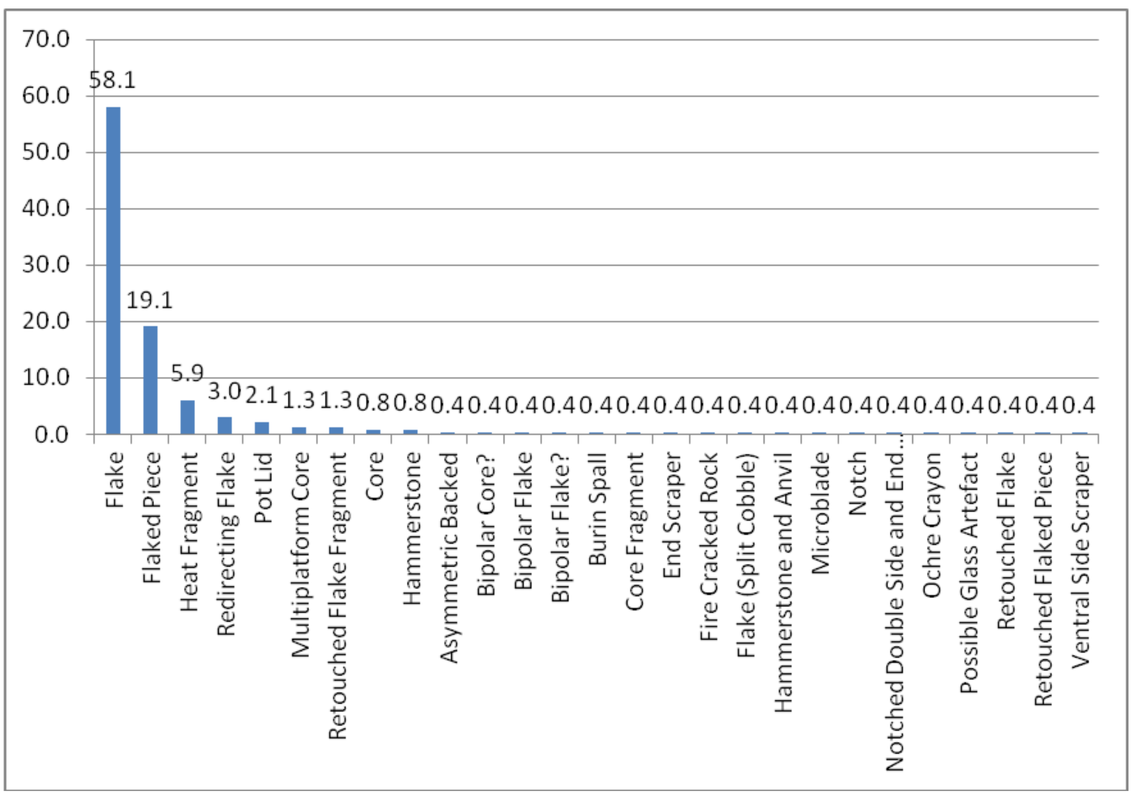


Figure 7-2: Percentage of artefacts in each technological class from the project assemblage

7.2.2 Stone artefact numbers

A breakdown of artefact numbers per PASA is provided in **Table 7-2**.

A breakdown of artefact numbers from each pit and spit for the subsurface assemblage is provided in **Table 7-3**.

A breakdown of artefact types is presented by site and pit in **Table 7-4**.

Table 7-2: Breakdown of artefact numbers per PASA

PASA #	No of lithic items
12	46
13	2
14	18
15	4
16	19
18	2
20	40
21	1
22	0
23	13
24	14
25	15
*26**	7
27	5
28	8
29	13
40	1
41	14
42	0
43	10
44	4

** Note the PASA26 artefacts are grouped with, and identified in this analysis as PASA27*

Table 7-3: Total artefact numbers for pits containing stone artefacts by PASA and pit

	PASA number																		
Pit	**12**	**13**	**14**	**15**	**16**	**18**	**20**	**21**	**23**	**24**	**25**	**27**	**28**	**29**	**40**	**41**	**43**	**44**	**Total**
1				1	1	1					2		2			7	7		14
2					13		2			1			1			1			18
3	1		1	1		1	3			10		4	1	3		1			26
4					5		3				1					1		4	14
5				2			2				2	1		1		1			9
6			2							2	2					1			7
7										1	3			4					8
8			9					1			5		2			1			18
9			3				2							1					6
10	1		1				1												3
11			1				4												5
12			1				6					7							14
13		1					2						1			1			5
14							1												1
15														1					1
16							1		1					2	1				5
17							2		1					1					4
18							1		11										12
19							2												2
20							7										1		8
21													1						1
22		1																	1
23							1												1
24	2																		2
25	1																		1
27	1																		1

	PASA number																		
Pit	**12**	**13**	**14**	**15**	**16**	**18**	**20**	**21**	**23**	**24**	**25**	**27**	**28**	**29**	**40**	**41**	**43**	**44**	**Total**
30	0																8		8
31																	1		1
36	2																		2
39	4																		4
40	10																		10
41	2																		2
42	8																		8
44	5																		5
46	1																		1
47	4																		4
48	1																		1
50	3																		3
Total	**46**	**2**	**18**	**4**	**19**	**2**	**40**	**1**	**13**	**14**	**15**	**12**	**8**	**13**	**1**	**14**	**10**	**4**	**236**

Table 7-4: **Breakdown of artefact types by PASA and pit for the entire assemblage**

PASA	Pit	Asymmetric Backed	Bipolar Core?	Bipolar Flake	Bipolar Flake?	Burin Spall	Core	Core Fragment	End Scraper	Fire Cracked Rock	Flake	Flake (Split Cobble)	Flaked Piece	Hammerstone	Hammerstone and Anvil	Hammerstone?	Heat Fragment	Microblade	Multiplatform Core	Notch	Notched Double Side and End Scraper	Ochre Crayon	Possible Glass Artefact	Pot Lid	Redirecting Flake	Retouched Flake	Retouched Flake Fragment	Retouched Flaked Piece	Ventral Side Scraper	Total
12	10										1																			1
12	24										1													1						2
12	25										1																			1
12	27												1																	1
12	3										1																			1
12	36				1																1									2
12	39							1			1						1												1	4
12	40										6		3											1						10
12	41										2																			2
12	42										3		4											1						8
12	44										5																			5
12	46										1																			1
12	47										2						1									1				4
12	48												1																	1
12	50										2						1													3
13	13										1																			1

PASA	Pit	Asymmetric Backed	Bipolar Core?	Bipolar Flake	Bipolar Flake?	Burin Spall	Core	Core Fragment	End Scraper	Fire Cracked Rock	Flake	Flake (Split Cobble)	Flaked Piece	Hammerstone	Hammerstone and Anvil	Hammerstone?	Heat Fragment	Microblade	Multiplatform Core	Notch	Notched Double Side and End Scraper	Ochre Crayon	Possible Glass Artefact	Pot Lid	Redirecting Flake	Retouched Flake	Retouched Flake Fragment	Retouched Flaked Piece	Ventral Side Scraper	Total
13	22										1																			1
14	10										1																			1
14	11										1																			1
14	12																							1						1
14	3										1																			1
14	6										2																			2
14	8										6		1				2													9
14	9										1		1												1					3
15	1												1																	1
15	3										1																			1
15	5										2																			2
16	1										1																			1
16	2										9		2				1	1												13
16	4										2		3																	5
18	1										1																			1
18	3												1																	1

PASA	Pit	Asymmetric Backed	Bipolar Core?	Bipolar Flake	Bipolar Flake?	Burin Spall	Core	Core Fragment	End Scraper	Fire Cracked Rock	Flake	Flake (Split Cobble)	Flaked Piece	Hammerstone	Hammerstone and Anvil	Hammerstone?	Heat Fragment	Microblade	Multiplatform Core	Notch	Notched Double Side and End Scraper	Ochre Crayon	Possible Glass Artefact	Pot Lid	Redirecting Flake	Retouched Flake	Retouched Flake Fragment	Retouched Flaked Piece	Ventral Side Scraper	Total
20	10										1																			1
20	11										3		1																	4
20	12										3		2	1																6
20	13										1														1					2
20	14										1																			1
20	16																								1					1
20	17										1																1			2
20	18										1																			1
20	19										1		1																	2
20	2															1						1								2
20	20		1								2		2				2													7
20	23										1																			1
20	3										1		1				1													3
20	4														1		2													3
20	5										2																			2
20	9										2																			2

PASA	Pit	Asymmetric Backed	Bipolar Core?	Bipolar Flake	Bipolar Flake?	Burin Spall	Core	Core Fragment	End Scraper	Fire Cracked Rock	Flake	Flake (Split Cobble)	Flaked Piece	Hammerstone	Hammerstone and Anvil	Hammerstone?	Heat Fragment	Microblade	Multiplatform Core	Notch	Notched Double Side and End Scraper	Ochre Crayon	Possible Glass Artefact	Pot Lid	Redirecting Flake	Retouched Flake	Retouched Flake Fragment	Retouched Flaked Piece	Ventral Side Scraper	Total
21	8	1																												1
23	16										1																			1
23	17										1																			1
23	18										4		6												1					11
24	2												1																	1
24	3										9														1					10
24	6											1							1											2
24	7																		1											1
25	1												1												1					2
25	4										1																			1
25	5										1								1											2
25	6										2																			2
25	7										2																1			3
25	8						1				4																			5
27	12								1		4														1		1			7
27	3										2		2																	4

PASA	Pit	Asymmetric Backed	Bipolar Core?	Bipolar Flake	Bipolar Flake?	Burin Spall	Core	Core Fragment	End Scraper	Fire Cracked Rock	Flake	Flake (Split Cobble)	Flaked Piece	Hammerstone	Hammerstone and Anvil	Hammerstone?	Heat Fragment	Microblade	Multiplatform Core	Notch	Notched Double Side and End Scraper	Ochre Crayon	Possible Glass Artefact	Pot Lid	Redirecting Flake	Retouched Flake	Retouched Flake Fragment	Retouched Flaked Piece	Ventral Side Scraper	Total
27	5												1																	1
28	1										2																			2
28	13										1																			1
28	2										1																			1
28	21																1													1
28	3																1													1
28	8										2																			2
29	15										1																			1
29	16												1											1						2
29	17										1																			1
29	3										1		1							1										3
29	5			1																										1
29	7										3																	1		4
29	9										1																			1
40	16										1																			1
41	1									1	5		1																	7
41	13										1																			1
41	2						1																							1

PASA	Pit	Asymmetric Backed	Bipolar Core?	Bipolar Flake	Bipolar Flake?	Burin Spall	Core	Core Fragment	End Scraper	Fire Cracked Rock	Flake	Flake (Split Cobble)	Flaked Piece	Hammerstone	Hammerstone and Anvil	Hammerstone?	Heat Fragment	Microblade	Multiplatform Core	Notch	Notched Double Side and End Scraper	Ochre Crayon	Possible Glass Artefact	Pot Lid	Redirecting Flake	Retouched Flake	Retouched Flake Fragment	Retouched Flaked Piece	Ventral Side Scraper	Total
41	3										1																			1
41	4																						1							1
41	5										1																			1
41	6										1																			1
41	8										1																			1
43	20												1																	1
43	30					1					4		3																	8
43	31										1																			1
44	4										1		2				1													4
Total	**10**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**137**	**1**	**45**	**1**	**1**	**1**	**14**	**1**	**3**	**1**	**1**	**1**	**1**	**5**	**7**	**1**	**3**	**1**	**1**	**236**

7.2.3 Raw materials

Twelve raw materials are present in the assemblage.

The numbers and percentages for different material types are provided for the whole assemblage in **Table 7-5**, and by PASA and pit in **Table 7-6**.

The assemblage is mostly comprised of:

- Chert (typically red or grey in colour) (71.6 per cent).
- Followed by quartz (11.4 per cent).

All other raw materials are rare and make up less than five per cent of the total assemblage. These include:

- Volcanic stone.
- Silcrete.
- Chalcedony.
- Mudstone.
- Quartzite.
- Sandstone, a dense metamorphic rock used for hammerstones.
- Glass.
- Ochre.
- An unidentified sedimentary stone.

Table 7-5: Number and percentage of each raw material type in the assemblage

Type	Number	Per cent
Chert	169	71.61
Quartz	27	11.44
Volcanic	10	4.24
Silcrete	7	2.97
Chalcedony	6	2.54
Mudstone	6	2.54
Quartzite	3	1.27
Sandstone	3	1.27
Metamorphic	2	0.85
Glass	1	0.42
Ochre	1	0.42
Sedimentary	1	0.42
Total	**236**	**100.00**

Table 7-6: Number of each raw material type per site and pit

PASA	Pit	Chalcedony	Chert	Glass	Metamorphic	Mudstone	Ochre	Quartz	Quartzite	Sandstone	Sedimentary	Silcrete	Volcanic	Total
12	10							1						1
12	24		2											2
12	25		1											1
12	27		1											1
12	3		1											1
12	36	1						1						2
12	39		4											4
12	40		8										2	10
12	41		1					1						2
12	42		6					1				1		8
12	44		5											5
12	46		1											1
12	47		4											4
12	48		1											1
12	50		3											3
13	13		1											1
13	22		1											1
14	10		1											1
14	11		1											1
14	12		1											1
14	3		1											1
14	6		2											2
14	8	2	7											9
14	9		3											3
15	1		1											1
15	3		1											1
15	5	1	1											2
16	1		1											1
16	2		12									1		13
16	4		1					4						5
18	1		1											1
18	3		1											1
20	10							1						1
20	11		2						1				1	4
20	12		4		1							1		6
20	13		2											2
20	14									1				1
20	16		1											1

PASA	Pit	Chalcedony	Chert	Glass	Metamorphic	Mudstone	Ochre	Quartz	Quartzite	Sandstone	Sedimentary	Silcrete	Volcanic	Total
20	17		1					1						2
20	18												1	1
20	19		2											2
20	2				1		1							2
20	20		6							1				7
20	23							1						1
20	3		1					2						3
20	4		2			1								3
20	5		1					1						2
20	9		2											2
21	8		1											1
23	16		1											1
23	17		1											1
23	18		2					5					4	11
24	2		1											1
24	3		5			1		4						10
24	6					1			1					2
24	7		1											1
25	1		1			1								2
25	4		1											1
25	5		1			1								2
25	6		1					1						2
25	7		2									1		3
25	8		3			1		1						5
27	12	1	5									1		7
27	3		4											4
27	5							1						1
28	1									1			1	2
28	13		1											1
28	2		1											1
28	21		1											1
28	3		1											1
28	8		2											2
29	15											1		1
29	16		2											2
29	17		1											1
29	3		3											3
29	5											1		1
29	7		4											4
29	9	1												1
40	16		1											1

PASA	Pit	Chalcedony	Chert	Glass	Metamorphic	Mudstone	Ochre	Quartz	Quartzite	Sandstone	Sedimentary	Silcrete	Volcanic	Total
41	1		5					1			1			7
41	13		1											1
41	2								1					1
41	3		1											1
41	4			1										1
41	5		1											1
41	6		1											1
41	8		1											1
43	20		7										1	8
43	30		1											1
43	31		1										1	1
44	4		4											4
Total	**10**	**6**	**169**	**1**	**2**	**6**	**1**	**27**	**3**	**3**	**1**	**7**	**10**	**236**

7.2.4 Spatial distribution of the assemblage

Relatively few artefacts were recovered from any of the PASA test pits.

The majority of artefacts were recovered from PASA 12 (N = 46) and PASA 20 (N = 40) (**Table 7-7**, **Figure 7-3**).

The remaining PASAs each had less than 20 artefacts, with the minimum being one artefact (PASAs 21 and 40).

For individual pits, the greatest number of artefacts comes from PASA 16 Pit 2 (N = 13), PASA 23 Pit 18 (N = 11), PASA 12 Pit 40 (N = 10) and PASA 24 Pit 3 (N = 10).

The remaining pits have less than ten artefacts, with more than half of the test pits (N = 48) contain only a single artefact.

In terms of activity differentiation between PASA, no overlap appears to occur in the kinds of activities suggested by distinctive artefact types such as cores, retouched flakes and hammerstones.

Cores are most abundant in PASA 24 and 25 (making up 13 and 14 per cent of each PASA).

Hammerstones and anvils are only found at PASA 20 (making up seven per cent of this PASA).

Table 7-7: Assemblage diversity by PASA

PASA	Asymmetric Backed	Bipolar Core?	Bipolar Flake	Bipolar Flake?	Burin Spall	Core	Core Fragment	End Scraper	Fire Cracked Rock	Flake	Flake (Split Cobble)	Flaked Piece	Hammerstone	Hammerstone and	Hammerstone?	Heat Fragment	Microblade	Multiplatform Core	Notch	Notched Double Side and End Scraper	Ochre Crayon	Possible Glass	Pot Lid	Redirecting Flake	Retouched Flake	Retouched Flake	Retouched Flaked	Ventral Side Scraper	Total	Assemblage Diversity
12				1			1			26		9				3				1			3		1			1	46	9
13										2																			2	1
14										12		2				2							1	1					18	5
15										3		1																	4	2
16										12		5				1	1												19	4
18										1		1																	2	2
20		1								20		7	1	1	1	5					1			2		1			40	10
21	1																												1	1
23										6		6												1					13	3
24										9	1	1						2						1					14	5
25						1				10		1						1						1		1			15	6
27								1		6		3												1		1			12	5
28										6						2													8	2
29			1							7		2							1				1				1		13	6
40										1																			1	1
41						1			1	10		1										1							14	5
43					1					5		4																	10	3
44										1		2				1													4	3
Total	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**137**	**1**	**45**	**1**	**1**	**1**	**14**	**1**	**3**	**1**	**1**	**1**	**1**	**5**	**7**	**1**	**3**	**1**	**1**	**236**	**28**

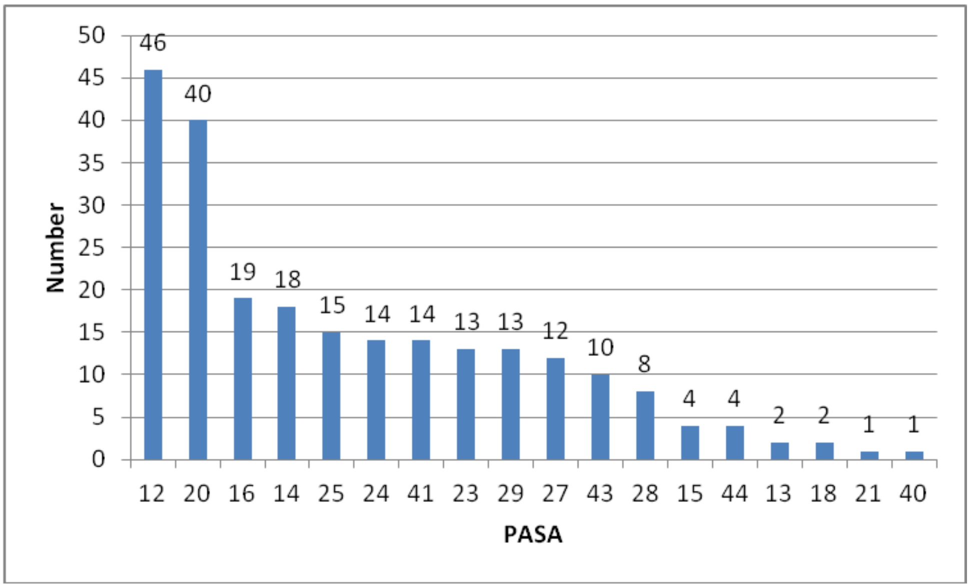


Figure 7-3: Total artefact numbers recovered from each PASA

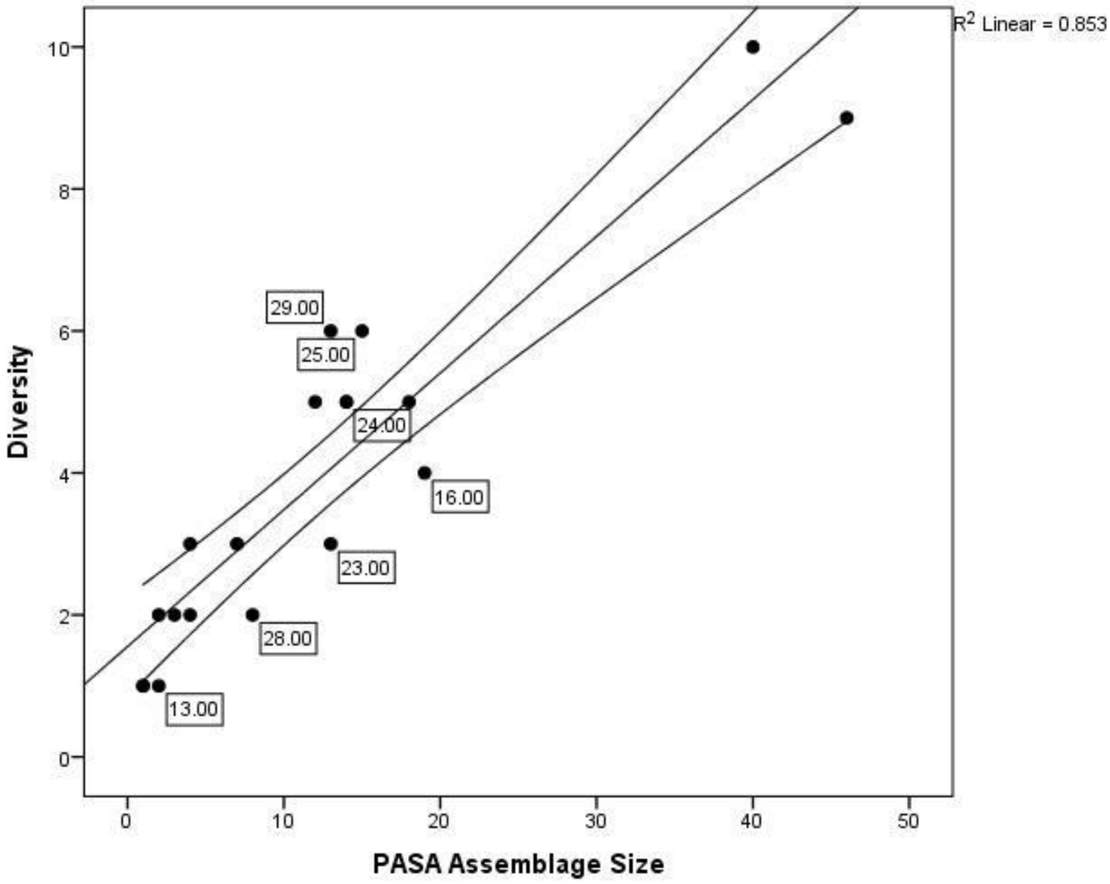


Figure 7-4: Relationship between assemblage size and artefact diversity, revealing two different richness relationships (i.e. high and low diversity for a given sample size). PASA with high or low ranges are labelled.

A scatter plot of assemblage size against the diversity of technological classes (i.e. number of different classes present) in each pit – a relationship known as richness - reveals a strong correlation between assemblage size and raw material diversity ($r2 = 0.853$) (**Figure 7-4**). This richness relationship represents the diversity of artefact classes for a given sample size (but makes no statement about the uniqueness or rarity of specific classes per se), and is a robust measure of assemblage diversity that can be used to compare assemblages of different sizes. Also shown in **Figure 7-4** is the line of best fit and the 95 per cent confidence interval around the mean. Artefacts above the 95 per cent CI can be thought of as significantly richer and those below as significantly less rich. It must be noted that sample size is small for most PASA, reducing the strength of this relationship to some degree as the effects of the vagaries of sampling are often stronger on smaller assemblages. In this case it is best to focus on the larger assemblages that show slightly higher than average richness, although even in these cases assemblage size is still small.

Three PASAs stand out as having higher than average richness: 25, 27 and 29. Four PASAs have lower than average richness: 13, 16, 23 and 28.

Differences in assemblage size, density and richness can reflect either:

- Past accumulations of artefacts at various locations where people chose to camp and discarded domestic debris including stone artefacts.
- Places where artefacts were manufactured (particularly if close to a source of flakeable stone).
- Locations where artefacts accumulated due to fluvial or colluvial transport and deposition.

The condition of artefacts and signs of post-depositional movement and size sorting, along with evidence for in situ stone knapping can help determine which of these scenarios is most likely for each site, and these are further explored below.

7.2.5 Vertical distribution of the assemblage

Although PASA are often far apart, a general pattern of decreasing artefacts numbers with depth can be seen for the PROJECT assemblage (**Figure 7.5**). A second small peak also appears in Spit 6. However, as assemblages occur in different landforms with different stratigraphic profiles, it is necessary to examine each PASA separately to determine whether this second peak is widespread or occurs in only one locality.

Figure 7-6 plots spit counts for each PASA and reveals that the vertical distribution of artefacts is quite variable between PASAs. It also reveals that the separate lower peak in Spit 6 is only found at PASA 24. In fact this peak is only observed in Pit 3 of PASA 24 – a pit that contains no artefacts above or below this spit. This may suggest that a buried occupation zone occurs at this locality. **Figure 7-6** also reveals two other PASA that depart from the general pattern - 27 and 41 - which both show slightly increasing artefact numbers down to Spit 3 or 4.

Not surprisingly, the pattern of decreasing artefact numbers with depth is most evident at PASA12 and PASA20 where the largest assemblages were recovered, hence reducing sample size effects.

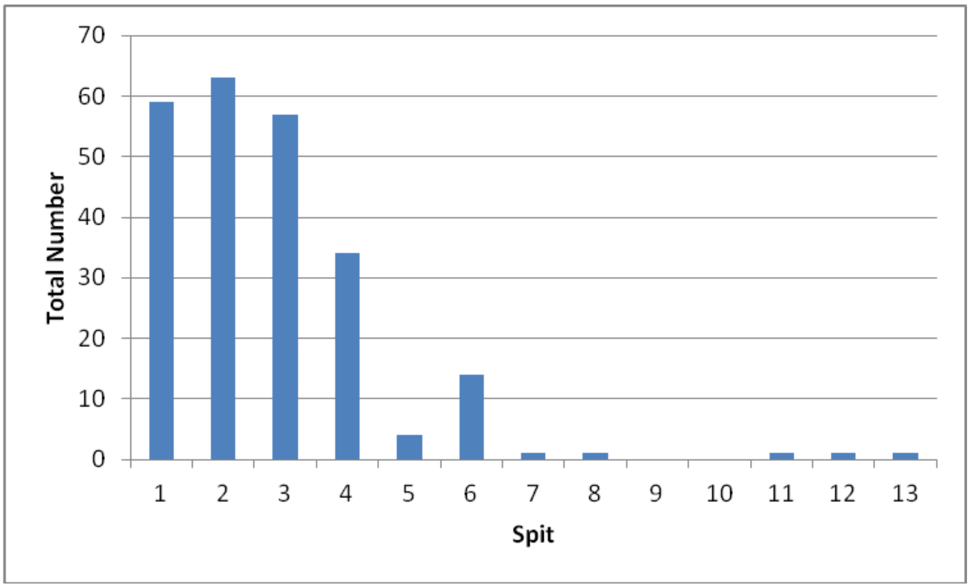


Figure 7-5: Vertical distribution of the assemblage across all PASAs

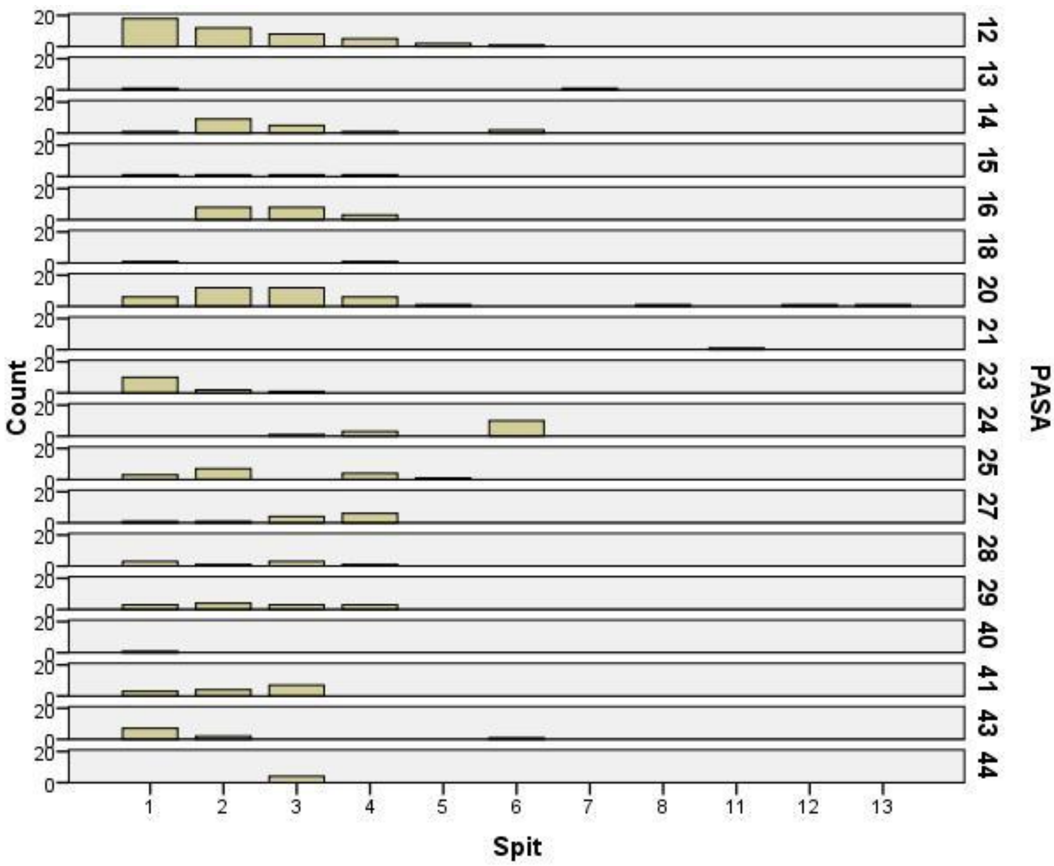


Figure 7-6: Spit counts by PASA

The general pattern of greatest artefact deposition in the top three spits and steeply declining artefact number below that depth could result from the downward movement of artefacts through bioturbation, or it could result from active depositional environments burying artefacts in correct stratigraphic position. Examining the data for evidence of size sorting may help determine whether processes such as bioturbation have altered the vertical distribution of artefacts at the site.

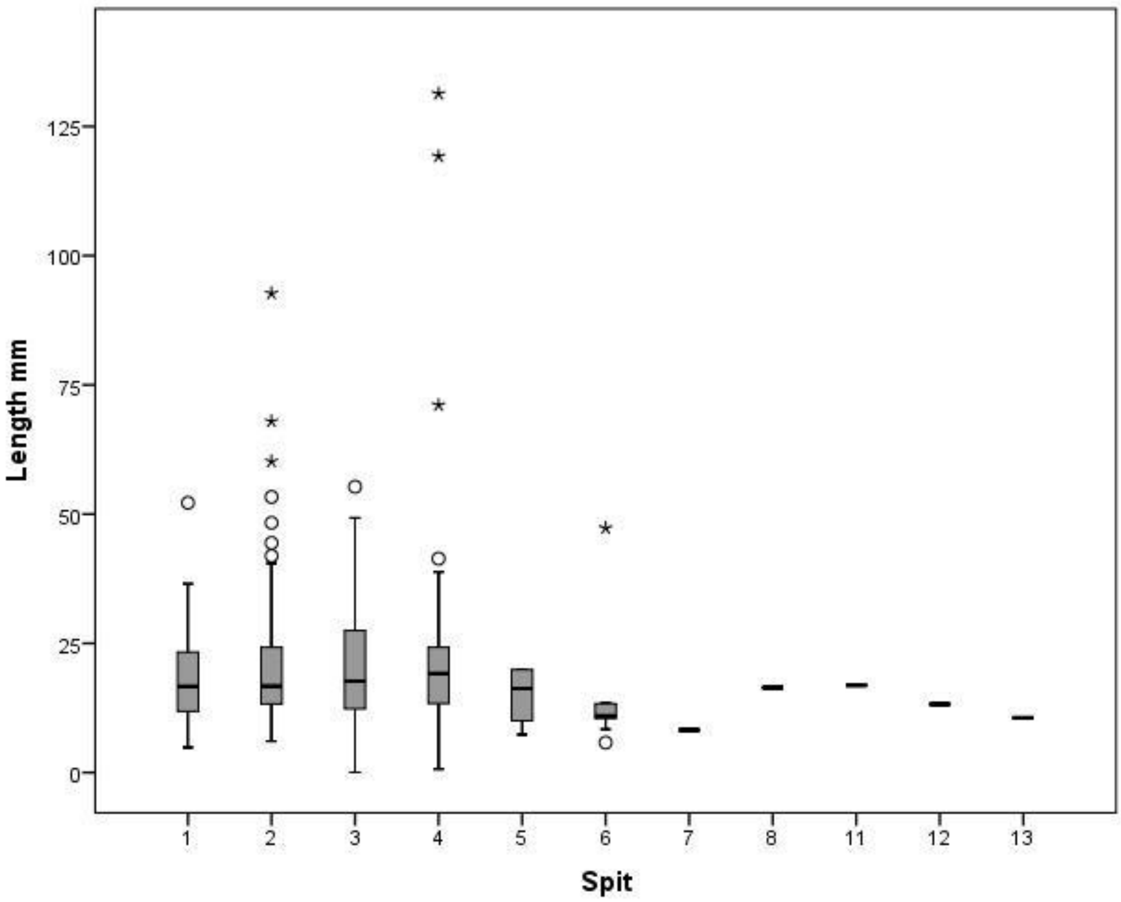


Figure 7-7: Boxplot of variation in artefact length by spit. Boxes represent the inner quartiles, whiskers represent the outer quartiles, circles represent outliers and stars represent extreme values.

A box plot of variation in artefact length is plotted for each spit for the total assemblage in **Figure 7-7**.

The largest artefacts are found in the top four spits, however, size range does not vary much over the depth for the entire assemblage. Sample size is very small for the lowermost spits, hence only individual artefact lengths are plotted for Spits 7-13.

Mean artefact length is plotted by spit for each PASA in **Figure 7-8**. This graph reveals quite variable patterns for each PASA, as for artefact numbers, but no overall pattern of size sorting is seen. Mean artefact size is also not correlated with sample size ($r^2 = 0.03$).

PASA 24 again stands out in having the largest artefacts found low in the profile in Spit 6.

Artefact size sorting therefore seems unlikely to have taken place at any of the PASA in the study, and each PASA appears to show its own specific pattern unrelated to depth.

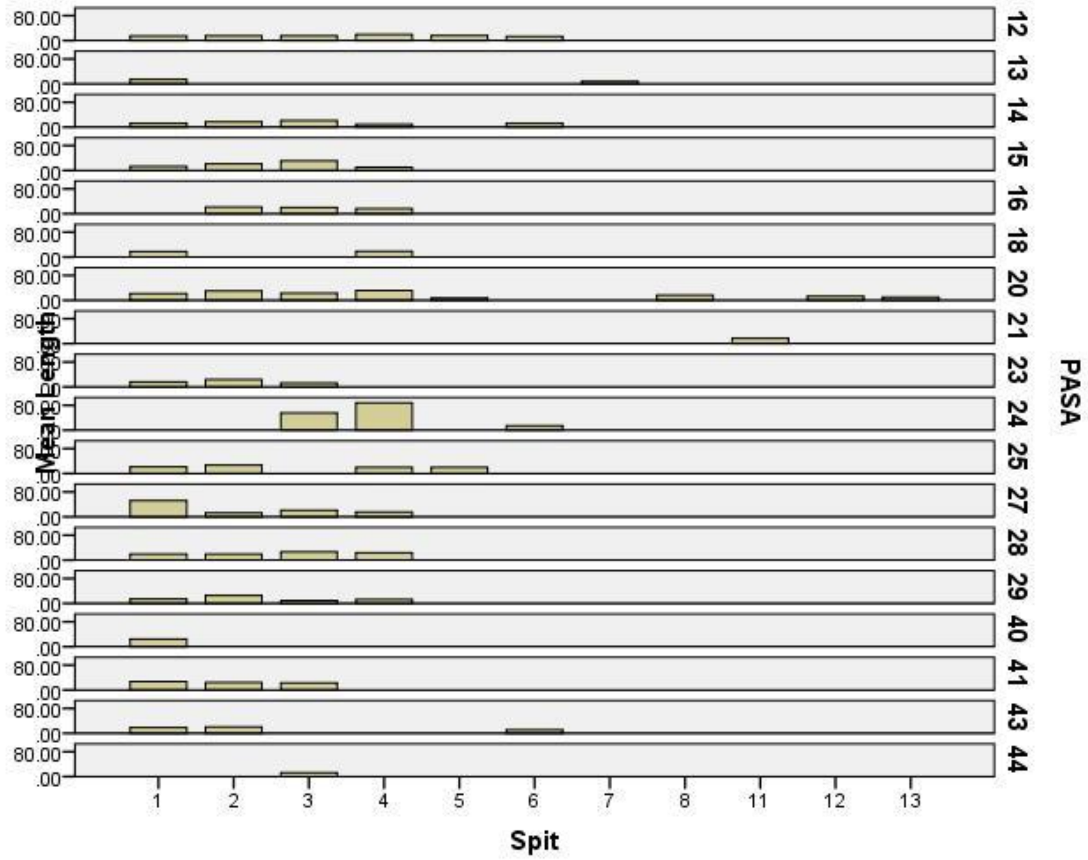


Figure 7-8: **Mean artefact length by spit for each PASA**

7.2.6 Site richness in regional context

Figure 7-9 compares the richness of the total assemblage (i.e. diversity / assemblage size) in comparison to 39 other open assemblages from the coastal and sub-coastal zone of southeastern Australia (including NSW, VIC and southeast QLD), collected using similar techniques (excavation combined with some surface collection) and analysed using the same classificatory techniques. (Refer **Appendix L** for project names and assemblage statistics). A line of best fit has been added to help determine average richness in southeastern Australia, with sites sitting above the line being richer and those below the line poorer for a given sample size.

The 95 per cent confidence intervals are shown as lines above and below the line of best fit. These help identify assemblages that are statistically significantly different from the average. Hence sites sitting outside the 95 per cent confidence region are either richer (above) or poorer (below) than the average.

The project assemblages as a whole sit well above the line of best fit. This indicates that the project assemblage is significantly richer than average for southeastern Australian assemblages, and is among the richest in the assemblage.

However, an issue that arises that is further discussed below is that several assemblage types relate to heat damage, and are not representative of cultural factors creating assemblage diversity. Even with heat damage components removed from the assemblage diversity count, the project assemblage remains above the 95 per cent confidence interval.

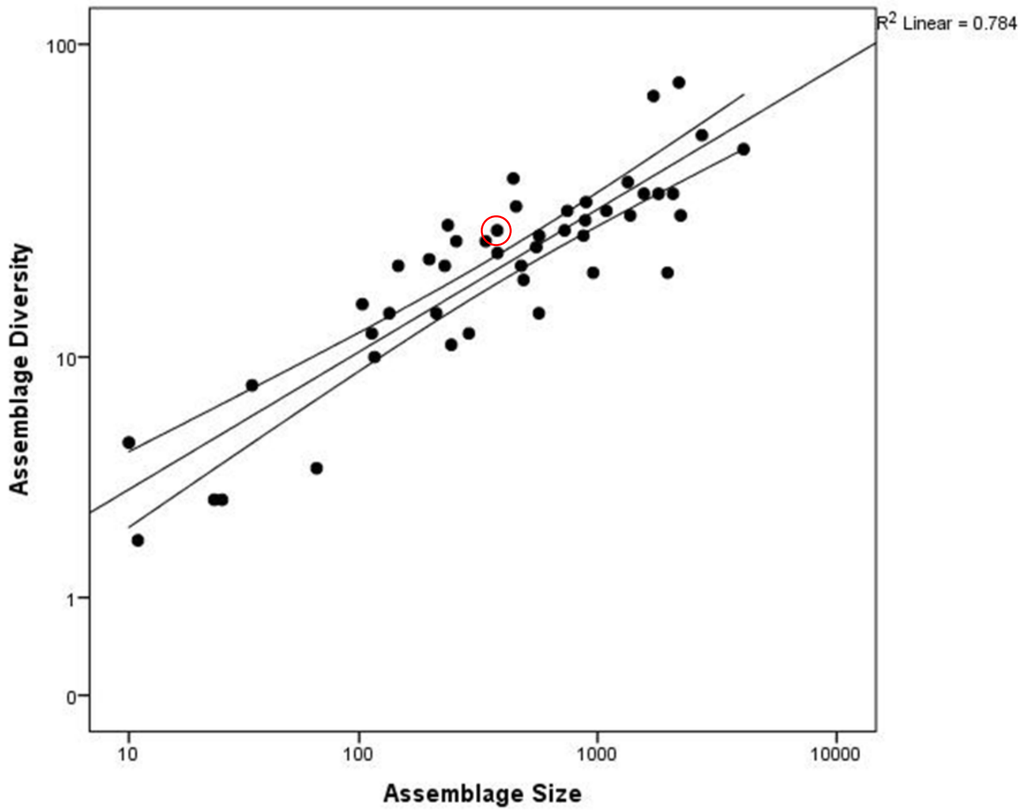


Figure 7-9: Assemblage richness for the project study (red circle) in comparison to 39 assemblages from southeastern Australia.

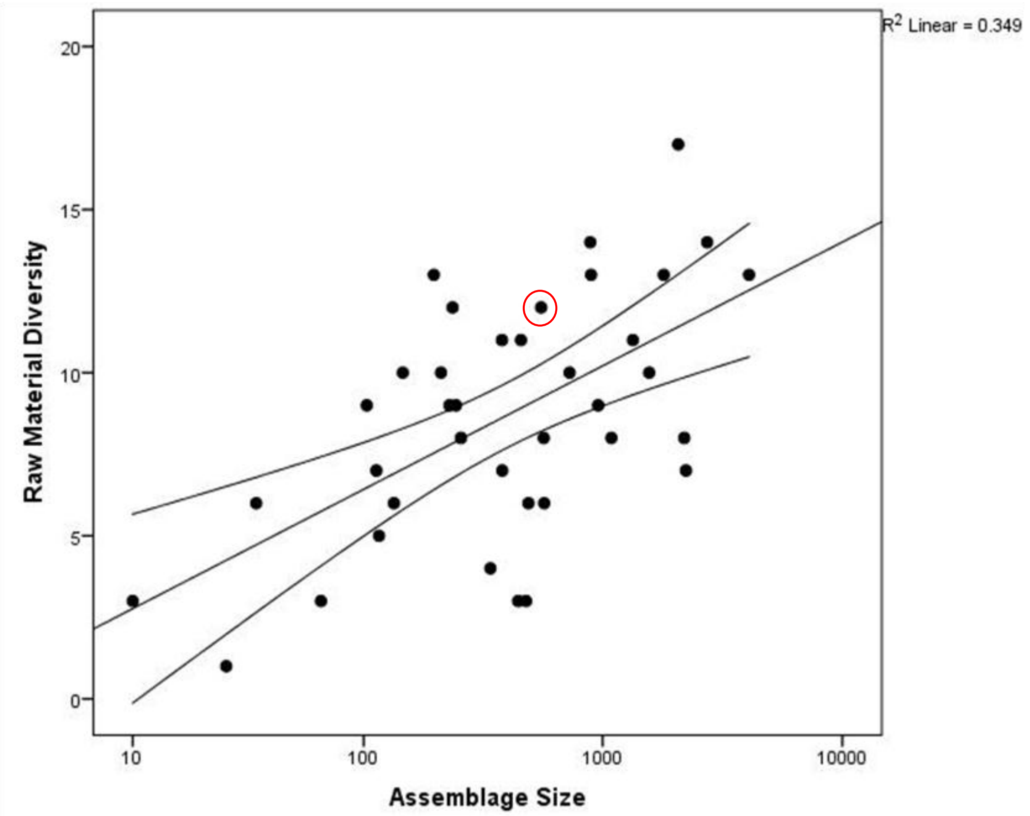


Figure 7-10: Raw material richness for C2B excavated artefacts (red circle) in comparison to 38 assemblages from southeastern Australia.

Figure 7-10 plots the same relationship for raw material richness in comparison to 38 south eastern Australian assemblages.

Unlike assemblage diversity, assemblage size is not a good predictor of raw material diversity in south eastern Australia (r2 = 0.349) as this is largely determined on local geology, although settlement pattern and site function can also affect raw material diversity (Clarkson 2007).

The graph nevertheless indicates very high raw material diversity for the project assemblage in comparison to numerous other south eastern Australian assemblages (i.e. well above the line of best fit and outside of the 95 per cent CI). This suggests that the local geology is rich in flakeable stone types. A possible explanation for this diversity can be found in the conglomerates and sandstones exposed in the Illawarra Range, upstream of the project area. These typically include pebbles and cobbles of highly siliceous rock types and once eroded from their rock matrix are concentrated in the beds of downstream drainage corridors. All of the drainage lines crossed by the project area have catchments originating from the escarpment.

7.2.7 Intactness of the assemblage

The majority of artefacts from the project assemblages are broken (63.6 per cent), with breakage rates varying by PASA and pit (**Table 7-8**). Most PASA have proportions of broken artefacts above 50 per cent, with PASA18, 29, 40 and 44 have 100 per cent breakage, and PASA 15, 28, 29 and 41 having breakage proportions between 75 per cent and 85 per cent. A breakage rate of 1.8 broken artefacts to every complete artefact is below the average of 2.46 for a sample of 32 south eastern Australian assemblages.

Many of the broken artefacts in the project assemblage have heat-related damages are either pot lids (40 per cent) or heat shattered in some way (50 per cent). PASA 44 and 40 have the highest proportions of heat damage (**Table 7-9**), although sample sizes are very small for these PASA, suggesting such high percentages could simply reflect sample size effects.

Table 7-8: Proportions of broken artefacts in each PASA

PASA	Broken	Total	% Broken
12	24	46	52.2
13		2	0.0
14	11	18	61.1
15	3	4	75.0
16	14	19	73.7
18	2	2	100.0
20	26	40	65.0
21		1	0.0
23	9	13	69.2
25	5	15	33.3
24	8	14	57.1
27	8	12	66.7
28	6	8	75.0
29	11	13	84.6
40	1	1	100.0
41	11	14	78.6
43	6	10	37.3
44	4	4	100.0
Total	**149**	**236**	**63.1**

Table 7-9: Proportions of heat damaged artefacts by PASA

PASA	Heat damaged	Total	% Heat damaged
12	9	46	19.6
13		2	0.0
14	4	18	22.2
15		4	0.0
16	1	19	5.3
18		2	0.0
20	6	40	15.0
21		1	0.0
23	1	13	7.7
24		14	0.0
25	2	15	13.3
27	2	12	16.7
28	3	8	37.5
29	2	13	15.4
40	1	1	100.0
41	5	14	35.7
43	2	10	33.3
44	2	4	50.0
Total	**40**	**236**	**16.9**

Transverse breaks are more common (50 per cent) than either longitudinal breaks (12 per cent) or combined transverse and longitudinal breaks (27 per cent) (**Table 7-10**). This is suggestive of end shock and heat shatter as the main causes of artefact breakage rather than manufacturing errors resulting from excessive force application. However, many of the broken fragments at sites are in fact flaked pieces that cannot be identified to type. This makes accurate determination of the causes of fracture more difficult.

A very low rate of edge damage on artefacts of only 0.3 per cent likely rules out heavy trampling or disturbance as a source of fragmentation.

In summary, it is likely fragmentation in the project assemblages is caused by manufacturing errors and excessive heating from campfires or bushfires.

Table 7-10: Fragment types in the assemblage

Orientation	Transverse			Longitudinal		Transverse and longitudinal						
Type	**Distal**	**Medial**	**Proximal**	**Left**	**Right**	**Left Distal**	**Left Proximal**	**Marginal**	**Mesial**	**Proximal Mesial**	**Right Proximal**	**Total**
Number	15	4	17	4	8	1	2	18	2	1	3	75
%	20.0	5.3	22.7	5.3	10.7	1.3	2.7	24.0	2.7	1.3	4.0	100.0

7.2.8 Attribute analysis of the project assemblage

This section examines artefact manufacturing and reduction patterns for the project sites. Technological attributes were recorded in detail on complete artefacts (N=83), and relevant information was also recorded on intact portions of broken artefacts where appropriate. It is possible using this information to examine some technological features of flakes and cores from sites and to make some comments about manufacturing technology in the area. Cortex proportions are highest on quartzite and mudstone flakes and remain at or close to zero on all other raw materials.

Flakes

Table 7-11 provides summary statistics for complete flakes (N=66) from the project assemblages (**Figure 7-11** and **Figure 7-12**). It can be observed from this table that flakes made from most raw materials excepting quartzite and mudstone are small, with chalcedony being the smallest.

Flakes are all of widely varying shape and size however, with most being squat and somewhat parallel sided. Silcrete flakes stand out as having higher than average elongation, and indeed one microblade of silcrete was found in the assemblage (**Figure 7-11**).

Flakes made from most raw materials except chalcedony have one dorsal ridge on average and platform angles in the normal range.

Platform types are mostly single conchoidal (58 per cent) or focalized (12 per cent), while cortical and faceted platforms account for six per cent each. Platforms are most commonly unprepared (56 per cent), but overhang removal is common (39 per cent) and faceting rare (six per cent).

Terminations are most commonly feather (77 per cent), less commonly hinge (17 per cent) and rarely stepped (six per cent).

Dorsal scar orientations are typically oriented from the proximal (76 per cent) with all other orientations making up less than five per cent of flakes each.

Figure 7-12 provides examples of complete flakes found in the project assemblage.

Figure 7-11: Silcrete microblade (No.27)

Table 7-11: Summary statistics for complete flakes from the C2B sites (N = number of items, S.D.= Standard deviation)

Raw Material		Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	No. Dorsal Ridges	Platform Width	Platform Thickness	Platform Angle	% Cortex	Platform Cortex	Marginal Angle	Elongation
Chalcedony	Mean	0.99	17.30	14.82	14.89	14.66	2.91		9.23	1.80	66.00	0.00	0.00	-6.68	1.15
	N	2	2	2	2	2	2		2	2	2	2	2	2	2
	S.D.	0.38	5.49	9.41	3.28	4.82	0.59		9.57	0.91	9.90	0.00	0.00	47.82	0.12
Chert	Mean	4.97	18.42	13.40	33.01	12.30	5.64	1.00	10.43	4.97	71.74	7.06	5.92	2.71	1.23
	N	51	51	51	51	51	51	8	48	48	46	51	49	51	51
	S.D.	12.03	12.07	11.82	124.83	7.81	4.07	0.00	6.98	8.52	10.13	23.00	23.44	32.10	0.55
Mudstone	Mean	11.10	47.31	25.79	20.49	0.00	7.69	1.00	26.14	7.74	65.00	10.00	100.00	30.49	2.31
	N	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	S.D.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Quartz	Mean	0.44	12.57	5.70	210.47	7.07	2.73		6.26	1.77	70.50	2.00	0.00	-6.79	0.88
	N	5	5	5	5	5	5		4	4	4	5	5	5	5
	S.D.	0.24	3.82	1.41	446.40	2.83	0.94		1.18	0.46	10.34	4.47	0.00	21.99	0.60
Quartzite	Mean	790.00	131.33	120.81	140.15	88.96	22.94		78.54	21.44	33.00	100.00	100.00	13.83	0.94
	N	1	1	1	1	1	1		1	1	1	1	1	1	1
	S.D.	.	.	.	.	.	.		.	.	.	.	.	.	.
Silcrete	Mean	1.04	21.30	4.85	9.53	6.38	3.77	1.50	4.74	2.21	79.67	0.00	0.00	-2.22	2.64
	N	3	3	3	3	3	3	2	3	3	3	3	3	3	3
	S.D.	0.72	8.96	3.40	5.41	2.93	1.48	0.71	3.58	0.65	9.07	0.00	0.00	6.75	1.54
Volcanic?	Mean	2.58	16.97	11.49	16.23	9.89	5.50	1.00	11.15	4.50	70.50	0.00	0.00	17.67	1.02
	N	3	3	3	3	3	3	1	2	2	2	3	2	3	3
	S.D.	1.99	8.91	3.08	7.29	7.79	2.49	.	5.64	3.32	10.61	0.00	0.00	43.57	0.11
Total	Mean	16.20	20.16	14.20	45.51	12.57	5.54	1.08	11.23	4.82	71.05	7.27	7.78	2.75	1.27
	N	66	66	66	66	66	66	12	61	61	59	66	63	66	66
	S.D.	97.30	18.09	17.23	163.53	12.11	4.33	0.29	11.15	7.94	11.06	23.44	26.73	30.86	0.67

N = number of items, S.D.= Standard Deviation

Figure 7-12: Some examples of complete chert flakes

Cores

Six cores and core fragments were recovered from the project test excavations. Two are made from chert, three are of mudstone and one is made from quartzite.

Summary statistics for cores are provided in **Table 7.12** by raw material type.

Mudstone cores are much larger on average than other materials, with chert the smallest. Mudstone also preserves the most exterior cortex and the least number of scars.

Step terminations are frequent on the extensively rotated chert core. The chert core is the only core to preserve an elongate parallel-sided flake scar. Final platform angles are low except on the mudstone cores.

Figure 7-13 provides examples of cores from the assemblage.

Table 7-12: Summary statistics for cores (N = number of items, S.D.= Standard Deviation)

Raw material	Chert			Mudstone			Quartzite			Total		
	Mean	N	S.D.	Mean	N	S.D.	Mean	N	S.D.	Mean	N	S.D.
Weight	37.3	2	37.6	357.5	3	257.8	45.3	1	.	198.7	6.0	239.0
Length	40.9	2	20.4	73.8	3	42.9	48.3	1	.	58.6	6.0	33.2
Medial Width	38.8	1	.	78.8	3	20.2	37.2	1	.	62.5	5.0	26.5
Thickness	38.4	1	.	45.5	3	18.2	24.9	1	.	40.0	5.0	15.7
% Cortex	0.0	1	.	60.0	3	10.0	40.0	1	.	44.0	5.0	27.0
Number of Scars	6.0	1	.	3.7	3	1.5	6.0	1	.	4.6	5.0	1.7
Number of Rotations	5.0	1	.	0.7	3	0.6	1.0	1	.	1.6	5.0	1.9
Longest Face	35.3	1	.	48.9	3	33.3	48.3	1	.	46.1	5.0	24.3
Core Platform Thickness	27.8	1	.	45.2	3	10.9	17.5	1	.	36.2	5.0	15.0
Base Thickness	0.0	1	.	43.9	2	16.9	0.0	1	.	21.9	4.0	27.1
Core Platform Width	43.1	1	.	81.8	3	23.9	35.3	1	.	64.7	5.0	28.9
No. Non-Feather	6.0	1	.	1.7	3	1.5	2.0	1	.	2.6	5.0	2.2
No. Parallel-Sided	1.0	1	.	0.0	3	0.0	0.0	1	.	0.2	5.0	0.4
No. Platform Quadrants	1.0	1	.	2.0	3	1.0	2.0	1	.	1.8	5.0	0.8
Final Core EPA	68.0	1	.	83.7	3	9.3	66.0	1	.	77.0	5.0	11.3

Figure 7-13: Examples of cores from the project assemblage. No.146 is an extensively rotated chert core. Number 3 is a quartzite core with a conchoidal platform

Retouched flakes

The retouched component of the C2B assemblages comprises nine scrapers or scraper fragments and one asymmetric backed artefact.

A burin spall also attests to burin retouch, but no burinated flake was found.

The scrapers are made mostly from chert with one of chalcedony and one of silcrete.

One scraper has retouch on the distal end, one has retouch on the ventral surface, and two have deep notches. The backed artefact is made from chert and shows bidirectional backing along the edge.

Scrapers are on average very squat in shape (mean elongation = 1.05), heavier than complete quartz flakes and retouched to widely varying degrees with some cortex (**Table 7-13** and **Figure 7-14**).

Two scrapers are extensively retouched, one with a huge final notch and the other has likely broken during retouching.

Retouch tends to be fairly straight and marginal and extends around a quarter of the way around the flake on average.

Table 7-13: Summary statistics for scrapers

Attribute	N	Minimum	Maximum	Mean	Std. Deviation
Weight	11	8.71	58.17	20.04	14.04
Length	11	21.65	49.56	32.13	7.97
Proximal width	10	18.07	34.18	25.78	5.33
Width	11	17.78	41.15	31.15	7.00
Distal width	11	10.07	38.97	23.55	8.69
Thickness	11	7.23	22.68	14.12	4.89
No ridges	2	1.00	2.00	1.50	0.71
Platform width	7	14.33	29.59	22.45	5.42
Platform thickness	7	3.96	10.76	7.70	2.59
Platform angle	7	70.00	87.00	76.71	5.77
% Cortex	11	0.00	100.00	14.55	32.05
Number of retouched segments	9	1.00	4.00	2.44	1.13
Marginal angle	11	-27.66	38.16	1.97	23.63
Invasiveness index	9	0.03	0.25	0.12	0.07
Retouch perimeter	11	0.00	60.00	25.18	20.64
Retouched edge curvature	8	-0.10	0.28	0.10	0.16
Kuhn index	11	0.00	0.71	0.28	0.27
Retouch edge angle	11	0.00	88.67	55.45	36.48
Elongation	11	0.75	1.40	1.05	0.21

Figure 7-14: Retouched flakes from the project assemblages. 235: Notched double side and end scraper, 197: extensively retouched broken scraper, 115: asymmetric backed artefact, 151: end scraper, 165: notched broken scraper.

Hammerstones and anvils

Three hammerstones were found at PASA 20.

Two are small hammerstones made from unidentified dense rock (probably plutonic or metamorphic) weighing around 70 grams (**Figure 7-15**). Both have broken areas that are suggestive of impact damage. The other hammerstone also shows impact pitting and was likely also used as an anvil. It is much larger and is made from softer stone, most likely mudstone.

Figure 7-15: Hammerstones and anvils. No. 59: Hammerstone and No.65: hammerstone with anvil pitting.

Ochre

A single large piece of yellow ochre, now stained black on the external surface, was found in Pit 2, Spit 4 at PASA 20 (**Figure 7-16**). Although no striations were visible under a hand lens, faint lineations do appear to be present; it seems likely that this piece is a crayon that smoothed and shaped by rubbing against a hard surface to apply colourant.

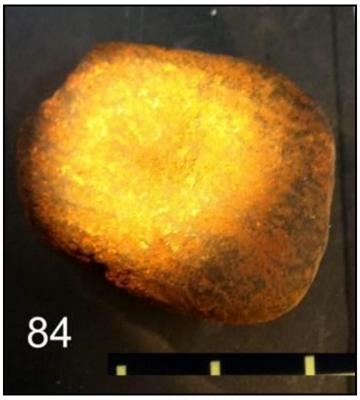


Figure 7-16: Yellow ochre crayon

7.2.9 Artefact incidence

Artefact incidence varied considerably across the 23 confirmed subsurface artefact occurrences. The lowest levels of artefact incidence were 2/m2 at G2BA15, G2BA17, G2BA21 and G2BA25.

The majority of sites were characterised by low to moderate levels of artefact incidence, with a maximum areal density of <10/m2 at: G2BA19, G2BA20, G2BA23, G2BA27, G2BA29, G2BA34, G2BA35, G2BA36 and G2BA37; and a density of 10-19/m2 at: G2BA16, G2BA18, G2BA26, G2BA28, G2BA32, G2BA33.

Four sites displayed an artefact incidence of 20 or more artefacts per square metre. These sites are:

- G2BA18 – where artefact incidence varied from 2/m^2 to 20/m^{2,} and most pits that contained artefacts had an incidence of >8/m^2.
- G2BA24 – which had the highest artefact incidence of any of the sites investigated (26/m2 in one pit) and an average of 12.6/m^2.
- G2BA30 – which had an average artefact incidence of 8.6/m2 and a maximum of 20/m^2.
- G2BA31 – where artefact incidence was generally low (2-4/m^2 in three of the four pits containing artefacts) but peaked at 20/m^2 in the remaining pit.

7.3 Site location trends and implications for the regional model

7.3.1 Previous conclusions

The results of subsurface investigations for the project area confirm conclusions from previous studies that “the archaeological resource of the Illawarra coastal plain can only be effectively identified and assessed through the combined application of archaeological excavation and the progressive development of predictive modelling” (NOHC 2010: 44). The program of subsurface testing undertaken across the Foxground and Berry bypass was guided by the results of previous subsurface investigations for the Gerringong upgrade component of the Gerringong to Bomaderry highway upgrade (NOHC 2010b, 2011a). That study concluded that:

- Valley floor contexts, on alluvium and which are not in the proximity of higher order (3rd or greater) riparian zones are likely to have low archaeological sensitivity.
- Locally elevated, well drained and low gradient micro-topographies situated within the valley floor (such as terrace edges), may be an exception to the low sensitivity of the valley floor alluvium and should be subject to testing.
- Riparian corridors associated with higher order streams require testing to better define archaeological sensitivity and possible geographical determinates of artefact incidence.
- Locally elevated, well drained and low gradient micro-topographies within 200 metres of known or predicted former wetland basins are likely to have high archaeological sensitivity and should be tested.
- The archaeological sensitivity of ridge and spurline crests and slopes requires further investigation, especially with regard to variables such as possible cross-country travel routes and distance from lower catchment wetland basins.

On the basis of archaeological survey across the Foxground and Berry bypass project area and the results of the previous investigations for the Gerringong upgrade (NOHC 2010, 2011) the following landforms were predicted to be archaeologically sensitive:

- Valley floor contexts, on alluvium and which are in proximity of higher order (3rd or greater) riparian zones.
- The lower elevation or terminal section of major spurs and ridgelines where they adjoin or traverse the valley floor.
- Level or low gradient ground on the crests of spurs and ridgelines.
- The down-slope margin of alluvial terraces.
- The banks of rivers, creeks and terrace edges where they are locally elevated and well-drained.
- Locally elevated, well-drained and low gradient micro-topographies within 200 m of known or predicted former wetland. This criteria may be of particular relevance to the margins of the former 'Meadow' areas (now-drained swamp basins).
- Locally elevated sand bodies outside of coastal barrier or dune systems, such as fossil beach ridges on the margins and flats of infilled estuaries, and source bordering dunes.

7.3.2 Summary of results from PASAs in the project area

Subsurface artefacts were recovered from 18 of the 21 PASAs tested for the project. Essentially, sites were confirmed in examples of most landscape contexts, the only exception being the minor spurline crest descending from Toolijooa Ridge at PASA42. The only other minor spurline to be tested was a spur crest adjacent a second order stream at PASA18. Two artefacts were recovered from one of the eight pits excavated at this PASA, which confirms the prediction for low archaeological sensitivity in association with the lower order creeks. The results from PASA42 and PASA18 also suggest low archaeological sensitivity across the more minor spurlines of the coastal hinterland.

The richest artefact assemblages were found to occur on a major spurline crest descending from Toolijooa Ridge (PASA29) and the spurline basal slopes (PASA25) and alluvial flats (PASA27) associated with the valley floor adjacent Broughton Creek. In the case of the spurline crest, the overall artefact distribution was relatively sparse and patchy, a pattern that was also displayed across similar landscape contexts at PASA28 and PASA15, where artefact numbers and assemblage richness were also noticeably lower.

The basal slopes and alluvial flats at PASA25 and 27 both displayed a trend for increasing artefact incidence with proximity to Broughton Creek. However, the basal slopes at PASA25 were characterised by a much more consistent artefact distribution, with six of the nine pits containing artefacts, while the alluvial flats at PASA27 were characterised by a patchier artefact distribution with artefacts present in only four of the 15 pits excavated. In this instance, the presence of artefacts appears to correspond more to locally elevated micro-topographic features, which is in keeping with the prediction regarding increased archaeological sensitivity across locally elevated, well drained and low gradient micro-topographies situated within the valley floor.

Localised examples of higher artefact incidence were found to occur on the alluvial flats adjacent Broughton Creek at PASA23 and PASA24. The crest and upper slopes of the prominent ridgeline knoll at PASA16, situated on a major ridgeline watershed between Broughton Mill and Broughton Creek catchments, also displayed an example of localised high artefact incidence.

Of note is the fact that no artefacts were recovered from the alluvial flats and valley floor at PASA22 and PASA26 and, even the alluvial terraces and levees on the flats at PASA21 and PASA13 displayed a very low incidence of artefacts. At PASA21, a single artefact was recovered from a pit on the terrace immediately adjacent Broughton Creek. Similarly, at PASA13, two artefacts were recovered from the pit on the eastern margin of Broughton Mill Creek, in a locally elevated levee context. This is contrasted by a relatively consistent and high artefact incidence across the crest and upper slopes of the watershed ridgeline within PASA14, which extends upslope to the north of the valley floor at PASA13.

The two largest and spatially most extensive assemblages were from PASA12 (46 artefacts across 16 of 55 pits) and PASA20 (40 artefacts across 15 of 20 pits). At PASA12, testing was undertaken across alluvial flats and terrace formations either side of Bundewallah Creek. In this instance, the more elevated terraces on the eastern side were characterised by higher artefact incidence and a more consistent presence of artefacts (G2BA18), while the lower alluvial flats along both sides of the creek displayed a patchier and lower artefact incidence (G2BA19).

The majority of test pits across the elevated spurline and basal slopes at PASA20 were found to contain low numbers of artefacts. Slightly higher incidences of artefacts were also encountered in one of the midslope test pits and the hand excavated pit on the locally elevated terrace remnant.

7.3.3 Conclusions regarding site location trends

On the basis of the Foxground and Berry bypass testing program, the main conclusions regarding trends in site location are as follows:

- Higher artefact incidence and/or assemblage richness tends to coincide with major spurlines and low gradient basal slopes above, and set back from, the valley floor.
- The valley floors, and in particular the alluvial flats, are generally characterised by intermittent and low incidences of artefacts.
- Micro-topographic features such as locally elevated terraces and creek banks, within the broader valley floor context, tend to contain a higher incidence of artefacts.
- The ridgeline crests and saddles tend to be characterised by intermittent and low incidences of artefacts, with higher incidences occurring in association with features such as low gradient knoll crests and break of slope interfaces.

Based on this study's results, the archaeological sensitivity of the alluvial flats that dominate the valley floor must be considered to be low. The only artefact finds within this category were low in incidence and only where a higher order drainage line (three or greater) was within 50 metres, or where locally elevated basal slopes with archaeological deposits were situated just upslope. Possible reasons for this may include cold air drainage, the presence of dense vegetation, and poorly drained or damp ground.

The larger and more dominant ridgelines (such as watersheds) have been confirmed to contain more continuous and higher density artefactual material compared to lesser landform corridors. The crests of ridgeline saddles have also been confirmed to contain artefact occurrences, especially where a saddle provides an efficient cross-country travel route due either to its low elevation, or strategic position relative to ridgelines.

The crests and basal slopes of low relief spurs which extend into and across the flood and wetland basins of the lower Shoalhaven valley have been confirmed as a focus for Aboriginal occupation. This is due to their well drained and elevated context in close proximity to a range of resource zones and water sources.

7.4 Site designations

The results of this investigation, and the landscape approach inherent within its methodology, provide a basis for moving beyond the limitations of a site based understanding of the archaeological resource, towards a landscape model of artefact incidences and characteristics relative to landform variables and past cultural interactions across those variables.

Despite this, the statutory and policy framework which manages and authorises impact to Aboriginal objects (artefacts) within NSW remains structured around sites and defined boundaries of artefact incidence. For this reason, the recorded locations of subsurface artefact occurrences detected by the testing program have been assigned site names. It should be remembered that these sites, although defined according to the sampling limitations dictated by the confines of the project construction footprint, are most likely manifestations of wider subsurface artefact occurrences, associated with landforms and which extend beyond the project area.

Of the twenty one PASAs subject to testing, eighteen were found to include subsurface artefact occurrences (PASA12, 13, 14, 15, 16, 18, 20, 21, 23, 24, 25, 27, 28, 29, 40, 41, 43 and 44).

Table 7-14 lists the various site designations outlined above.

Table 7-14: New site name and code designations for PASAs where artefacts were detected. [Please note that some locational information is not included in this report version]

PASA ID	Pit nos.	Site designation	Landform description
12	39-42, 44, 46-48	G2B A18	Upper level, embankment edge and immediate fringing lower slopes of a high terrace situated on the southern side of the valley floor floodplain
12	3, 10, 24-25, 27, 35, 51	G2B A19	Current banks, active flood plain and low terraces associated with a creek corridor
13	22	G2B A21	Levee bank and associated creek flats
14	3-12	G2B A22	Crest and upper slopes of a prominent spurline knoll
15	1-5	G2B A23	Crest and upper slopes of a prominent spurline shoulder
16	1-4	G2B A24	Crest and southwestern slopes of a prominent spurline knoll
18	1-3	G2B A25	Elevated west bank of a small unnamed tributary on the situated on the northern basal slopes of a creek valley
20	20	G2B A26	Locally elevated valley floor infill remnant (terrace remnant) situated between two tributary gullies
20	2-5	G2B A27	Crest and upper slopes of prominent ridgeline
20	9-16	G2BA28	Moderately graded crest of a north facing spur situated on the midslopes of a prominent ridgeline

PASA ID	Pit nos.	Site designation	Landform description
20 & 21 (incl. in 23)	17-19 23	G2BA29	Banks and adjacent flats on either side of a major creek (valley floor floodplain)
21 (incl. in 23)	16-18	G2B A30	Upper level embankment and adjacent lower slopes of a terrace situated on a valley floor floodplain
24	2-7	G2B A31	Northern bank of a major creek and adjacent flats (valley floor floodplain)
25	1-9	G2B A32	Crest and slopes of a low spurline adjacent to the west bank of a major creek
26 (incl. in 27)	12	G2B A33	Locally elevated western bank of an unnamed tributary on the valley floor of a major creek floodplain
27	3, 5	G2B A34	Flats associated with (east of) unnamed tributary on the valley floor of a major creek floodplain
28	1-13	G2B A35	Saddle floor and southern adjoining slopes on the crest of a major ridgeline
29	3-18	G2B A36	Crest and upper slopes of a prominent spurline shoulder forming part of the eastern slopes of a major ridgeline
40	16	G2B A15	Southwest facing low gradient basal slopes on a spurline adjacent to an unnamed tributary
41	1-8	G2B A16	Crest and north-east facing slopes of a low spurline adjacent to a creek
41	13	G2B A17	Locally elevated eastern bank of a creek, part of valley floor floodplain
43	30-31, 20	G2B A20	Locally elevated and western bank of a creekline
44	4	G2B A37	Bench formation on north facing basal slopes adjacent to a flood channel

7.5 PASAs 17 and 19

No test pits were conducted in PASAs 17 and 19. These locations were excluded given that project impact would only occur across PASA17 in already substantially disturbed deposits, and that direct impact to PASA19 could be avoided (refer section 2.4.4).

Based on the results achieved from the tested PASAs, it is expected that archaeological deposits are present at both PASA locations. In each case, the deposit is predicted to consist of a low, or low to moderate, discontinuous subsurface incidence of stone artefacts. The PASA 17 deposit may be comparable to those detected at PASA 15 (G2BA23) & PASA16 (G2BA24), and PASA19 comparable to PASA18 (G2B A25).

7.6 G2B PAD1

Subsequent to the drafting, review and finalisation of the test excavation program, a proposal to change access infrastructure in the area just south of Broughton Village was added to the project. The proposal includes, as part of a re-configuration of the Austral Park Road intersection, an eastwards extension of the existing road along an undeveloped public easement, to an elevated spur running parallel to Broughton Creek. At this point the new road would join an existing public road that descends to, and crosses, Broughton Creek. A u-turn facility would be constructed at the point where the new road met the existing public road on the creek-side spurline.

The landform on which the proposed u-turn facility and the intersection of the new and existing roads are proposed is the crest and upper slopes of a locally elevated spurline crest, situated parallel and adjacent to, Broughton Creek, and occupying a basal slope valley context. As such, this topography represents a sensitive landform with high potential to contain Aboriginal archaeological deposits, according to the current model of Aboriginal archaeological site location.

Given the locally tested and revised status of the current model, the predicted sensitivity of this landform can be considered to have a high degree of probability. Accordingly, that portion of the landform within and near to the project area can be identified as a PAD, the first such identification for the Gerringong to Bomaderry Princes Highway Upgrade projects. This PAD is identified as G2B PAD1, its location is shown in the mapping provided in **Appendix C**. The archaeological potential of the deposit is predicted to be moderate or high (refer **Appendix B** for an explanation of this classification). The main point of proposed development impact on the PAD is around the map grid reference 294277.6151235 (GDA).

8 Significance assessment

8.1 Assessment criteria

The Burra Charter of Australia defines cultural significance as 'aesthetic, historical, scientific or social value for past, present and future generations' (Aust. ICOMOS 1987). The assessment of the cultural significance of a place is based on this definition but often varies in the precise criteria used according to the analytical discipline and the nature of the site, object or place.

In general, Aboriginal archaeological sites are assessed using five potential categories of significance:

- Significance to contemporary aboriginal people.
- Scientific or archaeological significance.
- Aesthetic value.
- Representativeness.
- Value as an educational and/or recreational resource.

Many sites will be significant according to several categories and the exact criteria used will vary according to the nature and purpose of the evaluation. Cultural significance is a relative value based on variable references within social and scientific practice. The cultural significance of a place is therefore not a fixed assessment and may vary with changes in knowledge and social perceptions.

Cultural significance can be defined as the cultural values of a place held by and manifest within the local and wider contemporary Aboriginal community. Places of significance may be landscape features as well as archaeologically definable traces of past human activity. The significance of a place can be the result of several factors including: continuity of tradition, occupation or action; historical association; custodianship or concern for the protection and maintenance of places; and the value of sites as tangible and meaningful links with the lifestyle and values of community ancestors. Aboriginal cultural significance may or may not parallel the archaeological significance of a site.

Scientific significance can be defined as the present and future research potential of the artefactual material occurring within a place or site. This is also known as archaeological significance.

There are two major criteria used in assessing scientific significance:

1. The potential of a place to provide information which is of value in scientific analysis and the resolution of potential research questions. Sites may fall into this category because they: contain undisturbed artefactual material, occur within a context which enables the testing of certain propositions, are very old or contain significant time depth, contain large artefactual assemblages or material diversity, have unusual characteristics, are of good preservation, or are a constituent of a larger significant structure such as a site complex.
2. The representativeness of a place. Representativeness is a measure of the degree to which a place is characteristic of other places of its type, content, context or location. Under this criteria a place may be significant because it is very rare or because it provides a characteristic example or reference.

The value of an Aboriginal place as an educational resource is dependent on: the potential for interpretation to a general visitor audience, compatible Aboriginal values, a resistant site fabric, and feasible site access and management resources.

The principal aim of cultural resource management is the conservation of a representative sample of site types and variation from differing social and environmental contexts. Sites with inherently unique features, or which are poorly represented elsewhere in similar environment types, are considered to have relatively high cultural significance.

The cultural significance of a place can be usefully classified according to a comparative scale which combines a relative value with a geographic context. In this way a site can be of low, moderate or high significance within a local, regional or national context. This system provides a means of comparison, between and across places. However it does not necessarily imply that a place with a limited sphere of significance is of lesser value than one of greater reference.

The following assessments are made with full reference to the scientific, aesthetic, representative and educational criteria outlined above. Reference to Aboriginal cultural values has also been made where these values have been communicated to the consultants. It should be noted that Aboriginal cultural significance can only be determined by the Aboriginal community, and that confirmation of this significance component is dependent on written submissions by the appropriate representative organisations.

8.2 Aboriginal cultural values in the project area

A specific study of Aboriginal cultural values associated with the Princes Highway upgrade study area was conducted in 2009 (NOHC 2009b). This assessment sought to record sites and places with Aboriginal cultural significance and involved a review of ethno-historical sources, oral histories, and heritage studies, as well as the conduct of stakeholder interviews and field inspections. Both place-specific and more general cultural values were documented.

Three specific places of identified Aboriginal cultural significance occur within the Foxground and Berry bypass project area: “Dicky Wood’s Meadow” battle ground (G2B A13), an historical Aboriginal encampment at Brookside, Broughton Village (G2B A14), and the Toolijooa Ridge (classified as a cultural landscape: TRACL). These places were considered to have significance due to their importance in traditional lore, as evidence of past occupation patterns, their association with lives and memories of people’s ancestor’s, and their historical importance.

Archaeological sites, not necessarily of remembered or documented places, were also considered to have value for their importance in traditional lore, as evidence of past occupation patterns, their association with lives and memories of people’s ancestor’s. Due to low site detection rates during surface archaeological surveys, and a limited number of previous archaeological excavation programs, information on the nature and incidence of Aboriginal archaeological sites remained sketchy. Despite this, Aboriginal stakeholders acknowledged the cultural values of all artefacts encountered and emphasised the need to conserve and effectively manage all archaeological deposits.

The outcomes of the on-going project consultation program with Aboriginal stakeholders has confirmed these positions on significance, although opinions regarding preferred management strategies can vary across the stakeholder groups.

8.3 Archaeological recordings

8.3.1 Archaeological significance – deposits subject to testing

Low - local

The following sites are assessed as having low significance within a local context based on the low technological diversity and the relatively low, and discontinuous, artefact incidence encountered at these locations:

- G2BA15.
- G2BA17.
- G2BA19.
- G2BA20.
- G2BA21.
- G2BA23.
- G2BA25.
- G2BA34.
- G2BA35.
- G2BA37.

These sites correspond primarily to valley floor contexts, although G2BA23 and G2BA35 correspond to a spurline shoulder and saddle floor respectively; they are relatively common site types with limited research potential.

Site G2BA27 has also been assessed to be of low significance within a local context due to its limited research potential as a site with a low, albeit relatively continuous, artefact incidence.

Moderate - local

The following sites are assessed as having moderate significance within a local context based primarily on their greater research potential due to higher artefact incidences and/or higher than average assemblage richness:

- G2B A16.
- G2B A18.
- G2B A22.
- G2B A24.
- G2B A26.
- G2B A28.
- G2B A32.
- G2B A33.
- G2B A36.

These sites correspond to spurlines, basal slopes bordering valley floors and locally elevated micro-topographic features within the valleys. They are representative of locations that appear to have been a focus of Aboriginal activity and they have scientific and educational value due to their research potential.

Moderate to high - local

The following sites are identified as having moderate to high significance within a local context based on their potential association with the Brookside Aboriginal encampment and "Dicky Wood's Meadow" battleground:

- G2BA29.
- G2BA30.
- G2BA31.

These three sites also display higher artefact incidences (G2B A30 and G2B A31) or higher than average assemblage richness (G2B A29). These attributes, combined with the sites' potential association with Brookside and "Dicky Wood's Meadow", has contributed to an assessment of moderate to high scientific research value.

8.3.2 Archaeological significance – other recordings

There are three archaeological recordings (apart from PASAs) which were not subject to archaeological testing. These are:

- G2B A3, a site exposed by earthworks unrelated to this project and which falls outside of the project area.
- G2B A38, a site and associated PAD which is situated within a proposed ancillary area.
- G2B PAD1, a recording identified following the finalisation of the test excavation program.

Site G2B A3

This site is assessed as having low archaeological significance within a local context. This is based on:

- The very low artefact incidence evidenced across the available ground exposures (1/150 square metres).
- The low technological diversity evident in the recorded artefacts.
- The absence of subsurface artefacts 60 metres further upslope on an adjacent spurline crest (PASA 42).
- The substantially disturbed nature of the area, resulting from earthworks to create a house platform.

Site G2B A38

This recording consists of a single artefact, which is associated with an area of predicted archaeological potential, which remains untested. The PAD area consists of locally elevated, low gradient basal slopes adjacent to valley floor flats and associated nearby tributary streamlines. The site is situated in a moderately disturbed context due to sheet erosion, vegetation clearance, fence construction and use for grazing and pastoral purposes.

Based on the confirmed site content (one surface artefact), this site has only low archaeological significance within a local context. This assessment relates to the value of the site description in contributing towards a larger store of data, which may further scientific understanding of Aboriginal hinterland sites in the Southern Illawarra.

An assessment of the significance of the associated archaeological deposit cannot be conducted without reference to test excavation results. Despite this, it should be noted that archaeological deposits detected within similar local landforms have been assessed as having moderate to high significance within in a local context. Based on the predictive site location model, the potential of this PAD is considered to be moderate or high (refer **Appendix B**).

G2B PAD1

The identification of the potential archaeological deposit, G2B PAD1, post-dates the finalisation of the test excavation program, and is a result of the application of the predictive site location model to a concept design revision. In the absence of any surface or subsurface artefact data, it is not possible to provide a significance assessment for this recording. However, based on the test excavation results and the predictive site location model, the potential for this landform to contain archaeological material is considered to be high, and the potential archaeological significance of that material may be low, moderate or high within a local context. Key determinates in this assessment are:

- The proximity of the Broughton Creek, which is a high order and regionally important drainage line.
- The locally elevated and well drained nature off the landform.
- The presence of artefacts detected in PASA 20/site G2B A27, situated 500 metres further upslope on a higher portion of the same spurline.
- The presence of farm sheds and an existing access track along a portion of the spurline, may indicate potentially damaging levels of ground disturbance.

8.3.3 Aboriginal cultural significance

Discussion with Aboriginal stakeholders during fieldwork and AFG meetings indicate that all archaeological recordings within the project area are of Aboriginal cultural significance, however to date no detailed responses have been received with regard to individual sites.

8.4 Ethno-historical and other recordings

Brookside Aboriginal Encampment (G2B A14)

This recording is based on a non-Aboriginal oral account of Aboriginal people camping on the banks of Broughton Creek, opposite Brookside. As yet, this recording consists of a place only. No archaeological evidence has, to date, been found to augment the oral account.

This place has Aboriginal cultural significance due to its association with the actions and destinies of local community ancestors and their families in the late nineteenth century. This site relates in particular to the interrelation between Aboriginal and European people, and camping adjacent to homesteads.

Historical Aboriginal Encampments at Berry (G2B A39)

This recording comprises an area within which two phases of Aboriginal camping activity is known, or thought likely, to have occurred. It is surmised that nineteenth century camping may have occurred in this area, upstream of the Boongaree encampment, possibly as a response to the European ‘Broughton Creek’ village built on the adjacent spurline. Numerous oral accounts record that in the twentieth century, up to at least the 1960s, Aboriginal people regularly camped on the creek flats during seasonal employment as crop pickers.

The location of the Boongaree encampment, which was centred on the former meadow lands at the intersection of Broughton and Broughton Mill Creeks (outside of the project area), has high Aboriginal cultural significance within a regional context. This is due to multiple factors including:

- It's cultural, spiritual and historical importance as an Aboriginal encampment recorded at the time of European contact, and the home of important local identities Toodwick (known to Europeans as Broughton) and his brother Broger.
- It's cultural associations with the ancestors of contemporary Aboriginal people who identify with the lower Shoalhaven River district.
- The potential for burials to occur within the area.
- It's potential to contain archaeological evidence of potentially continuous Aboriginal occupation from prior to European contact, into the mid and later nineteenth century.
- It's potential to contain archaeological evidence of the interaction between the European and Aboriginal communities and economies throughout the period of occupation.

It is not known if nineteenth century Aboriginal camping occurred, upstream of Boongaree, within the area of the project and of recording G2B A39. It is surmised that this was likely, given the presence of the 'Broughton Creek' European village on the adjacent spurline, and the discovery of a gorget bearing the legend 'Neddy Noora Shoal Haven 1834' in the bed of Broughton Mill Creek opposite the *Mananga* homestead in 1925 (refer section 4.4.3). If archaeological evidence of this phase of camping was demonstrated within this area, then it could potentially have high archaeological significance, and the place have high Aboriginal cultural significance, both within a regional context.

The later twentieth century phase of Aboriginal camping on the creek flats, now associated with the Berry Bowling Club, is historically well established. These camps remain part of living memory for many local Aboriginal people and relate to both their own experiences and to the lives of community and family members now deceased. As such, the location and any physical traces of the camps have strong cultural significance to Aboriginal people. They are evidence of a past way of life, and constitute a place associated with their ancestors. The location and any physical traces also have historical and social significance to the local community in general, as evidence of the role of Aboriginal people in the Berry township and economy. Physical traces, if identifiable, could potentially have archaeological value.

'Dicky Wood's Meadow' Aboriginal battle ground (G2B A13)

This recording is based on an account provided by a local Aboriginal person Buthring in 1900. The place has high significance for Aboriginal people as it relates to traditional lore and practice, and is associated with the potential for burials. To date, no archaeological evidence from the general area of the reported battle ground, indicates Aboriginal occupation which is different in type or character from similar valley floor contexts adjacent to a major streamline. Despite the absence of specific archaeological evidence for a battle ground, such evidence may still be present. The test excavations conducted to date have been limited in scope and extent relative to the potential battle ground area. The current archaeological evidence remains compatible with the reported battle ground function and does not limit its Aboriginal cultural value.

Toolijooa Ridge Aboriginal cultural landscape (TRACL)

The Toolijooa Ridge has Aboriginal cultural significance due to its stated role as a traditional access route and pathway between the uplands of the Illawarra range and the coastal fringe. Archaeological test excavations conducted for this program and previous investigations for the Eastern Gas Pipeline confirm that discontinuous subsurface artefact distributions occur along the ridge crest and some of its prominent spurs. There are also unconfirmed and no-specific reports of ceremonial grounds on the ridgeline.

A further significant aspect of the ridgeline is its dominant visual role in the landscape, and its presumed importance as a wildlife corridor. These values relate to a sense of belonging and custodianship to the land and the health of its plants and animals.

Large and mature fig trees

Many of the Aboriginal stakeholders who have participated in the consultation program have stated or concurred with a view that large and old growth fig trees within the Illawarra region are of high Aboriginal cultural value (refer to Section 4.4 for additional detail regarding Aboriginal cultural values of fig trees). These are values which may be irrespective of a European planted, or pre-European and/or natural origin for the tree. All trees which are large and mature, or which can be classed as old-growth are of stated cultural significance to at least some of the Aboriginal stakeholders in the Southern Illawarra.

It is probable that high cultural significance would be unanimously accepted amongst the project Aboriginal stakeholders for the pre-European high canopy forest remnant fig tree (MFT22) identified on the banks of Bundewallah Creek. This would be based, not only on the traditional lore associated with large and mature fig trees, but also for the education, representative and rarity value of this tree. Its size, height and form are evocative of a forest structure now vanished from the Coastal Plain, and as a consequence, a traditional lifestyle which also disappeared with that forest.

9 Statutory and policy context[2]

The project will be assessed under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

9.1 *Environmental Planning and Assessment Act 1979*

The EP&A Act and its regulations, schedules and associated guidelines require that environmental impacts are considered in land use planning and decision making. Environmental impacts include cultural heritage assessment. The Act was reformed by the *Environmental Planning and Assessment Amendment (Infrastructure and other Planning Reform) Act 2005*.

The Minister for Planning declared by Order dated 10th September 2010 and published in NSW Government Gazette No. 114, that the Princes Highway upgrade between Toolijooa Road and Schofields Lane, known as the Foxground and Berry bypass, was a project to which Part 3A of the EP&A Act applied.

Part 3A of the Act was an amendment which established a separate streamlined and integrated development assessment and approvals regime for major State government infrastructure projects, development that was previously classified as State Significant development, and other projects, plans or programs declared by the Minister for Planning.

Part 3A (Section 75U) removed the stop-the-clock provisions and the need for single-issue approvals under eight other Acts, including the *National Parks and Wildlife Act 1974* (NP&W Act) and the *Heritage Act 1977*. In addition, environmental planning instruments such as the heritage provisions within Regional Environmental Plans (REPs) and Local Environmental Plans (LEPs), (other than State environmental planning policies) did not apply to projects approved under Part 3A (Section 75R, paragraph 3).

This section established an exemption to the application of the NP&W Act regarding Aboriginal Heritage Impact Permits. It stated that a Permit was not required for an approved project subject to the provisions of Part 3A of the EP&A Act. Section 75U also extended this exemption to include ‘any investigative or other activities that are required to be carried out for the purpose of complying with any environmental assessment requirements under this Part in connection with an application for approval to carry out the project or of a concept plan for the project’ (s75(U)4.

Some provisions of the NP&W Act remained relevant to Part 3A investigations, notably the requirement to notify the Director-General of the location of Aboriginal objects within a reasonable time of their detection (now section 89A).

Since the Minister’s declaration, Part 3A of the Act has been repealed (EP&A Amendment Act 2011). The amendment Act commenced on October 2 2011. The savings provisions in the amended EP&A Act mean that the project is a transitional Part 3A project. This means that Part 3A continues to apply to the project.

An application for project approval was made under Part 3A of the EP&A Act on 22 December 2010.

Environmental assessment requirements (DGRs) were issued for the project on 11 February 2011.

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[2] The following information is provided as a guide only. Readers are advised to seek qualified legal advice relative to legislative matters.

9.2 Implications for the project

This project is being assessed under Part 3A of the EP&A Act .

Permits normally required under the NP&W Act for disturbing Aboriginal objects were not required for the conduct of the test excavations conducted in this assessment. There remains, however, requirements to report any findings to the OEH.

As part of the environmental assessment for the project as required under the EP&A Act, and specified in the DGRs (refer section 1.3), the potential impact of the project on Aboriginal heritage must be assessed and effective impact mitigation and conservation management proposed. Specifically, this assessment must consider artefacts, potential archaeological deposits and landscape cultural values, and be consistent with the draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC, July 2005), specifically.

It is recommended that the strategies for impact minimisation, mitigation and the management of heritage values drafted in this assessment be included in the Statement of Commitments for the project.

10 Impact assessment

10.1 Representative and worst case impact

The general requirements included in the DGRs for the project specify that the environmental assessment must include:

> An assessment of the key issues, including an assessment of the worst case and representative impact for each issue for all aspects of the project (general requirement no.3).

For this assessment, representative impact is defined as that impact which has been anticipated in this analysis and to which the proposed management and impact mitigation strategies are directed. It is representative of the expected scenario, based on an analysis of the best information available and on a reasonable or normative level of prediction.

Worst case impact is defined as an extreme scenario where the highest conceivable degree of impact is anticipated due to unexpected occurrences which are extraordinary and outside of a reasonable level of prediction.

The worst case scenario with regard to Aboriginal heritage would consist of an unexpected encounter of an Aboriginal object or objects which, due to an exceptional level of assessed significance warrants *in situ* conservation and a consequential change in the Project alignment. This would conceivably be due to the discovery of a previously undetected or unpredicted item.

Worst case scenario discoveries fall into two broad categories:

- An archaeological deposit or feature with exceptional Aboriginal cultural value.
- A previously unassessed place of exceptional Aboriginal cultural value which may, or may not be associated with archaeological material.

The following hypothetical discoveries are examples which may constitute a worst case scenario, depending on the Aboriginal cultural and scientific values associated with the find and it's *in situ* conservation:

- Unique or rare site types.
- Evidence of mid to early Holocene and/or Pleistocene occupation (i.e. older than 5000 years before present).
- A burial ground (or grouping of burials), or a single burial with high significance grave goods.
- An archaeological deposit containing rare and well preserved organic items due to water logged and anaerobic conditions, such as may be found within a swamp or peat deposit.

It is considered that the potential for a worst case scenario has been minimised by the application in this assessment of a robust analysis which included:

- The participation of registered Aboriginal stakeholders and the exchange of information and discussion of issues at Aboriginal focus group meetings.
- A review of ethno-historical sources.
- Reference to oral tradition and information provided by local community sources.
- The use of predictive archaeological modelling.
- Archaeological survey and interpretation.
- Review of aerial photography.

An unexpected finds procedure has been developed by the RMS which defines a protocol to be followed in the event that an unexpected find is made during the process of construction (refer **Appendix M**). The adoption of this procedure provides both a safeguard and management process in the event of a worst case scenario.

10.2 Categories of potential impact

The potential impacts of the project on Aboriginal heritage consist of:

- A complete or majority degree of direct impact and disturbance to Aboriginal objects present within the direct construction footprint of the development. This can be expected to involve up to 100 per cent of the planned highway easement, with some limited potential for site remnants to survive in undeveloped areas of the easement (if any).
- A complete or majority degree of direct impact and disturbance to Aboriginal objects present within proposed construction and storage depots and other ancillary areas situated outside of the post-construction highway easement.
- Complete or varying degrees of direct impact/disturbance to items with Aboriginal cultural significance which do not fall into the category of an Aboriginal object, such as mature fig trees.
- Indirect impact to Aboriginal objects, or non-Aboriginal objects with Aboriginal cultural value, such as from development related changes to the landscape or scenic context of a site or item.

10.3 Recordings subject to impact

Of the 42 Aboriginal heritage recordings, (two surface artefact occurrences, 23 subsurface artefact occurrences (archaeological deposits), one PAD, twelve fig trees, and four ethno-historical recordings), sixteen would not be impacted by the project, eighteen would be partially impacted, and eight fully impacted. Of those fully impacted, all consist of archaeological deposits, with the exception of one fig tree. Three of the four ethno-historical recordings would be partially impacted. In the cases of G2B A13 and G2B A14), impact is measured relative to the broadly defined areas within which those places may have been located. Only one of the twelve fig trees would be impacted by the project.

Table 10-1: Summary of anticipated construction related impacts to Aboriginal heritage recordings, the ID of recordings subject to impact are bolded

Site ID	Recording type	Direct impact	Degree of impact	Comments
G2B A3	Aboriginal artefact occurrence	no		Known site exposure is outside of construction footprint (CF),
G2B A13	Ethno-historic place (Dicky Wood's Meadow Battle ground)	yes	partial	The actual size and location of the battle ground remains unknown, however 1.7 km of the CF passes through an area within which the battle ground is likely to have been situated. The battle ground is associated with the potential for burials
G2B A14	Ethno-historic place (Brookside Aboriginal historic encampment)	yes	partial	The actual size and location of the encampment is unknown, however 0.4 km of the CF passes through an area within which the encampment is likely to have been situated. The encampment is associated with the potential for archaeological occupation deposits
G2B A15	Archaeological deposit	yes	full	Deposit exists within the CF
G2B A16	Archaeological deposit	yes	partial	Deposit likely to extend to either side of the CF
G2B A17	Archaeological deposit	yes	partial	Deposit extends to either side of the CF
G2B A18	Archaeological deposit	no	partial	Deposit would be impacted by creek diversion trench, but extends to either side of proposed trench
G2B A19	Archaeological deposit	yes	partial	Deposit likely to extend to either side of the project
G2B A20	Archaeological deposit	no		Deposit is to the north of the project
G2B A21	Archaeological deposit	yes	partial	Deposit likely to extend to either side of the project
G2B A22	Archaeological deposit	yes	full	Most of the site focus is likely to be present within the CF
G2B A23	Archaeological deposit	yes	full	Most of the site focus is likely to be present within the CF
G2B A24	Archaeological deposit	yes	full	Most of the site focus is likely to be present within the CF
G2B A25	Archaeological deposit	yes	partial	Deposit exists within and likely to extend downslope and to the south of the CF.
G2B A26	Archaeological deposit	yes	full	Deposit exists within the CF
G2B A27	Archaeological deposit	yes	partial	Deposit likely to extend to either side of the CF
G2B A28	Archaeological deposit	yes	partial	Deposit likely to extend to either side of the CF
G2B A29	Archaeological deposit	yes	partial	Deposit likely to extend to either side of the CF
G2B A30	Archaeological deposit	yes	partial	Deposit likely to extend to either side of the CF

Site ID	Recording type	Direct impact	Degree of impact	Comments
G2B A31	Archaeological deposit	yes	partial	Deposit likely to extend to either side of the CF
G2B A32	Archaeological deposit	yes	partial	Deposit likely to extend to either side of the CF
G2B A33	Archaeological deposit	yes	partial	Deposit likely to extend to either side of the CF
G2B A34	Archaeological deposit	yes	partial	Deposit likely to extend to either side of the CF
G2B A35	Archaeological deposit	yes	full	Deposit likely to extend to either side of the CF. However most of the focus of the site occurs within the CF
G2B A36	Archaeological deposit	yes	full	Most of the likely archaeological deposit on this spurline shoulder would be impacted
G2B A37	Archaeological deposit	no		Deposit is to the west of the project
G2B A38	Aboriginal artefact occurrence and associated PAD	no		Site and associated PAD is located within proposed ancillary area. Direct impact can be avoided by excluding this area from ancillary use.
G2B A39	Ethno-historic place (Aboriginal historical encampments at Berry)	no		Proposed roundabout within area of G2B A39 recording can be constructed within existing road disturbance corridor and thus avoid any potential for direct impact to recording area.
G2B PAD1	Potential archaeological deposit	yes	partial	Deposit likely to extend to either side of the CF
TRACL	Aboriginal Cultural Landscape (Toolijooa Ridge) an ethno-historic place	yes	partial	Approximately 1.4 km of the project would traverse the higher slopes of the Toolijooa Ridge and its associated side spurs. Impacts would include the carriageway formation, deep cuttings, and visually obtrusive embankments
MFT12	Fig tree	yes	full	Tree is situated within CF
MFT13	Fig tree	no		Tree is situated outside of CF
MFT14	Fig tree	no		Tree is situated outside of CF
MFT15	Fig tree	no		Tree is situated outside of CF
MFT16	Fig tree	no		Tree is situated outside of CF
MFT17	Fig tree	no		Tree is situated outside of CF
MFT18	Fig tree	no		Tree is situated outside of CF
MFT19	Fig tree	no		Tree is to the north of the project
MFT20	Fig tree	no		Tree is situated outside of CF
MFT21	Fig tree	no		Tree is situated outside of CF
MFT22	Fig tree	no		Tree is to the north of the project
MFT23	Fig tree	no		Tree is to the north of the project

10.4 Impact to cultural landscape values

10.4.1 General values

Generalised landscape features considered to have cultural significance and values by Aboriginal stakeholders can be summarised by the following:

- Large and old/mature growth fig trees.
- Remanent and regenerating native vegetation.
- Plants and animals with significance in past and contemporary Aboriginal cultural practice.
- Landforms which remain unchanged by European land use or strongly manifest the pre-European landscape (examples include prominent ridgelines, escarpments, hills former swamp basins and river and creek corridors).
- The sustainable presence of natural ecological systems associated with features such as creeks and rivers, forests and swamps.

The project would have varying degrees of impact to these generalised values, these can be summarised by the following:

- Loss of one large fig tree.
- Loss of some areas of native vegetation which may include plants known to have traditional uses.
- Substantial modification of natural landforms within the project area, through the construction of road platforms and cuttings.

10.4.2 The Toolijooa Ridge Aboriginal cultural landscape

The physical, visual and potential habitat changes across Toolijooa Ridge resulting from the project would amount to a substantial impact to the Aboriginal cultural values of the ridgeline.

Approximately 1.4 km of the project would traverse the higher slopes of the Toolijooa Ridge and its associated side spurs. Impacts would include the carriageway formation, deep cuttings, and visually obtrusive embankments. The cutting through Toolijooa Ridge is to be 900 metres in length, a maximum of 130 metres wide and a maximum of 25.5m deep.

These impacts will affect the Aboriginal cultural values of the landscape. The cutting through the ridge will result in significant alteration to the profile from various viewing angles. The visual continuity of the crest of the ridge will also be impacted. The presence of the project corridor would prevent vehicle and pedestrian through-travel along the ridge crest. This constraint is significant given the value of the ridge as a former pathway.

The vegetation clearance required for the project will reduce the current extent of vegetation cover. Aboriginal stakeholders have expressed concern that this may also impact habitat values.

10.5 Potential impact within ancillary areas

The location of heritage sites and items relative to the indicative location of ancillary areas is shown in Section C.3 of **Appendix C**. There are thirteen areas in which ancillary facilities may be placed. Eleven areas relate to proposed temporary or permanent stockpiles and compounds, including in some cases, potential backup and site offices. There are also five specific potential locations for offices or compounds. All but two of these are included wholly or partially within the eleven stockpile areas.

The impact associated with compounds includes a range of works and actions which would result in a complete or majority degree of direct impact and disturbance to any Aboriginal objects present. These include:

- Erection of fencing and bunded fuel and chemical storage areas.
- Construction of offices and sheds.
- Installation of sewerage and other services, as required.
- Sediment and erosion control works.
- Clearing and levelling.
- Construction of hard stand areas for plant and equipment.

The impact associated with temporary or permanent stockpile areas includes a range of works and actions which could result in a complete or partial degree of direct impact and disturbance to any Aboriginal objects present. There is some potential to avoid direct impact by fencing and excluding certain areas from use, or by temporarily covering deposits with hard stand gravels and rehabilitating the area upon completion. These works and actions include:

- Temporary storage of construction materials or material generated from within the construction site.
- A permanent area for the interim storage of materials for highway maintenance
- Erection of fencing.
- Sediment and erosion control works.

The exact location, configuration and scope of the impacts within these ancillary developments is impossible to anticipate at the current stage of project planning. This is because of the variables which would only be clarified at the detailed design stage of the project, and are dependent on the operational preferences and logistical constraints brought to the project by successful contractors. This uncertainty has implications for the effective management of potential impacts to heritage values. One option would be the conduct of a full scale test excavation program to define archaeological sensitivity across all possible ancillary areas. This, however, would result in considerable unnecessary testing impact to sites given that not all of the proposed ancillary sites would be impacted. An alternative would be to avoid impact to areas of potential were feasible, and where necessary, conduct a delayed and focused pre-construction testing program (where and if necessary), once areas of planned and unavoidable impact have been defined (refer discussion in section 11.1.3).

The following is an outline of Aboriginal heritage items and areas of potential which could potentially be directly impacted for impact at each indicative location. The areas of predicted archaeological potential are based on the predictive model used in this analysis and consideration of the test and salvage excavation results achieved to date on the Gerringong upgrade and Foxground and Berry bypass projects.

Southwest of intersection of Toolijooa Road and Princes Highway

This area has been the subject of recent archaeological surface survey (NOHC 2012). One known Aboriginal archaeological site has been identified, together with an associated area of predicted archaeological potential (refer Section 6.2).

The higher ground on the spurline in the northwestern portion of the area falls within the approximately defined boundary of the Aboriginal cultural landscape of the Toolijooa Ridge. A confirmed sub-surface Aboriginal archaeological deposit (G2BA12, NOHC 2011a), is located outside of the proposed ancillary area, on the crest of the spurline extending to the east of the intersection of the Toolijooa Road and Princes Highway. This deposit is interpreted as the eastern remaining portion of a site which was focused on the saddle in which the road intersection and highway is now situated (NOHC 2011a). Given the high degree of direct impact which has occurred in this area as the result of road and house construction, it is considered unlikely that the deposit now extends into the ancillary area.

An area of predicted archaeological potential is identified within the ancillary area (refer mapping in **Appendix C**). This area consists of valley-side basal slopes associated with an unnamed third order tributary creekline.

Toolijooa Ridge, on either side of the bypass alignment

This area occurs within the Aboriginal cultural landscape of the Toolijooa Ridge. There is one confirmed sub-surface Aboriginal archaeological deposit within the northern area, G2BA 35. This deposit is likely to extend to the north of the limit of archaeological testing, along the crest of the ridge, including the proposed vehicle access to the northern area. A further area of predicted archaeological potential is situated on the crest of a ridgeline knoll in the southern area. Although archaeological test pits within PASA28, indicated an absence of artefacts in proximity to this knoll, the knoll crest was not tested, and the low gradient surface of this feature is indicative of archaeological potential. The predictive model would anticipate a low incidence of subsurface artefacts.

A large fig tree (MFT12) is situated at the eastern end of the northern area, and may be subject to direct impact from construction, independent of any preparation or function of the ancillary area. This tree is relatively young compared to the remaining fig trees noted in or near the project.

East of Broughton Creek (SE of existing highway bridge)

There are no known Aboriginal sites within this area. Based on the recovery of artefacts from archaeological test pits just to the north (G2B A33 and 34), it is probable that archaeological deposits are also present within the proposed ancillary area. The area of predicted archaeological potential covers approximately two thirds of the proposed ancillary area (refer mapping in **Appendix C**) and comprises locally elevated micro-topographic landforms and valley-side basal slopes associated with an unnamed third order tributary creekline. The predictive model would anticipate a low or moderate incidence of subsurface artefacts to be present.

West of Broughton Creek (SW of existing highway bridge)

There are no confirmed Aboriginal sites or archaeological deposits within this area, however the whole of the area is classed as having archaeological potential for the following multiple considerations (refer mapping in **Appendix C**):

- A confirmed archaeological deposit is situated on the slopes and crest of a low spur, just north of the area (G2BA32). This indicates that archaeological deposit will be present on the same landform, where it extends into the northern portion of the proposed ancillary area. The predictive model would anticipate a low incidence of subsurface artefacts to be present.

- A confirmed archaeological deposit situated adjacent to the north bank of Broughton Creek, just west of the area the (G2BA31), indicates that archaeological deposit will be present along the southern margin of the proposed ancillary area, where it occurs within at least 200 metres of the river bank. The predictive model would anticipate a low or moderate incidence of subsurface artefacts to be present.
- The southern two thirds of this area falls within former portion 181, which is a potential location of Dicky Woods' Meadow. An ethno-historical source identifies this former meadow as the location of a traditional Aboriginal battle ground which is associated with the potential for burials (refer sections 4.4.2 and 6.2.3). If a margin of up to 200 metres from the meadow is allowed for the potential location of associated burials, the whole of the proposed ancillary area falls within this outlined area of potential.

Greystanes Lodge

This area includes a mature fig tree (MFT16) which was probably planted in association with a former Berry Estate tenant farmhouse at this location.

In addition, this area is situated on the edge of a potential location of Dicky Woods' Meadow. As mentioned above, this former meadow is associated with the potential for burials (refer sections 4.4.2 and 6.2.3). If a margin of up to 200 metres from the meadow is allowed for the potential location of associated burials, the whole of this proposed ancillary office or compound falls within this outlined area of potential.

Southeast of intersection of Austral Park Road and Princes Highway

There are no known Aboriginal sites within this area.

There is one area of predicted archaeological potential on a small spurline shoulder situated immediately east and southeast of the existing building complex.

Southwest of intersection of Austral Park Road and Princes Highway

There are no known Aboriginal sites within this area.

There are two areas of predicted archaeological potential:

- A spurline shoulder on the western margin of the proposed ancillary area.
- Basal slopes and elevated microtopography associated with an unnamed second order tributary creekline, flowing along the northern edge of the Broughton Creek valley floor. This area of potential occurs within the southeastern portion of the proposed ancillary area.

West of Intersection of Tindalls Lane and Princes Highway

A confirmed archaeological deposit (G2BA24) is situated on the elevated slopes of a prominent ridgeline knoll, immediately adjacent to the boundary of this proposed ancillary area. It is not considered likely that this deposit extends further downslope and into the proposed ancillary area.

A large fig tree (MFT19) is situated in the base of a gully on the western boundary of this area.

An area of predicted archaeological potential occurs along the spurline crest and low knoll in the northern portion of the proposed ancillary area. The predictive model would anticipate a low incidence of subsurface artefacts to be present.

There are a number of mature native trees within the area which have not been inspected for the possible occurrence of Aboriginal scars.

Oakleigh farmhouse and area, West side of Woodhill Mountain Road

There are no known Aboriginal sites or areas of predicted archaeological potential within this area.

A large fig tree (MFT23) occurs within the middle of the proposed ancillary area, and was probably planted in association with the early history of the present farmhouse, or a former homestead at this location.

Western end, and South of North Street, Berry

There are no known Aboriginal sites within this area. However a confirmed subsurface archaeological deposit (G2BA16) is situated immediately to the east, on the basal slopes of a spurline, adjacent to creek flats. This indicates that archaeological deposit will be present on the same landform, where it extends into the southern, upslope portion of the proposed ancillary area. The predictive model would anticipate a low incidence of subsurface artefacts to be present.

Southwest of Princes Highway, south of Graham Park

The majority of this area has not been the subject of archaeological survey. Survey of the proposed Princes Highway upgrade, along the eastern margin of this area, resulted in the identification of a potential archaeologically sensitive area (PASA 11) in association with an unnamed second order creekline. This PASA falls within the future assessment area of the Berry to Bomaderry Upgrade and has not been the subject of test excavation. A suite of micro-topographic landforms with predicted archaeological potential are associated with this creek line, and cover approximately half of this proposed ancillary area, within an east-west band across the middle of the area. These landforms include locally elevated landforms and valley-side basal slopes adjacent to the creekline, and the crest of a narrow spurline between the creek and a tributary. The predictive model would anticipate a low to moderate incidence of subsurface artefacts to be discontinuously present.

There are a number of mature native trees within the area which have not been inspected for the possible occurrence of Aboriginal scars.

10.6 Impact from realigned services and utilities

The project would include, as necessary, the realignment of some services and utilities. These works would occur during the pre-construction stage of the project and would be in accordance with the design and construction methods approved by the relevant service authorities.

Alterations to the alignment of major utilities are anticipated for the Shoalhaven Water sewer main along Kangaroo Valley Road, and about 800 meters of the Optus fibre optic cable east of Tindalls Lane. In other cases, existing service crossings would be reinforced, encased, or ducted on new overbridges.

Where sections of the existing highway would be upgraded, any existing minor utilities would be relocated as required to suit the new alignment. Temporary utility diversions may also be undertaken should the new permanent alignment be located within the active construction footprint.

In most of these cases, the works involved would occur within the assessed footprint of the project and the associated easement. These impacts are included within the project assessment presented in this report. There remains some potential for the realignment of services outside of the proposed project easement, such as in the two major utility examples referenced above. Where such a possibility is anticipated, an appropriate heritage assessment and impact mitigation process would be required to be completed prior to any disturbance.

10.7 Cumulative impact

The cumulative impacts of the project can best be understood by dividing the assessment area into broad landscape suites. This allows a comparison of similar known or predicted archaeological resources according to the premise that the distribution of, and variability in, Aboriginal sites tends to be related to landscape types and associations. The incidence of six broad landscape suites, or topographies, has been mapped in **Figure 10-1** across the project area and the two adjacent section of the Princes Highway upgrade – the Gerringong upgrade (GU) and the Berry to Bomaderry upgrade (BBU).

The six landscape suites are:

- *Low relief, locally elevated, undulating bedrock slopes adjacent to the Shoalhaven River gorge.* This topography occurs within the southern end of the BBU, but is widespread on either side of the Shoalhaven river gorge upstream from Nowra.
- *Basal slopes, spurs and interfluves fringing the coastal flats (which were former estuary basins).* This topography dominates the BBU and GU projects and forms a margin of descending spurlines and drainage lines around the edge of the coastal plain. The plain, now relatively well drained, was formerly dominated by swamp basins, and before that, by estuarine embayments. This topography consists of the terminal slopes of the south-eastern fall of the Illawarra Range.
- *Ridges, spurs and interfluves fringing major alluvial valley floors*. This topography dominates the (FBB) project area and is characterised by the spurlines, slopes and drainage gullies which border the major alluvial valleys that drain onto, and later merge with, the coastal plain. Those portions occurring within the G2B project areas form part of the Broughton Creek and Broughton Mill / Bundewallah Creek valleys.
- Major alluvial valley floors (excluding former estuary basins). Despite numerous drainage lines crossing the G2B project areas, only two major valley floors are traversed which are situated away from former estuarine basins of the coastal plain. These are the valleys of Broughton Creek and Broughton Mill / Bundewallah Creeks. Both are traversed in the (FBB) project area.
- *Higher ridges and spurs.* This topography consists of the higher ground within the G2B project areas and occurs across Toolijooa Ridge and Mount Pleasant. This topography dominates the lower-middle portion of the southeastern fall of the Illawarra Range.
- Wetland basin (drained), former estuary basin. This topography dominates the coastal plain of the Southern Illawarra, situated between the coastal sand bodies and the bedrock slopes. The G2B alignment largely avoids this flood prone topography, except for Omega flat in the GU project area.

All of these topographies extend to a majority degree, to either side of the project areas for the three sections of the Princes Highway upgrade between Gerringong and Bomaderry. None of these categories are rare across the Southern Illawarra and the proportion subject to impact from the upgrade projects is very small relative to their total distribution.

Table 10-2 presents the incidence of heritage recordings relative to topography and project areas. It should be noted that the data for the BBU does not yet include subsurface testing results, and may consequently be a substantial underestimate of actual site numbers.

The greatest net impact of all three sections of the Princes Highway upgrade between Gerringong and Bomaderry occurs across the alternating spurs and valleys of the coastal plain margin, with 55 per cent of the projects traversing this topography. Only 7 per cent of this net impacted area however occurs within the FBB project. This is 10 per cent of the FBB project but accounts for only 4 per cent of all confirmed BBU Aboriginal recordings (ie excluding tested PASAs with no detected archaeological material).

The FBB project is dominated by the spurlines, slopes and gullies which fringe the valleys of the Broughton and Broughton / Bundewallah Creek valley floors. This topography accounts for 44 per cent of the FBB project and 36 per cent of all confirmed FBB Aboriginal recordings. The next largest landscape within the FBB consists of major alluvial valley floors, again belonging to the Broughton and Broughton / Bundewallah Creek valleys. These comprise 31 per cent of the project and account for 50 per cent of all confirmed FBB Aboriginal recordings.

The remaining topography is of the higher ridges and spurs. This comprises 14 per cent of the FBB project and accounts for 4 per cent of all confirmed FBB Aboriginal recordings. Fifteen per cent of the GU project area also includes higher ridges and spurs, and includes 22 per cent of the confirmed GU Aboriginal recordings.

Although these figures demonstrate that most of the topographies traversed by the three sections of the Princes Highway upgrade between Gerringong and Bomaderry have a relatively high site incidence, 1.14 sites per GU kilometre and 2.48 sites per FBB kilometre, they do not in themselves provide a basis for broad concern about the cumulative impact of the FBB project or the G2B development context. In all cases, the topographies are not rare within the Southern Illawarra, and all extend up and downslope, and/or up and downstream of the highway easement. The archaeological resource encountered within the three sections of the Princes Highway upgrade between Gerringong and Bomaderry can be expected to similarly occur in adjacent areas. Given the linear nature of the highway project, the potential for substantial impact to a full suite of related landforms is low.

Apart from the limited urban expansion occurring around the region’s towns, such as Berry, Bomaderry and Gerringong, and localised impacts from rural residential home construction the topographies traversed by the three sections of the Princes Highway upgrade between Gerringong and Bomaderry are not subject to significant development re is not a significant cumulative impact.

At a more localised scale, it can be noted that the FBB valley floor traverses pose the greatest increase in cumulative impacts. This is partly due to the fact that each diverge from the existing highway easement, and therefore will create new disturbance corridors. The other factors are the bypass alignments through the former location of Dicky Woods Meadow (G2B A13), and around the northern margin of Berry. The high Aboriginal cultural significance of the former Meadow cannot be compared, or weighed against, an equivalent or expected archaeological resource elsewhere within the same topographic zone. This ethnographically recorded traditional battle ground is a rare site type and would be hard to predict elsewhere using archaeological and landscape criteria. The construction of the bypass through the potential area of the former Meadow represents a substantial cumulative impact to the remaining area of that site – approximately 7 per cent of the total potential area (**refer section 6.2.3**).

The township of Berry is situated in the lower catchment of Broughton Mill Creek. Its continuing urban development has substantially impacted a suite of low spurs, basal slopes and creek flats at a point where the catchment merges with the coastal plain and the former estuary. Although this transitional zone, from bedrock basal slopes to the flat coastal plain, is extensive and continues southwest to Bomaderry, Berry remains the only section intersected by a major alluvial valley. As such, the impact of the FBB project along the northern margin of the town poses a further cumulative impact to this particular topographic nexus.

It can be concluded that the two FBB traverses across major alluvial valley floors, Broughton Creek, and the Broughton Mill / Bundewallah Creeks, pose localised cumulative impacts. These are to the Dicky Woods Meadow site, and to the transitional topography of the Broughton Mill Creek catchment onto the coastal plain. This underlines the need to effectively mitigate the impacts of the project within these two areas. On the northern margin of Berry, this can be realised through archaeological salvage and the return of recovered materials and information to the local Aboriginal community. At the potential location of Dicky Woods Meadow, mitigation must address both visual, archaeological and Aboriginal cultural issues.

Table 10-2: The incidence of PASAs, PADs and Aboriginal sites/recordings, relative to topography, across the three sections of the Princes Highway upgrade between Gerringong and Bomaderry (excluding ancillary area data)

		Broad scale landscape suite						
Project	**Variable**	**Low relief, locally elevated, undulating bedrock slopes adjacent to the Shoalhaven River gorge**	**Basal slopes, spurs and interfluves fringing the coastal flats (which were former estuary basins)**	**Ridges, spurs and interfluves fringing major alluvial valley floors**	**Major alluvial valley floors (excluding former estuary basins)**	**Higher ridges and spurs**	**Wetland basin (drained), former estuary basin**	**Totals**
GU	Approx. GU length (km)	-	5.32	-	-	1.17	1.38	7.87
	No. of PASA/PADs	-	7	-	-	2	0	9
	No of confirmed archaeological sites	-	7	-	-	2	0	9
	No of other recordings	-	0	-	-	0	0	
	Total no. confirmed Aboriginal recordings	-	7	-	-	2	0	9
FBB	Approx. FBB length (km)	-	1.17	5.00	3.51	1.59	-	11.27
	No. of PASA/PADs	-	1	11	10	3	-	25
	No. of confirmed archaeological sites	-	1	10	11	2	-	24
	No. of other recordings	-	0	0	3	1	-	4
	Total no. confirmed Aboriginal recordings	-	1	10	14	3	-	28
BBU	Approx. BBU length (km)	0.96	10.11	-	-	-	-	11.07
	No. of PASA/PADs	1*	13*	-	-	-	-	14*
	No. of confirmed archaeological sites	1*	1*	-	-	-	-	2*
	No. of other recordings	0	0	-	-	-	-	0
	Total no. confirmed Aboriginal recordings	1*	1*				-	2*
G2B	Approx. total G2B length (km)	0.96	16.60	5.00	3.51	2.76	1.38	30.21
	Proportion of total G2B length (%)	3.0	55.0	16.5	12.0	9.0	4.5	100
	Total no. of PASA/PADs	1	21	11	10	5	0	48
	Proportion of total PASA/PADs (%)	2.0	44.0	23.0	21.0	10.0	0	100
	Total no. confirmed Aboriginal recordings	1	9	10	14	5	0	39
	Proportion of total confirmed recordings (%)	2.0	23.0	26.0	36.0	13.0	0.0	100

** - These values are based only on surface survey results and do not include test excavation results*

BBU	FBB	GU	Broad scale landform suite
			Low relief, locally elevated, undulating bedrock slopes adjacent to the Shoalhaven River gorge
			Basal slopes, spurs and interfluves fringing the coastal flats (which were former estuary basins)
			Ridges, spurs and interfluves fringing major alluvial valley floors
			Major alluvial valley floors (excluding former estuary basins)
			Higher ridges and spurs
			Wetland basin (drained), former estuary basin.

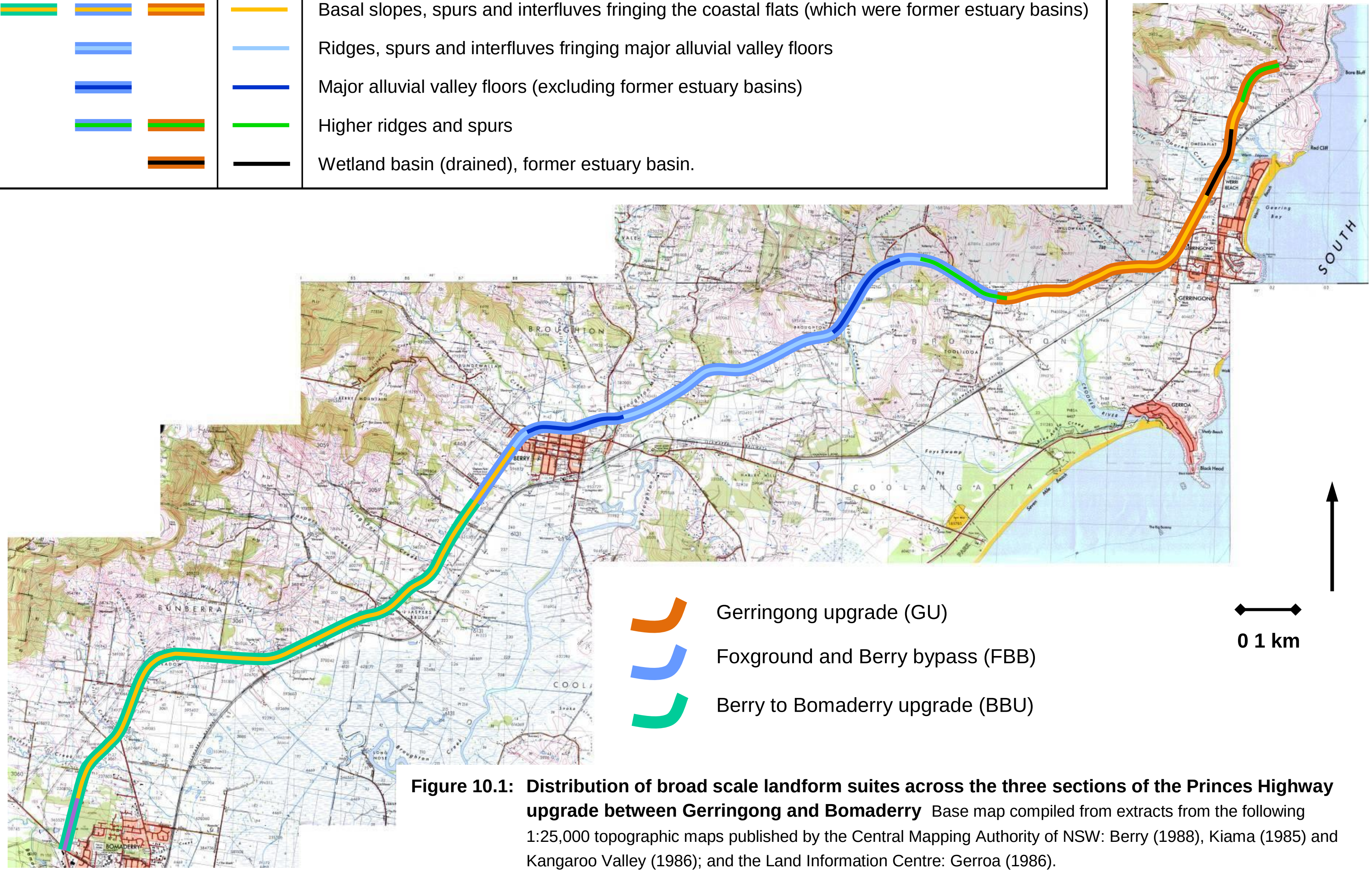

Figure 10.1: Distribution of broad scale landform suites across the three sections of the Princes Highway upgrade between Gerringong and Bomaderry Base map compiled from extracts from the following 1:25,000 topographic maps published by the Central Mapping Authority of NSW: Berry (1988), Kiama (1985) and Kangaroo Valley (1986); and the Land Information Centre: Gerroa (1986).

11 Recommended management and mitigation strategies

11.1 Management and mitigation measures

11.1.1 Archaeological values

Archaeological recordings G2B A15, G2B A17, G2BA19, G2B A20, G2B A21, G2B A23, G2B A25, G2B A27, G2B A34, G2B A35 and G2B A37 are relatively common, low density and discontinuous archaeological deposits with limited research potential. Impacts associated with the project are anticipated at all of these sites except G2B A20 and G2B A37. Given the low archaeological significance of these sites, no further archaeological investigations are warranted to commencement of construction impacts.

Archaeological recordings G2BA16, G2B A18, G2B A22, G2B A24, G2B A26, G2B A28, G2B A32, G2B A33, and G2B A36 have been assessed to be of moderate archaeological significance due to their research potential. These sites are generally characterised by a higher incidence of artefacts and/or a higher than average assemblage richness. These sites can also be grouped according to landform: G2B A16 and G2B A32 both correspond to the crest and slopes of a low spurline adjacent to a drainage line; G2B A22 and 24 both correspond to the crest and slopes of a prominent spurline knoll; G2B A26 and 33 both correspond to locally elevated features in a valley floor context; G2B A18, 28 and 36 correspond to an alluvial terrace, moderately graded spur crest and a prominent spurline shoulder, respectively.

Impacts associated with the project are anticipated at all of these sites. G2B A18 would be impacted by the trench diversion of Town Creek onto Bundewallah Creek.

Further archaeological investigation, in the form of salvage excavation, is warranted at a sample of these sites in order to assist with characterisation and the refinement of the model of Aboriginal occupation for the local region. The selection of an appropriate sample of sites for salvage can be based on the inclusion of sites that display higher levels of integrity, artefact diversity, or artefact incidence for any given landscape setting.

For example, G2B A32 displays a higher artefact incidence and richer assemblage than other low spurline sites adjacent to drainage lines, and as such it is a logical choice for salvage excavation. The identification of a possible glass artefact at Site G2B A16 warrants further excavation as part of a salvage program. Site G2B A24 is a less disturbed and higher density example of a site similar to that encountered at G2B A22, and G2B A33 displays a richer assemblage than G2B A26. G2B A36 and G2B A28, while not directly comparable in terms of landscape, are broadly similar as examples of spur crests and slopes of prominent ridgelines. In this instance, G2BA36 is associated with Toolijooa Ridge, a place of ethno-historical significance, and it displays a richer artefact assemblage, thus making it a potentially more significant site and hence worthier of salvage excavation. G2B A18 on the other hand is relatively unique in terms of landscape context as the only locally elevated alluvial terrace with a well defined higher incidence of artefacts. There is therefore a good argument for the conduct of salvage excavation at this site.

Based on this analysis, an appropriate sample of the sites with assessed moderate archaeological significance, for the conduct of salvage excavations is G2B A16, G2B A18, G2B A24, G2B A32, G2B A33 and G2B A36. Sites G2BA22, G2B A26 and G2B A28 have not been selected.

The archaeological deposits at G2BA29, G2B A30 and G2B A31 have all been assessed as being of moderate to high archaeological significance; they are potentially associated with the ethno-historically significant Brookside Aboriginal encampment and "Đicky Wood's Meadow" battle ground. Because of the significance of these sites, further archaeological investigation in the form of salvage excavation is considered to be prudent at all of these sites prior to commencement of construction impacts at these sites.

The potential archaeological deposit identified following the finalisation of the excavation program (G2B PAD1), has predicted moderate or high archaeological potential, within a local context. As such it warrants the conduct of a salvage excavation program prior to the commencement of construction impact.

In the event that project related disturbance is anticipated to occur outside of the project area as defined in this assessment, then an appropriate heritage assessment and impact mitigation process should be completed prior to any disturbance. This requirement would include impact mitigation actions such as land rehabilitation and revegetation programs.

11.1.2 Aboriginal cultural values

The following points provide a summary of the stated Aboriginal values and associated issues within the project, as defined in the last and previous AFG discussions and stakeholder responses.

- All Aboriginal archaeological sites have Aboriginal cultural values. These may differ to the archaeological evaluations.
- It is acknowledged that all archaeological assessment is based on sampling, and that there is always potential for test excavation programs to miss items or sites which fall outside of the predictive theory upon which the sampling is based.
- The potential for burial sites to occur within a given area cannot be fully excluded based on test excavation results alone. There is always the possibility that an isolated burial is situated between the test pits.
- The conduct of archaeological salvage at those sites where test excavations have indicated research value, has been supported by stakeholders. Archaeological salvage excavation provides a means of managing both archaeological and cultural values. Information recovered by archaeological salvage actions can have value for the traditional Aboriginal interpretation of these sites, and understanding the past life of ancestors.
- However, the conduct of archaeological salvage, where it is justified by demonstrated research value, cannot effectively manage all of the Aboriginal cultural values present. This is because all Aboriginal artefacts have cultural value and many artefacts remain within the construction areas after archaeological salvage is completed, and at sites where salvage is not deemed to be warranted.
- Stakeholders have expressed a strong opinion that the cultural values inherent in artefacts which remain on-site, (after the completion of any required archaeological salvage excavations), and which would be directly impacted by construction, should still be effectively managed. The stakeholders have consistently proposed that this be achieved by the monitoring of construction works by qualified Aboriginal sites officers.
- The potential for encountering and disturbing Aboriginal burials, or their remains, is a major concern for all stakeholders, especially within the area of Dicky Wood's Meadow Battle Ground (G2B A13). Where there is a substantial potential risk for encountering burials, stakeholders have suggested monitoring of construction works by qualified Aboriginal sites officers and an archaeologist.
- Large and mature fig trees have high cultural value and should be conserved wherever possible.

- It is acknowledged that the local Aboriginal community is the custodial group for all of the Aboriginal artefacts recovered from the project area. The storage and/or return of all Aboriginal artefacts recovered from the project area should be determined according to an agreement decided upon by the stakeholders, the RMS, and the OEH.

At the AFG held on 21 November 2011 two key resolutions were made in relation to Aboriginal heritage and cultural values:

- That as little damage as possible be incurred at Toolijooa Ridge and Dicky Wood's Meadow, [these places] should be protected at all costs.
- It was strongly recommended that RMS reconsider its monitoring policy [in favour of] requiring monitors on-site during activities resulting in ground disturbance.

In the only written response to the draft report, the Jerrinja LALC reiterates the call for involvement of Aboriginal sites officers in the monitoring of construction works. The Land Council specifies that sites officers should be present during the removal of the first 500 millimetres - 1000 millimetres of topsoil.

In response to these values and issues, the RMS makes the following acknowledgements and undertakings:

- RMS has undertaken an archaeological assessment of the project area and undertaken community consultation to identify areas with heritage significance. Based on this, RMS proposes to undertake a strategic salvage program across all areas with moderate to high heritage significance that would be impacted by the project. RMS acknowledges that Aboriginal objects may occur anywhere across the landscape; however it also acknowledges that it is not feasible to attempt to identify and/or collect all objects through monitoring. Given that a salvage program would be employed prior to construction, the request to undertake monitoring during construction is not supported by RMS.
- Managing Aboriginal cultural values would be the subject of further consultation with Aboriginal stakeholders, and a Heritage Interpretation Plan (HIP) would be developed with the aim of identifying options for promoting local cultural values (refer recommendation no. 8).
- The management and curation of recovered Aboriginal artefacts would, where possible, be determined by a consensus or majority view of the Aboriginal stakeholders, and subject to approval by OEH, as necessary (refer recommendation 9). All such actions must be consistent with OEH policy, comply with any necessary permit or agreement conditions, and satisfy documentation standards.
- In order to minimise and mitigate impacts to cultural landscape values, the following strategies would be conducted where feasible (refer recommendation No.10):
  - Reduce the visual impact of the project through the planting and regeneration of vegetation.
  - Minimise and mitigate impact to ecological values.
  - The re-establishment of native vegetation to be a priority in areas requiring revegetation.
  - The use of native plant species with Aboriginal cultural values to be encouraged in revegetation programs. Appropriate species can be identified through liaison with Aboriginal stakeholders.
  - Incorporate or allow for the interpretation of cultural values, through the erection of signage, the adoption of Aboriginal nomenclature, or the inclusion of appropriately commissioned Aboriginal art or motifs.
  - Provide opportunities and access for the conduct of Aboriginal ceremony.

- RMS acknowledges the cultural significance of Dicky Wood's Meadow (G2B A13) and the Toolijooa Ridge Aboriginal cultural landscape to the Aboriginal community. RMS make the following commitments:
  - Provide an opportunity for the Aboriginal stakeholders to conduct ceremonial activities, where required, within the project area of G2B A13 and the Toolijooa Ridge Aboriginal Cultural Landscape prior to construction works. (refer recommendation no.11).
  - Minimise disturbance to the natural soil profile of G2B A13 within the construction footprint. This would generally be achieved by constructing the proposed carriageway on embankment, and thus reducing the need to cut into the natural soil profile (refer recommendation no.12). This strategy would also be deployed to minimise impact to G2B A14 (recommendation no.14).
  - Archaeological salvage excavation would be conducted in all areas of G2B A13 where the natural soil profile would be impacted, including pier, abutment and swale construction (refer recommendation no.13).
- Impact to large and mature fig trees would be avoided wherever feasible, and where unavoidable, impacts would be managed in consultation with Aboriginal stakeholders (refer recommendations 18, 19 and 20).

The construction of embankment in preference to impacting the natural soil profile within those portions of the construction footprint which include sites of Aboriginal cultural significance, is a strategy with two aims:

1. To minimise impact to Aboriginal cultural values by preventing the disturbance and exposure of remains as a consequence of ground excavations. In other words, to maximise the potential for archaeological deposits to lay undisturbed, albeit with a new construction and earth mass overlying them.
2. To provide the potential for the long term continuity of undisturbed archaeological deposits underneath the constructed mass of the bypass.

Neither aim is fully realised in this context as it is acknowledged that an undetermined degree of compaction must occur under the bypass mass. Despite this, the potential of this strategy to retain some cultural and archaeological values within the permanent impact zone of the construction footprint is a major advantage and justification for its use. The ability to ensure that potentially present, but undetected, burials would remain undisturbed (apart from compaction) and in their original context and country, is also a major justification for the use of this strategy, as a compromise position, advocated by the Aboriginal community.

In relation to the conduct of rehabilitation and revegetation, where it serves as a strategy for the reinforcement and mitigation of impacts to Aboriginal cultural values, it is noted that such actions have the potential to impact upon archaeological values. If and where such programs are anticipated outside of the area of the current assessment, then potential impacts to heritage values should be considered in a separate impact assessment (refer recommendation 25).

With regard to the effective archaeological management of construction impacts to the four areas with significant Aboriginal cultural landscape values the OEH has requested that the RMS consider the use of non-invasive and remote sensing techniques, such as ground penetrating radar (GPR) or electro-resistivity. The areas referred to by the OEH are the Toolijooa Ridge Aboriginal cultural landscape (TRACL), the Brookside encampment (G2B A14), Dicky Woods Meadow battle ground (G2B A13), and the Berry encampments (G2B A39), In the case of G2B A39, such action should not be necessary as construction impacts would be limited to areas of past road construction and disturbance (refer **Appendix I**).

The remaining recordings cover large areas, and the deployment of remote sensing would need to be further focused using other criteria in order to be cost-effective. Greatest archaeological potential within the affected portions of the TRACL consist of the ridge and spur crests, however these have been substantially impacted by agricultural development. The G2B A13 and G2B A14 areas have similar landuse histories. There are difficulties in conducting remote sensing techniques in disturbed agricultural lands because signals or anomalies can be generated by the detection of past disturbance traces with no archaeological value, such as from stump removal, erosion gullying, animal burrows, ripped rabbit warrens, and the disposal of stock animal remains. All such signals require ground truthing.

A possible exception would be the conduct of GPR within some portions of the G2B A13 area (Dicky Woods meadow). This technique could assist in the pre-salvage excavation assessment of theorised burial locations, based either on archaeological or Aboriginal cultural parameters. The potential burials that would be the subject of remote detection across this area could date as late as the nineteenth century and therefore have a distinct GPR signal, as opposed to the poor differentiation of much older burial pits due to greater degrees of compaction and mineralisation.

It is recommended that consideration be given to the use of remote sensing techniques as part of the impact mitigation program across G2B A13 (recommendation no. 13).

Please refer to section 11.2 below for a detailed outline of all recommendations.

11.1.3 Ancillary areas

The location of proposed ancillary areas relative to archaeological recordings is shown in **Appendix C.3**.

Two Aboriginal archaeological sites (G2B A35 and G2B A38) occur within proposed ancillary areas, one west of Toolijooa Road, and another on Toolijooa Ridge. Both of these proposed ancillary areas also include areas of predicted archaeological potential associated with the confirmed archaeological finds. No further archaeological or impact mitigation action is recommended at site G2B A35. Avoidance of impact is recommended at G2BA38 and its associated potential archaeological deposit.

Three ancillary areas would be situated partially or wholly within the Toolijooa Ridge Aboriginal cultural landscape. The recommended strategies for minimising impact to this landscape (Recommendation no. 12) would apply also to these ancillary areas.

Three mature fig trees occur within ancillary areas (MFT12, 13 and 23). The three recommended strategies for avoiding or mitigating impact to these trees would apply to the use of these ancillary areas (Recommendations 16, 17 and 18).

Ten of the ancillary areas include areas of predicted archaeological potential. In five of these instances, these predicted areas are based on the nearby presence of confirmed archaeological deposits where a program of salvage excavation would be recommended prior to direct impact (G2B A16, G2B A24, G2B A31, G2B A32 and 33). At the two ancillary areas west of Broughton Creek, predicted archaeological potential is also associated with the potential for burials around the location of Dicky Woods' Meadow (G2B A31). The proposed inter-project ancillary area south of Graham Park includes an untested PASA and an extensive area of associated predicted archaeological potential.

The management of potential heritage impacts within ancillary areas must address two particular characteristics of ancillary developments:

- There is a degree of flexibility in the placement of ancillary infrastructure and storage, due to the size of the properties available, and the fact that they are not constrained by a need for permanence.
- The exact location, scope and configuration of ancillary developments cannot be accurately defined until the detailed design stage of the project, when the specific preferences and operating requirements of contractors can be detailed.

One consequence of these is that, where necessary, any program of test excavation is better conducted at the detailed design stage, so that test areas can be limited to anticipated development footprints and testing impact can be kept to a minimum. Although ground truthing is delayed by this contingency, the action is predicted on predictive mapping of archaeological sensitivity, which itself is based on the now well established site location model, that has been developed and revised according to test results gained from the adjacent bypass corridor.

In response to these characteristics and the consequential testing constraints, a number of criteria for the selection of ancillary development areas have been proposed with respect to minimising impact to heritage values (refer also to section 4.4.7 of the environmental assessment). These are:

- Ancillary facilities to be located on sites that have a low likelihood of having Aboriginal or non-Aboriginal heritage significance and/or potential.
- Sites or areas of moderate to high Aboriginal and/or non-Aboriginal heritage significance and/or potential, including known sites, potential archaeologically sensitive areas and areas of Aboriginal cultural significance, are not to be used for ancillary facilities except where the impact is authorised and managed by a relevant approval or an approved Heritage Management Plan.

In addition, to these criteria, the following management strategies are proposed:

- In all cases, direct impact to areas of predicted archaeological potential should be avoided where feasible. This could be achieved by either:
  - Fencing off and excluding these areas from ancillary functions and use.
  - Avoiding direct disturbance to the natural soil profile, by overlaying the area with a temporary protective treatment and barrier (such as a geotextile), followed by a layer of hard stand gravels, all of which can be removed after construction and during rehabilitation.
- Where direct impact to areas of predicted archaeological potential cannot be avoided, it is recommended that:
  - Those areas of potential which consist of an extension of a landform on which a confirmed archaeological deposits is situated, and which has been recommended for salvage excavation, should be the subject of a program of salvage excavation prior to impact. This applies to the proposed ancillary areas: east of Broughton Creek, the two areas west of Broughton Creek, the area southwest of Tindalls Lane, and on the south side of North Street.
  - Those areas of potential which are unrelated to adjacent confirmed archaeological deposits should be subject to a program of test excavation (where and if necessary) prior to direct impact, and any management strategies developed as a consequence of the results of the test program. This applies to the proposed ancillary areas: southwest of Toolijooa Road, the ridgeline knoll in the southern area on Toolijooa Ridge, southwest of Austral Park Road, and south of Graham Park.

The use and effectiveness of temporary ground barriers as a means to protect overlain archaeological deposits is a technique subject to on-going review and improvement. Recent deployment of this technique by the RMS on the Woomarmaga bypass revealed limitations and potential areas for refinement. Following the removal of hard stand gravels and an underlying geotextile, varying degrees of compaction of the underlying sediments was observed, including some breakage of stone artefacts. Retarded rates of revegetation were also noted, resulting in greater susceptibility to erosion (pers. comm. Julian Watson, RMS 24/10/12). These observations should be taken into consideration when formulating a barrier design and protocol for use, within the project area. Possible refinements and local characteristics which should be considered include:

- High local re-growth and revegetation rates.
- The characteristic absence of stone artefacts on the surface and at least the upper 10 centimetres of the natural soil profile.
- In most senarios, temporary hard stand surfaces would be deployed over areas of lower (predicted or tested) significance (refer selection criteria above).
- The potential for compaction could be reduced by better and more even structural distribution of the weight of any structures or objects placed on the hard stand.
- The placement of a non-recoverable sand layer between the natural land surface and the geotextile could be trialled with a view to reducing compaction impact, and mechanical disturbance when removing the textile and overlying gravels.
- Any deployment of barriers and temporary had stands should be coupled with a program to test and review the effectiveness of the strategy.

11.2 Recommendations

The following recommendations have been prepared with input from the RMS and in certain instances are limited by RMS policy which excludes monitoring strategies.

These recommendations would be incorporated into the Statement of Commitments and included, as appropriate, within a project specific Construction Environmental Management Plan or relevant Heritage Sub Plan or equivalent.

With regard to stakeholder consultation it is recommended that:

1. Aboriginal stakeholders should continue to have the opportunity to actively participate in an on-going consultation program regarding the management of Aboriginal cultural heritage within the project area.

With regard to archaeological sites it is recommended that:

2. Avoid unnecessary impact to sites G2B A3, 20 and 37. All of these sites are outside of the project area.

3. Avoid impact to site G2B A38, and the associated area of potential archaeological deposit. This site is situated within a proposed ancillary area (refer also recommendation 23b).

4. No further archaeological investigation is necessary at G2B A15, G2B A17, G2B A19, G2B 20, G2B 21, G2B A22, G2B A23, G2B 25, G2B 26, G2B 27, G2B 28, G2B 34, G2B A35 or G2B 37.

5. A program of salvage archaeological excavation should be completed at G2BA16, G2B A18, G2B A24, G2B A29, G2B A30, G2B A31, G2B A32, G2B A33, G2B 36 and G2B PAD1 prior to the conduct of construction related ground disturbance within the area of those sites. The aim of this program would be to realise the information potential of the deposits through the recovery and analysis of a larger sample of artefacts from each site.

6. Where an Aboriginal site, or portion thereof, is situated adjacent to, but outside of the zone of construction activity, temporary fencing should be erected between the zone of construction activity and the adjacent site area and/or archaeological deposit, with the aim of defining a ‘no–go’ area for vehicles, material storage or other actions likely to result in ground disturbance. This function may be realised by temporary and purpose specific fencing, or by standard fencing which may be erected to define the road easement and works area, regardless of heritage requirements. Temporary fencing should be removed at the cessation of construction activities. This recommendation is relevant to the following known Aboriginal sites: G2B A2, G2B A3, G2B A15, G2B A16, G2B 17, G2B A18, G2B A19, G2B A21, G2B A23, G2B 24, G2B 25, G2B A26, G2B A27, G2B A28, G2B A29, G2B A30, G2B A31, G2B 32, G2B A33, G2B A34, G2B A35, G2B A36 and G2B A38.

7. The protocols provided in **Appendix M** of this report should be adopted and followed in the event that construction related disturbance involves the unanticipated discovery of Aboriginal objects or suspected human remains.

<u>With regard to Aboriginal cultural values and Ethno-historical recordings, it is recommended that:</u>

8. A Heritage Interpretation Plan (HIP) should be developed, with the aim of identifying options for the promotion of the cultural values of the project area for current and future generations. The HIP should be drafted with the involvement of Aboriginal stakeholders, landowners and local Councils. Options may include interpretive signage, educational materials, and supporting local museum displays. In particular, the HIP should address the acknowledgement and promotion of Aboriginal cultural values associated with the Toolijooa Ridge Aboriginal cultural landscape, and the Dicky Wood’s Meadow traditional battleground (G2B A13).

9. The RMS continue to liaise with Aboriginal stakeholders regarding the management and curation of all Aboriginal artefacts (Aboriginal objects) recovered or salvaged from the project, following the completion of any required description and analysis. Where possible a consensus or majority view should be determined. If and as necessary, an application for a Care Agreement may need to be approved by OEH where artefacts are to be held in the care of an individual or organisation. Alternatively, recovered artefacts may be re-buried on-site or deposited with the Australian Museum (Sydney) pursuant to section 88 of the *National Parks and Wildlife Act 1974*.

   The location of all reburied Aboriginal objects must be recorded on an OEH Aboriginal site recording form and submitted to the OEH.

10. In order to minimise and mitigate impacts to cultural landscape values, the following strategies should be conducted where feasible:

    a. Reduce the visual impact of the project through the planting and regeneration of vegetation.

    b. Minimise and mitigate impact to ecological values.

    c. The re-establishment of native vegetation should be a priority in areas requiring revegetation.

    d. The use of native plant species with Aboriginal cultural values should be encouraged in revegetation programs. Appropriate species can be identified through liaison with Aboriginal stakeholders.

    e. Incorporate or allow for the interpretation of cultural values, through the erection of signage, the adoption of Aboriginal nomenclature, or the inclusion of appropriately commissioned Aboriginal art or motifs.

    f. Provide opportunities and access for the conduct of Aboriginal ceremony.

11. The RMS provide an opportunity for the Aboriginal stakeholders to conduct ceremonial activities, where required, within the project area sections of Toolijooa Ridge Aboriginal cultural landscape, and Dicky Wood's Meadow traditional battleground (G2B A13) prior to construction works.

G2B A13 "Little Mountain" or "Dicky Wood's Meadow" battle ground

12. Where feasible, minimise disturbance to the natural soil profile of G2B A13 within the construction footprint. This would generally be achieved by constructing the proposed carriageway on embankment, thus reducing the need to cut into the natural soil profile.

13. Prior to the conduct of construction works within G2B A13, archaeological salvage excavation should be conducted in all areas where it is anticipated that the natural soil profile would be impacted, such as from pier, abutment and swale construction. Consideration should be given to the use of remote sensing techniques as an initial stage of the salvage excavation program. This could assist in the selection of areas warranting detailed salvage methodologies.

G2B A14 Brookside (Broughton Village) Aboriginal encampment

14. Where feasible, adopt a carriageway elevation and a construction methodology which minimises disturbance to the natural soil profile within the construction footprint, and which requires the construction of an embankment across the valley floor rather than the excavation and removal of the natural soil profile.

G2B A39 Historical Aboriginal encampments at Berry (G2B A39)

15. The proposed roundabout at the intersection of Woodhill Mountain Road and the current Princes Highway, should be designed and constructed in such a way that direct impact is limited to the area of the existing disturbance corridor around the intersection. This corridor is illustrated in **Appendix I**.

16. Temporary fencing should be erected between the zone of construction activity and the adjacent areas of G2B A39, with the aim of defining a ‘no–go’ area for vehicles, material storage or other actions likely to result in ground disturbance. This function may be realised by temporary and purpose specific fencing, or by standard fencing which may be erected to define the road easement and works area, regardless of heritage requirements. Temporary fencing should be removed at the cessation of construction activities.

Toolijooa Ridge Aboriginal cultural landscape (TRACL)

17. Where feasible, construct and finish the embankment and cutting faces in such a way as to minimise adverse visual impacts, and re-establish vegetation to reduce visual impacts and minimise disruption to wildlife corridor values.

<u>With regard to the management of potential impact to mature fig trees it is recommended that:</u>

18. Wherever feasible, direct impact to mature fig trees is avoided and the continued and sustainable health of near or adjacent trees is considered in the detailed design of the bypass.

19. In cases where direct impact to mature fig trees is unavoidable:

    a. Then, wherever practicable, trees with reduced health, condition or vigour are impacted in preference to examples displaying good condition, health and vigour.

    b. Establish a management and impact mitigation program in consultation with the AFG.

20. Consultation with Aboriginal stakeholder groups should be conducted with regard to all incidences of anticipated impact to mature fig trees. The objective of this consultation is to propose strategies for the management of the Aboriginal cultural values which may be effected by the impact. Some impact mitigation strategies previously suggested by Aboriginal stakeholders for consideration by the RMS include:

    a. Conducting a program of propagation (such as via semi-hardwood cuttings) for replanting within and outside of the development.

    b. Make available established cuttings to members of the local Aboriginal and non-Aboriginal community for use in private gardens and landholdings.

    c. Removal and transplantation of high or exceptional value trees, to a new secure location and providing necessary aftercare.

<u>With regard to potential impact within ancillary areas it is recommended that:</u>

21. The following selection criteria for the location of ancillary facilities should be adopted:

    a. Ancillary facilities to be located on sites that have a low likelihood of having Aboriginal heritage significance.

    b. Sites or areas of moderate to high Aboriginal heritage significance, including known sites, potential archaeologically sensitive areas and areas of Aboriginal cultural significance, are not to be used for ancillary facilities except where the impact is authorised and managed by a relevant approval or an approved Heritage Management Plan.

22. In all cases, direct impact to areas of predicted archaeological potential should be avoided where feasible. This could be achieved by:

    a. Fencing off and excluding these areas from ancillary functions and use.

    b. Avoiding disturbance to the natural soil profile, by overlaying the area with a temporary protective treatment and barrier (such as a geotextile), followed by a layer of hard stand gravels, all of which would be removed after construction and during rehabilitation.

       The design and deployment of this strategy should seek to address recently identified limitations of the technique in other RMS projects, and take into account the characteristics and possible refinements outlined in section 11.1.3.

23. Where direct impact to areas of predicted archaeological potential cannot be avoided, it is recommended that:

    a. Those areas of potential which consist of an extension of a landform on which a confirmed archaeological deposits is situated, and which has been recommended for salvage excavation, should be the subject of a program of salvage excavation prior to impact. This applies to the proposed ancillary areas: east of Broughton Creek, the two areas west of Broughton Creek, the area southwest of Tindalls Lane, and on the south side of North Street.

    b. Those areas of greater than low predicted archaeological potential which are unrelated to adjacent confirmed archaeological deposits should be subject to a program of test excavation prior to direct impact, and any management strategies developed as a consequence of the results of the test program. This applies to the proposed ancillary areas: just southwest of Toolijooa Road (including site G2B A38), the ridgeline knoll in the southern area on Toolijooa Ridge, southwest and southeast of Austral Park Road, and south of Graham Park.

    c. Any required test excavation program should be conducted and completed as part of the detailed design stage of the project, and prior to construction. This would allow for a focused approach, in which testing can be limited to defined facility locations, and necessary revisions or mitigation actions can be proposed and enacted.

With regard to the management of unexpected finds it is recommended that:

24. Conduct of the following strategies is recommended to address the potential for encountering unexpected finds, including human remains:

    a. Basic recognition skills for Aboriginal artefacts and human remains should be included in all construction fieldwork induction programs.

    b. Adopt and conduct, when and as necessary, the protocols outlined in the RMS policy - Unexpected Finds Procedure, provided in **Appendix M** of this report.

With regard to on-site staff training it is recommended that:

25. An appropriate representative of the registered Aboriginal parties and a project archaeologist be invited to give a tool box talk to construction teams prior to construction. The purpose would be to make the construction teams aware of the cultural significance of Dicky Wood's meadow, Brookside and Toolijooa Ridge. In particular, to be aware that if any bones are identified during construction, works must cease until they can be dealt with in accordance with the RMS' *Unexpected archaeological finds procedure*.

26. With regard to any anticipated works (including mitigation actions such as revegetation and land rehabilitation) to be conducted outside of the currently defined project area, proposed easement boundaries, or ancillary areas, it is recommended that:

    a. An appropriate heritage assessment and impact mitigation process should be completed prior to any disturbance occurring. This process should be outlined within any Construction Environmental Management Plan or relevant Heritage Sub Plan or equivalent.

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Appendix A

Aboriginal stakeholder consultation

Registered Aboriginal stakeholders

As of 7 October 2011

Title	First name	Last name	Organisation
Mr	Tony	Acton	
Mr	Shane	Acton	
Mr	Richard	Archibald	Wollongong Northern District Aboriginal Corp
Mr	Keith	Ball	Wadi Wadi Coomaditchie Aboriginal Corp
Mr & Mrs	Keith and Heather	Ball	Wadi Wadi Coomaditchie Aboriginal Corp
Ms	Natalie	Beckett	Nowra LALC, Yuin Traditional Owner
Mr	Dean	Bell	Yurwang Gundna Consultant
Mr	Don	Bell	
Mrs	Ruth	Bell	Buru Ngunnwal Traditional Elders Group
Mr	Tyronne	Bell	
Ms	Veronica	Bird	Aboriginal Liaison Officer Shellharbour city council
Mr	Cohen	Blair	
Ms	Djarkin	Blair	
Mr	Leeroy	Boota	
Ms	Taminya	Boota	
Mr	Aaron	Broad	
Mr	Bart	Brown	KEJ Aboriginal Corp
Ms	Lorraine	Brown	Coomaditchie United Aboriginal Corp
Mr	Reuben	Brown	KEJ Aboriginal Corp
Mr	Richard	Campbell	
Mr	Paul	Charles	Killila Site Consultants
Mr	Greg	Coe	
Mr	Graham	Connolly	Jerrinja Traditional Owners
Mr	Bob	Davis	
Mr	Greg	Davis	
Mr	James	Davis	Illawarra Elders Wodi Wodi Corp.
Ms	Karon	Davis	Illawarra Elders Wodi Wodi Corp.
Ms	Lisa	Davis	
Mr	Lyle	Davis	
Mr	Richard	Davis	Illawarra ITEC
Mrs	Sheryl	Davis	
Mr	Jason	Davison	
Mr	Stewart	Davison	

Title	First name	Last name	Organisation
Ms	Sally	Dellitson	
Mrs	Joyce	Donovan	
Mrs	Mavis	Errington	
Ms	Charmain	Evans	
Mr	Mick	Farrett	
Mr	Rodney	Freeman	
Ms	Pam	Glover	
Mr	Shannon	Glover	
Mr	Andrew	Harvey	CEO Jerrinja LALC
Mr	Robert	Harvey	
Mr	Steve	Henry	
Mr	William	Henry	
Ms	Holly	Herring	Yurwang Gundana Consultant
Mr	Bronson	Ireland	
Mrs	Judith	Ireland	
Ms	Nicole	Ireland-Vuaceva	
Mrs	Gwenda	Jarrett	Yunimyna Industries & Logistics
Mr	Kelvin	Jarrett	
Mr	Kristian	Jarrett	
Mr	Mick	Jarrett	
Mr	Stan	Jarrett	CEO, Nowra LALC
Ms	Wendy	Kelley	
Mr	Roy	Kennedy	Chairman Illawarra LALC
Ms	Julie	Luland	
Mr	Ali	Maher	
Mr	Geoff	Maher	
Mrs	Maria	Maher	
Mr	Damien	Maher-Pagett	
Mr	Steven	Marsden	
Mr	Bob	Maynard	CEO Jerrinja LALC
Ms	Elizabeth	Miller	
Mr	Robert	Miller	
Mr	Lionel	Mongta	NPW Elder
Mrs	Mary	Mongta	Traditional Owner
Ms	Margaret	Mongta	

Title	First name	Last name	Organisation
Mr	Anthony	Moore	
Mr	Chris	Moran	
Mr	Donald	Moran	
Mr	Edward	Moran	
Ms	Irene	Moran	
Mr	Kim	Moran	
Mr	Robert	Moylan	Coomaditchie United Aboriginal Corp
Mr	Mattew	Naylor	
Mr	Robert	Naylor	
Mr	Glenn	Pagett	
Mr	John	Pagett	
Mr	Johnathan	Pagett	
Mr	Rick	Pagett	
Mr	Shayne	Pegett	
Ms	Sheree	Rankmore	Illawarra Aboriginal Corp
Ms	Angelia	Reid	
Ms	Sharrallyn	Robinson	CEO Illawarra LALC
Ms	Jenny	Sajkovic	Wollongong NIAC
Ms	Phoebe	Sajkovic	Wollongong NIAC
Mr	Sonny	Simms	Nowra LALC
Mr	C	Smith	
Mr	Mah	Spanda	
Mr	Clayton	Stewart	
Mr	Elliott	Stewart	
Ms	Gwendoline	Stewart	
Mr	Jodie	Stewart	
Ms	Keira	Stewart	Illawarra Local Aboriginal Land Council
Ms	Lila	Stewart	
Ms	Marie	Stewart	Nowra LALC, Yuin Traditional Owner
Mr	Paul	Stewart	Nowra LALC, Yuin Traditional Owner
Mr	Roy	Stewart	
Ms	Kristy	Thomas	Coomaditchie United Aboriginal Corp
Mr	David	Thulin	
Ms	Leanne	Tungai	
Mr	Noel	Webster	
Mr	Dennis	Wellington	Jerrinja Land Council

Title	First name	Last name	Organisation
Mr	Gordon	Wellington	Shoalhaven Elders Corp. Chair.
Mr	Noel	Wellington	Jerrinja LALC
Mr	Kone	Willams	

MEETING MINUTES

Name of meeting: Aboriginal Focus Group (AFG) for the Foxground and Berry Bypass

Location of meeting: Berry Agricultural Pavilion

Meeting facilitator: Ron de Rooy

Date: 10/11/11 **Time:** 10:00 am – 1:00 pm

Attendees	
John Pagett	Site Officer
Paul Charles	Killila Housing and Welfare
Ali Maher,	National Koorie Site
Geoff Maher,	Killila Housing and Welfare
Troy Tungai	Lands Council Wollongong – Site officer
Lyle J Davis	Yuin Nation
Clint Andy	Yuin Nation
Johnathon Pagett	Site officer
Kelly Ingram	
Rick Pagett	IAC/ILALC
Noel Wellington	Jerringa LALC
Andrew Harvey	Jerringa LALC
Alfred Wellington	Jerringa LALC
Anthony Moore	Illawarra Bush Tucker Man / site officer
Leanne Tungar	Illawarra
Daniel Percival (RMS)	RMS Environment Officer (Heritage)
Denis Gojak (RMS)	RMS Senior Environmental Officer (Heritage)
Julian Watson (RMS)	RMS Senior Environmental Officer
Mark Kheireddine (RMS)	RMS Project Engineer
Rebecca Parkes	NOHS
Kelvin Officer	NOHS – Navin Officer
Ron de Rooy (RMS)	RMS Project Manager
Jason Davison	Dungarn
Pam Glover	Illawarra Local Lands Council
Lorraine Brown	Coomaditchie United Aboriginal Corp
Agnes Donovan	RMS Cultural and Heritage Advisor – Southern Region
Apologies	
Maria Maher	
Veronica Bird	
David Thulin	

Agenda

1. Welcome to Country
2. Introduction – Agnes Donovan – Aboriginal Cultural Heritage Advisor
3. Project background and update – Ron de Rooy – Project Manager
   - Julian Watson – Senior Environmental Officer
4. Navin Officer – Findings of the Foxground and Berry Bypass Aboriginal Cultural Heritage Assessment investigations -
   Draft Cultural Heritage Assessment Report for Foxground and Berry Bypass
5. Comments on the Draft Cultural Heritage Assessment Report for Foxground and Berry Bypass
6. What's the next step, where to from here

Acronyms

GU – Gerringong upgrade

FBB – Foxground and Berry bypass

BBU – Berry to Bomaderry upgrade

EA – Environmental assessment

OEH – Office of Environment and Heritage

PASAs - Potential Archaeological Sensitive Areas

Agenda item	Record of discussion
Welcome to Country	Welcome to Country by Rick Pagett.
Introduction **Agnes Donovan** **RMS Aboriginal Cultural Heritage Advisor, Southern**	Agnes welcomed all attendees and asked all those present to state their name, organisation they represent and reason they are attending the meeting.
Project Background and Update	Ron - described project update and background for each of the three projects – GU, FBB and BBU Lyle – Simms Road was a trading track – Gerringong to mountains and beyond (Aunty Mary Simms. Need to consider in accordance of relevant legislation. Ron – FBB discussion in general. Dates for display/approval/salvage etc. John Paget – why not continue work for the remainder of projects –Denis noted we do not have approval. Continuity of work issue and possibility of third project. Ron – BBU discussion. Nick Boyd is current project manager. Julian – Reform of Aboriginal Heritage Legislation was noted for the benefit of the AFG who may not be aware. For any extra information please contact OEH or Agnes. Denis – Aboriginal Community should speak up and give their perspective. Community member – RMS should do their bit too and reconciliate with the Aboriginal community. Kelvin – Participation in reform/hand our flyers/phone line to call.
Cultural Heritage Assessment Report for Foxground and Berry Bypass **Navin Officer** **Heritage Consultants**	Kelvin – presents findings of Cultural Heritage Assessment Report for FBB. This now gives an expanded understanding of the area from an archaeological perspective. Previous large investigation was for the Eastern Star Gasline. The testing undertaken for RMS has enabled this understanding to take place. A number of artefacts have been found across the PASAs identified and tested. All PASAs (Potential Archaeological Sensitive Areas) have been tested. Wider area investigated in North Berry due to PM request to investigate an alignment further away from North St. 21 PASAs and 298 test pits. Community member – Tubular clay material found near Broughton Creek? Where did it come from and was it tested? Kelvin – not tested. There is clay under all of the profiles we tested but the column we found is most likely from geotechnical investigations where a hole was drilled and filled back up. Not Aboriginal material. 236 Artefacts were found from pits. 71 per cent chert. There may be a chert source in this area. 19 PASAs where artefacts were found mainly near major spur lines, slopes, ridges. Not many found in low lying areas maybe because these

Agenda item	Record of discussion
	areas were previously dense rainforest. Historic description of area details massive areas of brush – thick rainforests and large swamps. Test North of Berry – elevated area near Bundewellah Creek was a good site for artefacts. Toolijooa Ridge – most artefacts were found lower down near flats. 23 archaeological deposits, 12 fig trees, one of which is to be removed. A 1953 aerial image of the fig tree to be removed shows it to be a relatively young tree. 3 recorded historic sites. Lyle – These are not batteground's, but are massacre sites. Ted Thomas as a 12 year old walked to Hawkesbury River and witnessed massacre sites. Kelvin – Battleground was referenced from a 19th century Aboriginal Man. Dickie Wood's Meadow – last AFG meeting we did not know where it was located. We have now narrowed it to Broughton Creek Valley. Alignment to go through section of Dickie Wood's Meadow. Community member – will it be monitored? Kelvin – RMS policy states no monitoring will be undertaken. 8-9 locations identified for salvage works to recover much larger samples of artefacts. John Paget – It seems like European heritage is more important than Aboriginal heritage Kelvin - Not true, some European heritage will be destroyed and not salvaged. A wide range of various investigations to be undertaken for heritage purposes. Julian – Discussion about Cultural Heritage Office John Paget – elders are reluctant to give information to RMS. Daniel Percival – is there a way to make it more comfortable for the elders to divulge the information? Community – no. Ron – Road may be built anyway but with respect to Aboriginal Heritage Community member – is compensation an option? Ron – this is a broader issue therefore we will make a note and discuss with the appropriate people. Kelvin – Discuss recommendations Continue consultation Avoid/protect sites that do not need to be impacted Further salvage for some sites John Paget – what was that piece of glass we found?

Agenda item	Record of discussion
	Kelvin – all material was looked at by stone artefact specialists Training for work crews to identify PAD's RMS does not approve of monitoring. Community member – Why does RMS not employ a monitoring program? Ron – Pursue consultative process for change in legislation. Denis – Add other conditions if disagree with RMS approach. Give us a better solution. Community member – put a monitoring officer on. Committee requests a monitoring officer. Ron – Comments need to be put in. Kelvin – everyone should write in and state they want a site officer Ron – there are two forms for response – Respond to this report and respond to the reform. Lyle – Archaeologists study only rocks. Anthropology is more relevant to the cultural associations we have here. John Paget – what happened with the photos of Green and Golden Bell Frog Ron – we will pursue the photo. Kelvin – Impact on Fig trees – 1 young fig tree impacted, will plant new fig trees. We need your assessment of the sites. Comments on report. Will be submitted to DP&I (Department of Planning and Infrastructure). Community member – battleground sites should be protected, not only aboriginal history but Australian history. All sites should be protected. People respect sites overseas and therefore should respect Aboriginal Sites. Ron – Comments also go to Department of Planning and Infrastructure and they can stop the project from getting approval. Julian – need your feedback in writing/recommendation for monitoring – specific sites will help us to respond in detail if you are more specific. Consultation open till 21st Nov 2011. Lyall – Europeans took land off us with weapons and made it their own place. **Resolution – As little damage as possible to Toolijooa Ridge, Dickie Wood's Meadow, protect at all costs.** **Community Resolution adopted by community members – strongly recommend RMS reconsider monitoring policy to acquire monitors on-site.** Kelvin – my recommendations are constrained by RMS.

Agenda item	Record of discussion
	Ron – Next steps, if you need help getting response in, contact myself or Agnes. **<u>Community resolution – fair and equitable distribution of workers across project.</u>**
Where to from here	Ron - Site officer application – BBU work to commence early next year. No more work on FBB until after project approval. Good progress was made during this meeting. The RMS would like to thank all attendees for their commitment and input. Meeting closed.

Appendix B

Site recording parameters

Site recording parameters

Aboriginal Sites, PADs and PASAs

The archaeological survey aimed at identifying material evidence of Aboriginal occupation as revealed by surface artefacts and areas of archaeological potential unassociated with surface artefacts. Recordings fall into three broad categories: sites, potential archaeological deposits, and potential archaeologically sensitive areas (PASAs).

Sites

A site is defined as any material evidence of past Aboriginal activity that remains within a context or place which can be reliably related to that activity.

Most Aboriginal sites are identified by the presence of three main categories of artefacts: stone or shell artefacts situated on or in a sedimentary matrix, marks located on or in rock surfaces, and scars on trees.

Frequently encountered site types within south eastern Australia include stone artefact occurrences - including isolated finds and open artefact scatters, coastal and freshwater middens, rock shelter sites - including occupation deposit and/or rock art, grinding groove sites and scarred trees. For the purposes of this section, only the methodologies used in basic site identification are outlined, together with those for the recording types encountered by this investigation.

Stone artefact occurrences

Stone artefact occurrences are the most commonly recorded site type in Australia. They may consist of single artefacts - described as isolated finds; or as a distribution of more than one artefact – often described as an artefact scatter or 'open camp site' when recording surface artefacts, or as a subsurface artefact distribution when dealing with an archaeological deposit.

Where artefact incidence is very low, either in terms of areal distribution (artefacts per square metre) or density (artefacts per cubic metre), the differentiation of the recording from background artefacts counts or background scatter may be an issue.

Isolated finds

An isolated find is a single stone artefact, not located within a rock shelter, and which occurs without any associated evidence of Aboriginal occupation within a radius of 60 metres. Isolated finds may be indicative of random loss or deliberate discard of a single artefact; the remnant of a now dispersed and disturbed artefact scatter; and/or an otherwise obscured or subsurface artefact scatter.

Except in the case of the latter, isolated finds may be considered to be constituent components of the background scatter present within any particular landform.

The distance used to define an isolated artefact varies according to the survey objectives, the incidence of ground surface exposure, the extent of ground surface disturbance, and estimates of background scatter or background discard densities. In the absence of baseline information relating to background scatter densities, the defining distance for an isolated find must be based on methodological and visibility considerations.

Given the varied incidence of ground surface exposure and deposit disturbance within the project area, and the lack of background baseline data, the specification of 60 metres is considered to be an effective parameter for surface survey methodologies. This distance provides a balance between detecting fine scale patterns of Aboriginal occupation and avoiding environmental biases caused by ground disturbance or high ground surface exposure rates. The 60 metre parameter has provided an effective separation of low density artefact occurrences in similar southeast Australian topographies outside of semi-arid landscapes.

Background scatter

Background scatter is a term used generally by archaeologists to refer to artefacts which cannot be usefully related to a place or focus of past activity (except for the net accumulation of single artefact losses).

There is no single concept for background discard or 'scatter', and therefore no agreed definition. The definitions in current use are based on the postulated nature of prehistoric activity, and often they are phrased in general terms and do not include quantitative criteria. Commonly agreed is that background discard occurs in the absence of 'focused' activity involving the production or discard of stone artefacts in a particular location. An example of unfocused activity is occasional isolated discard of artefacts during travel along a route or pathway. Examples of 'focused activity' are camping, knapping and heat-treating stone, cooking in a hearth, and processing food with stone tools. In practical terms, over a period of thousands of years an accumulation of 'unfocused' discard may result in an archaeological concentration that may be identified as a 'site'. Definitions of background discard comprising only qualitative criteria do not specify the numbers (numerical flux) or 'density' of artefacts required to discriminate site areas from background discard.

Artefact distribution

Artefacts situated within an open context are classed as an open artefact distribution, also known as artefact scatter (or 'open camp site') when two or more occur no more than 60 metres away from any other constituent artefact. The 60 metre specification relates back to the definition of an isolated find (Refer above). The use of the term scatter is intended only to be descriptive of the current archaeological evidence and does not infer the original human behaviour which formed the site. The term open camp site has been used extensively in the past to describe open artefact scatters. This was based on ethnographic modelling suggesting that most artefact occurrences resulted from activities at camp sites. However, in order to separate the description from the interpretation of field evidence, the terms artefact scatter, artefact distribution or artefact occurrence are now more extensively used. The latter two options can also be used to categorise artefacts occurring in sub-surface contexts.

Rock shelter sites

In a rock shelter, a site is defined as one or more artefacts occurring within or immediately adjacent to the sheltered space. Unlike a single artefact in an open context, a rock shelter provides a probable occupational focus to the interpretation of a single artefact and can therefore be considered to be indicative of a site rather than a background occurrence. An exception would be a single artefact which may have been deposited in the shelter through natural processes.

Rock art

Any location containing one or more marks of Aboriginal origin on rock surfaces is classed as a site. Marks typically consist of grinding features such as grinding grooves for hatchet heads, and rock art such as engravings, drawings or paintings. The boundaries of these sites are defined according to the spatial extent of the marks, or the extent of the overhang, depending on which is most applicable to the spatial and temporal integrity of the site.

Scarred trees

Trees with scars of Aboriginal origin form the other major type of artefactual evidence. Each tree is normally considered to be a separate site. The identification of a scar as Aboriginal in origin is dependent on a set of inter-related interpretive criteria. The credibility of alternative causal explanations such as natural traumas and other types of human scarring must be tested for each scar.

A range of diagnostic criteria has been developed to assist in the identification of Aboriginal scarred trees. The following criteria are based on archaeological work conducted by Simmons (1977) and Beesley (1989), and the field manual for Aboriginal scarred trees developed by Long (2005):

1. The scar does not normally run to ground level: (scars resulting from fire, fungal attack or lightning nearly always reach ground level). However, ground termination does not necessarily discount an Aboriginal origin (some ethno-historical examples of canoe scars reach the ground).

1(a). If a scar extends to the ground, the sides of the original scar must be relatively parallel: (natural scars tend to be triangular in shape.

2. The scar is either approximately parallel sided or concave, and symmetrical: (few natural scars are likely to have these properties except fire scars which may be symmetrical but are wider at the base than their apex. Surveyors marks are typically triangular, and often adzed).
3. The scar should be reasonably regular in outline and regrowth: scars of natural origin tend to have irregular outlines and may have uneven regrowth.
4. The ends of the scar should be 'shaped', either squared off, or pointed (often as a result of regrowth): (a 'keyhole' profile with a 'tail' is suggestive of branch loss).
5. A scar which contains adze or axe marks on the original scar surface is likely to be the result of human scarring. Their morphology and distribution may lend support to an interpretation of an Aboriginal origin: (marks produced after the scarring event may need to be discounted).
6. The scar must date to the time of Aboriginal bark exploitation within its region: The traditional Aboriginal exploitation of bark probably ceased in most regions between 100 and 150 years ago. However, in some locations associated with Aboriginal settlement, the Aboriginal removal of bark may have continued to the present day, or restarted as part of new cultural movements.
7. The tree must be endemic to the region: (and thus exclude historic plantings).

Field based identification of Aboriginal scars, is based on surface evidence only and will not necessarily provide a definitive classification. In many cases the possibility of a natural origin cannot be ruled out, despite the presence of several diagnostic criteria or the balance of interpretation leaning toward an Aboriginal origin. For this reason interpretations of an Aboriginal origin are qualified by the recorder’s degree of certainty. The following categories were used:

- Aboriginal scar - This is a scar where an Aboriginal origin is considered the most likely. The scar conforms to all of the criteria and a natural origin is considered unlikely and improbable.
- Probable Aboriginal scar - This is a scar that conforms to all of the criteria and where an Aboriginal origin is considered to be the most likely. Despite this, a natural origin cannot be ruled out.

- Possible Aboriginal scar - This is a scar which conforms to all or most of the criteria and where an Aboriginal origin cannot be reliably considered as more likely than alternative natural causes. The characteristics of this scar will also be consistent with a natural cause.

Potential archaeological deposits

A potential archaeological deposit, or PAD, is defined as any location where the potential for subsurface archaeological material is considered to be moderate or high, relative to the surrounding project area landscape. The potential for subsurface material to be present is assessed using criteria developed from the results of previous surveys and excavations relevant to the region. Where necessary, PADs can be given an indicative rating of their 'archaeological potential' based on a combined assessment of their potential to contain artefacts, and the potential archaeological value of the deposit.

Table A2.1 illustrates the matrix on which this assessment is based. Locations with low potential for artefacts fall below the threshold of classification. In such cases the potential incidence of artefactual material is considered to be the same as, or close to that for background scatter. Where there is moderate potential for artefacts, the predicted archaeological potential parallels the potential significance of the deposit. For deposits with high potential for artefacts, the assessed archaeological potential is weighted positively.

The boundaries of PADs are generally defined by the extent of particular micro-landforms known to have high correlations with archaeological material. A PAD may or may not be associated with surface artefacts. In the absence of artefacts, a location with potential will be recorded as a PAD. Where one or more surface artefacts occur on a sedimentary deposit, a PAD may also be identified where there is insufficient evidence to assess the nature and content of the underlying deposit. This situation is due mostly to poor ground surface visibility.

Table A2.1 Matrix showing the basis for assessing the archaeological potential (shown in bolded black text) of a potential archaeological deposit

		Potential to contain Aboriginal objects		
		Low	***Moderate***	***High***
Potential archaeological significance	***Low***	---	**low**	**moderate**
	Moderate	---	**moderate**	**high**
	High	---	**high**	**high**

Potential archaeologically sensitive areas

Where a predictive model has been substantially tested and refined against a corpus of subsurface archaeological results, the resulting degree of certainty associated with areas of predicted potential allows the use of a term such as Potential Archaeological Potential (PAD), (refer above). In contrast, where a model remains largely untested, as is the case for the Southern Illawarra coastal hinterland, it must necessarily be inclusive and general in its use of criteria. There is therefore a consequential level of uncertainty in the model's predictions. On-going refinement of the model following the application of test results may well establish a more discriminatory and exclusive subset of archaeological predictions.

It is the intention of the assessment program to progressively test and revise the predictive model through successive stages of archaeological test pitting. Through the refinement of the model, locations that were identified using an early version, may no longer qualify after model refinement. In view of both the higher level of uncertainty associated with the current Southern Illawarra model, and the related risk of identifying areas as PADs in contexts which may subsequently be considered to have lesser or no potential, an alternative terminology has been adopted for this assessment.

Those areas which are consistent with the current predictive criteria have been termed Potential Archaeologically Sensitive Areas (PASAs). This term is intended to denote that the archaeological sensitivity of the identified area remains subject to confirmation and model refinement. The use of this term is deliberately distinct from potential archaeological deposit (PAD). In the context of the present investigation, the identification of a PASA is more tentative, and based on a less tested regional model, than for a PAD.

At present some PASAs include known site locations. This is not a contradiction. Despite the presence of one or more surface artefacts, a reliable prediction regarding the nature of any associated subsurface artefact distribution cannot yet be made for Southern Illawarra coastal plain sites. Elsewhere across NSW, a low incidence of surface artefacts is often associated with a higher subsurface incidence. However, within the Southern Illawarra, and especially within areas of former rainforest vegetation, low numbers of surface artefacts may yet be a reliable reflection of the below-ground resource. Given the regional uncertainty regarding the nature and incidence of archaeological deposits, a PASA identification in association with surface artefacts (a site) should not be inferred to correspond to a PAD for that site.

The identification of PASAs within the project area was based on the following:

- The predictive model criteria developed in the route options assessment stage of the project.
- Ethno-historical information.
- A review of landscape characteristics relative to known archaeological site patterning and landscape disturbance.
- Locations suggested by local Aboriginal community representatives.

Appendix C

Location of Aboriginal cultural heritage recordings

[Mapping not included in this report version]

Appendix D

Test pit locations and transects

[Mapping not included in this report version]

Appendix E

Pit data and soil profile descriptions

Pit data and soil profile descriptions

[Map grid references for each test pit location not included in this report version]

G2B - Foxground and Berry bypass (PASA 12)

Pit number	Spit number	Depth (cm)	Description
1			
	1	0-10	Rich dark brown sandy clayey loam, grass roots + tree roots, some rounded gravels + cobbles in base of spit.
	2	10-20	Continuing with increasing clay, tree roots continuing.
	3	20-30	Increasing clays onto a layer of river cobbles in base of spit.
	4	30-40	Grading onto large orange/brown sandy clays.
	5	40-45	Massive compact orange/brown clays.
3			
	1	0-10	De-turfed - Dark brown sandy clayey loam, grass roots. Lots of glass + ceramics. Cobbles (sub-rounded) appearing 25 cm.
	2	10-20	Continuing with increasing clays. Nodules of red + orange clay. Historic artefacts continuing into base of spit. Sub-rounded cobbles (<80 mm) continuing.
	3	20-30	Continuing increasing clays + compaction. Small brick fragment, otherwise decreasing historical artefacts.
	4	30-40	Increasing red/brown sandy clays, fine grained.
	5	40-50	Layer of river cobbles 45cm. Grades onto compact brown clays.
4			
	1	0-10	De-turfed – Dark brown sandy clayey loam, increasing orange/brown sandy clays in base of spit. Some sub-rounded cobbles <100mm.
	2	10-20	Increasing orange/brown sandy clays. Decreasing cobbles, 300mm sub-rounded rock embedded in base of spit.
	3	20-30	Grades onto massive orange brown clays.
5			
	1	0-10	De-turfed – Thin layer of dark brown sandy clayey loam, compact layer of nodules + rounded river cobbles < 50mm, consistent through spit.
	2	10-20	Continuing with cobble size + density decreasing.
	3	20-30	Continuing some large cobbles (<450mm), grey/brown clays increasing.
	4	30-40	Cobbles decreasing in size. Increasing grey clays.
	5	40-50	Continuing orange/brown sandy clays in base.
	6	50-60	Grading onto orange/brown clayey sands. Cobbles decreasing.
	7	60-70	Continuing with appearance of cobbles.
	8	70-80	Increasing clays + moisture. Increasing cobbles.

Pit number	Spit number	Depth (cm)	Description
	9	80-90	Continuing.
	10	90-100	Clays increasing as above.
	11	100-110	Continuing.
	12	110-120	Sand grain size increasing.
	13	120-130	Coarse sand, cobbles decreasing.
	14	130-140	Dense layer of river cobbles in coarse clayey sandy matrix.
6			
	1	0-10	De-turfed – Rich dark brown sandy clayey loam with patches of brown/orange gritty sands in base of spit. A few sub-rounded cobbles <50mm.
	2	10-20	Continuing increasing cobbles, some sub-angular.
	3	20-30	Increasing large brown clays, sand patches decreasing. Some patches of decaying roots.
	4	30-40	Grades onto massive fine-grained orange/brown clays.
7			
	1	0-10	De-turfed – Dark brown sandy clayey loam, patches of orange/brown silty sandy. Some sub-rounded cobbles in base of spit (100mm).
	2	10-20	Continuing with increasing clays. Some sub-rounded cobbles continuing.
	3	20-30	Increasing brown clays. Decreasing cobbles.
	4	30-40	As above, increasing density.
	5	40-45	Grading onto large brown clays.
8			
	1	0-10	De-turfed – Rich dark brown sandy clayey loam, tree roots continuing into base of spit.
	2	10-20	Increasing brown sandy clays + compaction, tree roots continuing. Flecks of decaying roots.
	3	20-30	Increasing clay density, roots continuing.
	4	30-40	Continuing decaying roots present.
	5	40-50	Grading to orange/brown sandy clays, medium compaction, fine grained. Decaying roots continuing into base of spit.
	6	50-60	Continuing, increasing compaction.
	7	60-70	Grading onto rounded cobbles (<150mm) in base of spit.
	8	70-80	Cobbles continuing in base, clays increasing. Patch of sandy dusky red clay in base.
	9	80-90	Grading onto brown large clays in eastern side of pit, cobbles in western side.
	10	90-100	Increasing coarse sands in western side of pit.
	11	100-110	Onto gravels, cobbles, orange/brown coarse sand.

Pit number	Spit number	Depth (cm)	Description

Pit number	Spit number	Depth (cm)	Description
9			
	1	0-10	De-turfed – Thin layer of dark brown sandy clayey silt. Turf string, large (<200mm) angular cobbles + gravels. Grading to brown/orange sandy clays with embedded angular + sub-rounded cobbles. Grass + tree roots (fine) disturbed.
	2	10-20	Mottled orange/orange-brown sandy clays continuing, cobbles continuing, decreasing in size.
	3	20-30	Continuing, large lumpy clays, brown bottle glass. Some gravels continuing. Cicada holes.
	4	30-40	Increasing clay density. Rounded cobbles (<150mm) continuing, absence of angular rock.
	5	40-50	Clays increasing, cobbles decreasing. Some patches of gravelly, coarse orange brown sand.
	6	50-60	Onto orange-brown coarse sands, cobbles (<150mm) and gravels sub-rounded.
	7	60-70	As above - onto sands (orange-brown) cobbles decreasing.
	8	70-80	Coarse orange brown sands+ cobbles (<200mm)
10			
	1	0-10	Silty clay loam – De-turfed, grey/brown with yellow inclusions.
	2	10-20	Silty clay loam – grey/brown with yellow inclusions
	3	20-25	Clay loam – grey/brown with yellow inclusions, some rocks.
	4	25-40	Clay loam, grey/brown with some rocks.
	5	40-43	Clay loam, some rocks – grey/brown.
	6	43-57	Clay loam – grey/brown some rocks.
	7	57-70	Clay loam – grey/brown some rocks.
	8	70-80	Clay loam, grey/brown some rocks and charcoal.
	9	80-90	Compacted clay loam – grey/brown and charcoal.
	10	90-100	Compacted clay loam – grey/brown and charcoal
	11	100-110	Grey/brown clay loam with some charcoal
	12	110-120	Grey/brown clay loam with some charcoal
11 to 19	Numbers not allocated		
20			
	1	0-10	De-turfed – Dark brown sandy clayey loam grass roots.
	2	10-20	Continuing with increasing clays + compaction.
	3	20-30	Increasing orange – brown sandy clays.
	4	30-40	Continuing rounded boulder (<400mm) in base of spit.
	5	40-50	Grading onto cobble (sub-rounded) layer in sandy clayey matrix.

Pit number	Spit number	Depth (cm)	Description
	6	50-60	Cobbles + decomposing rock continuing.
	7	60-70	Continuing, increasing brown clay.
	8	70-80	Onto orange brown sandy clays.
21			
	1	0-10	Thick grass onto brown clayey loam damp.
	2	10-20	As above.
	3	20-30	As above, less damp and more compact with depth.
	4	30-40	As above.
	5	40-50	Grades to more clayey brown and lighter orange/brown clayey sand.
	6	50-60	Grades to orange/brown sandy clay.
22			
	1	0-10	De-turfed – Rich dark orange/brown sandy clayey silt. Grass roots.
	2	10-20	Continuing with increasing clays.
	3	20-30	As above, patches of orange – brown compact clays, decaying roots.
	4	30-40	Onto compact orange/brown sandy clays.
	5	30-40	Continuing.
23			
	1	0-10	Thick grass onto brown loam, damp.
	2	10-20	As above, more clay with depth, tree roots.
	3	20-30	As above.
	4	30-40	Grading to brown & orange/brown clayey sand, some charcoal.
	5	40-50	As above.
	6	50-60	Grades to orange/brown sandy clay.
24			
	1	0-10	De-turfed. Rich dark brown sandy clayey silt. Grass and tree roots.
	2	10-20	Increasing clays, roots continuing.
	3	20-30	Continuing increasing clays.
	4	30-40	Grading to compact orange/brown sandy clays.
	5	40-50	Increasing compaction.
25			
	1	0-10	Thick grass onto brown sandy loam grades to brown clayey sand.
	2	10-20	As above, patch of pebbles and cobbles, rounded, unsorted, tree roots, some charcoal.
	3	20-30	Brown clayey sand, pebbles/cobbles end.
	4	30-40	More sandy with depth, some cobbles.
	5	40-50	As above, tree roots.
	6	50-60	Grades onto cobles and sandy clay tree roots.

Pit number	Spit number	Depth (cm)	Description
	7	60-70	Cobble layer decreased onto brown clayey sand.
	8	70-80	As above, tree roots.
	9	80-90	As above, layers of cobble, tree roots continued.
	10	90-100	Grades to mixture of cobbles and brown sand.
26			
	1	0-10	Thick grass onto brown loam, sandy and clayey.
	2	10-20	As above, more sand and clay with depth.
	3	20-30	Grades to brown sandy loam with orange/brown sandy clay, some charcoal.
	4	30-40	Orange/brown sandy clay.
27			
	1 2	0-10 10-20	Thick grass onto brown loam. As above, some charcoal and ironstone.
	3	20-30	As above, sandier with depth, some small gravels, more clay.
	4	30-40	Grades quickly onto brown clayey sand with rounded, unsorted pebbles and cobbles.
	5	40-50	Sand, pebbles and cobbles continued. Linear charcoal and burning feature at end of pit – charcoal sample taken.
	6	50-60	As above.
	7	60-70	As above.
	8	70-80	As above.
28			
	1	0-10	Thick grass onto brown loam.
	2	10-20	As above.
	3	20-30	As above, more clay and orange colour with depth.
	4	30-40	Grades to clayey sand, some cobbles.
	5	40-50	Grades to orange/brown sandy clay, some cobbles.
29			
	1	0-10	Grass onto brown loam and some cobbles sandy loam.
	2	10-20	As above, gravel and cobbles continued.
	3	20-30	Grades to clayey sand with some gravels and cobbles.
	4	30-40	Grades to sandy clay with some cobbles and gravels.
	5	40-50	Orange/brown sandy clay, cobble and pebble inclusions.
30			
	1	0-10	Thick grass onto brown loam with large cobbles and pebbles.
	2	10-20	As above, including large cobbles.

Pit number	Spit number	Depth (cm)	Description
	3	20-30	As above
	4	30-40	As above
	5	40-70	Grades onto cobbles with sandy clay orange/brown.
31			
	1	0-10	Thick grass onto orange/brown clayey loam, worms.
	2	10-20	As above
	3	20-30	More clay with depth.
	4	30-40	As above
	5	40-50	Grades to sandy clay, orange/brown.
	6	50-60	Orange/brown sandy clay
32			
	1	0-10	De-turfed – Rich dark brown clayey silt few specks of decaying orange rock. Grass roots. 1 rounded cobble (<200mm).
	2	10-20	Continuing increasing clays, some sub-rounded cobbles.
	3	20-30	Increasing clays + compaction. Increasing cobble size (<400mm).
	4	30-40	Onto cobble layer with nodules of decaying rock, some orange- brown sandy clays in base of spit.
	5	40-50	Cobbles decreasing in size, orange-brown gravelly clays.
	6	50-60	Onto orange gravelly clays some embedded rounded cobbles.
33			
	1	0-10	Grass onto brown loam and worms.
	2	10-20	As above, more clay with depth.
	3	20-30	Silty clayey loam.
	4	30-40	Grades to mix of brown silty loam and orange/brown sandy clay, more clay with depth.
	5	40-50m	As above, more clay with depth.
	6	50-60	Orange/brown sandy clay.
34			
	1	0-10	Thick grass onto brown sandy loam, damp more clay with depth.
	2	10-20	As above, more clay with depth, some charcoal.
	3	20-30	Grades to clayey sandy silt, some charcoal.
	4	30-40	Grading to clayey sand, more clay with depth.
	5	40-50	More orange with depth more clay.
	6	50-60	Orange/brown sandy clay.
35			
	1	0-10	De-turfed – Dark orange/brown sandy clayey fine-grained silt grass roots.

Pit number	Spit number	Depth (cm)	Description
	2	10-20	Increasing clays. Grades onto cobble (sub-rounded <100mm) layer in base of spit.
	3	20-30	Continuing with increasing orange/brown sandy clays. Small cobbles continuing.
	4	30-40	Continuing cobbles decreasing.
	5	40-50	Onto compact orange/brown sandy clays.
36			
	1	0-10	De-turfed – Dark orange/brown sandy clayey silt, grass roots.
	2	10-20	Increasing orange clays, sub-rounded cobbles (<150mm).
	3	20-30	Increasing rounded gravels, increasing cobble size (<250mm).
	4	30-40	Cobble size decreasing, gravels + clays continuing.
	5	40-50	Continuing clays + gravels, some small cobbles (<50mm).
	6	50-60	Onto orange gravelly clayey sands.
37			
	1	0-10	Thick grass onto brown clayey silty sand.
	2	10-20	Grades to brown slightly clayey sand, some charcoal.
	3	20-30	As above
	4	30-40	As above, some cobble noted in base.
	5	40-50	As above, grades quickly onto sand, cobbles and pebbles.
	6	50-60	As above, cobbles and pebbles continued.
	7	60-70	As above
	8	70-80	Cobbles diminish onto brown sand some gravel.
	9	80-90	Grades quickly onto dense cobbles and gravels.
38			
	1	0-10	Rich dark brown clayey silts. Grass roots.
	2	10-20	Continuing increasing clays flecks of decomposing roots + decomposing red rock.
	3	20-30	Onto orange sandy clays medium compaction.
	4	30-40	Compact yellow orange clays.
39			
	1	0-10	Thick grass onto brown loam, more orange colour and clay with depth.
	2	10-20	As above, orange/brown clayey silty sand.
	3	20-30	Grades to orange/brown sandy clay artefact from base.
	4	30-40	More clay and orange colour lighter.
	5	40-50	Orange sandy clay.

Pit number	Spit number	Depth (cm)	Description
40			
	1	0-10	Rich dark brown sandy clayey silt with grass roots.
	2	10-20	Increasing orange/brown sandy clays.
	3	20-30	Onto red/brown sandy clays, medium compaction.
	4	30-40	Increasing red clays, some sand.
	5	40-50	Onto large red clays.
41			
	1	0-10	Thick grass onto brown loam, grades quickly to red/orange brown silty gravelly clay, some cobbles and angular stones.
	2	10-20	Onto orange/red brown silty clay.
42			
	1	0-10	Thick grass onto brown loam some list material in end pit, cobble with opposite end early 20th.
	2	10-20	As above, some burnt wood and charcoal in and (same end as list artefacts)
	3	20-30	Lighter more yellow colour, more sandy with depth, some cobbles and pebbles, more clay with depth.
	4	30-40	Grades to yellow/brown clayey silty sand some pebbles.
	5	40-50	Yellow/brown compact silty clay.
	6	50-105	Clay continued onto sandy clay.
43			
	1	0-10	Dark orange brown sandy clayey silt, grass + tree roots.
	2	10-20	Increasing orange/brown sandy clays + compaction, gravels at base of spit.
	3	20-30	Increasing clay density, increasing compaction, decomposing roots.
	4	30-40	As above, gravel size increasing.
	5	40-50	Cobbles decreasing. Dark/orange brown sandy silty clay.
	6	50-60	As above, yellow/brown clayey sands grading in at base of spit.
	7	60-70	Continuing
	8	70-80	Increasing orange sandy clays + compaction.
	9	80-90	Compact orange/brown sandy clay.
44			
	1	0-10	De-turfed – grass, brown sandy clay loam.
	2	10-20	Lighter brown sandy clay loam.
	3	20-28	Lighter brown sandy clay loam, can see orange coming through.
	4	28-35	Clay loam orange/brown/orange clay.

Pit number	Spit number	Depth (cm)	Description
45			
	1	0-10	De-turfed – Dark orange brown clayey silt with grass roots
	2	10-20	Increasing red/brown clays, some gravels, charcoal flakes.
	3	20-30	Continuing larger patches of charcoal.
	4	30-40	As above, gravels decreasing.
	5	40-50	Onto compact red/brown clays.
46			
	1	0-10	De-turfed – Dark brown clayey silt, grass roots.
	2	10-20	Increasing clays, some gravels appearing, speck of orange decomposing rock.
	3	20-30	Grading onto red/brown silty clay, specks of charcoal + burnt clay. Few sub-rounded cobbles (<350mm).
	4	30-40	Increasing clays, specks of burnt clay continuing.
	5	40-50	Onto large red compact clays.
47			
	1	0-10	De-turfed - sandy clay loam brown, quite orange
	2	10-20	Sandy clay loam brown, getting more orange.
	3	20-30	Clay loam (orange/brown) coming down onto orange clay.
48			
	1	0-15	De-turfed grass – Dark brown clay loam.
	2	15-30	Brown orange clay loam.
	3	30-37	Orange/brown clay loam.
	4	37-40	Orange clay, piece of brick.
49			
	1	0-10	De-turfed – Dark brown clayey silt, grass roots.
	2	10-20	Increasing brown clays + compaction.
	3	20-30	Continuing small patch of charcoal.
	4	30-40	Increasing brown clays + compaction.
	5	40-50	As above
	6	50-60	As above
	7	60-70	Increasing compaction, 1 sub-rounded cobble (<400mm) in base of spit.
	8	70-80	Continuing
	9	80-90	Onto large brown clays.
50			
	1	0-10	Grey/brown clay loam devegetated.

Pit number	Spit number	Depth (cm)	Description
	2	10-20	Clay grey/brown loam, getting more compact, some charcoal inclusions.
	3	20-30	Clay grey/brown loam getting more compact.
	4	30-38	Sandy clay grey/brown getting more compact, charcoal inclusions.
	5	38-40	Sandy clay grey/brown charcoal inclusions getting more compact
	6	40-50	Sandy clay grey/brown getting more compact, yellow clay inclusion, charcoal inclusions.
	7	50-60	Clay grey/brown, charcoal inclusions, some yellow inclusions.
51			
	1	0-10	Orange grey/brown clayey silt, some small river gravels, earthenware fragment and grass roots.
	2	10-20	Grading to orange/brown clayey gravelly sand, small rounded + sub-rounded rock nodules (<60mm).
	3	20-30	Continuing increasing rock size including sub-rounded boulders <300mm, increasing compaction.
	4	30-40	Continuing rock size decreasing, rock density increasing.
	5	40-50	As above.
	6	50-60	Increasing clays, cobbles + boulders continuing.
	7	60-70	Continuing.
	8	70-80	Onto solid cobble/gravels.
52			
	1	0-10	Sandy clay loam light grey/brown.
	2	10-20	Sandy clay loam light grey/brown, some cobbles.
	3	20-30	Sandy clay loam, light grey/brown and more cobbles.
	4	30-40	As above.
	5	40-50	As above.
	6	50-60	As above
	7	60-70	As above.
	8	70-80	As above.
53			
	1	0-10	De-turfed – Dark orange/brown clayey sand silt, fine grained grass roots.
	2	10-20	Continuing gradual increase of orange sandy clays.
	3	20-30	Increasing clays and compaction.
	4	30-40	As above
	5	40-50	As above
	6	50-60	Onto layer of rounded rock nodules + cobbles (<250mm)
	7	60-70	Onto gravelly sandy clays, rock size decreasing.

Pit number	Spit number	Depth (cm)	Description
	8	70-80	Continuing.
	9	80-90	Sands cobbles decreasing.
54			
	1	0-10	De-turfed – Rich dark orange/brown sandy clayey silt, fine grained. Grass roots.
	2	10-20	Continuing increasing orange/brown clayey sands, 1 sub-rounded boulder <300mm.
	3	20-30	Continuing some sub-rounded cobbles (<100mm) in base of spit.
	4	30-40	Compaction increasing, cobble size increasing (<200mm).
	5	40-50	Onto cobble + gravel layer, sand coarseness increasing.
	6	50-60	Dense cobble layer in coarse sandy matrix.
55			
	1	0-10	De-turfed – Dark orange/brown clayey silt, fine-grained grass roots.
	2	10-20	Continuing, increasing orange clayey sands.
	3	20-30	Continuing, increasing compaction.
	4	30-40	Continuing.
	5	40-50	Onto cobbles + boulders <600mm boulder embedded in spit.
	6	50-60	Onto gravelly coarse

G2B - Foxground and Berry bypass (PASA 13)

Pit number	Spit number	Depth (cm)	Description
1			
	1	0-10	(No grass continuing) very compact dark brown clay loam, grey clay patch on south end pit.
	2	10-20	As above. One patch circular grey clay like substance continuing (20 diameter).
	3	20-30	As above, cylinder of grey clay substance continued through entire pit.
	4	30-40	Grading to orange/brown mottled silty clay loam, cylinder of clay continued.
	5	40-50	As above increased clay commence.
	6	50-60	Grading to orange clay at base.
2			
	1	0-10	Patchy grass (not De-turfed) humic rich brown silty clay loam. Increasing clay + compaction towards base.
	2	10-20	Grading to dark brown silty clay increased compaction towards base.
	3	20-30	Grading to orange/brown silty clay loam, occasional orange clay nodules at base.
	4	30-40	As above increased clays.
	5	40-50	Grading to orange sandy clay.
	6	50-60	As above, increased compact + clay.
3			
	1	0-10	Patchy grass over humic, rich brown silty clay loam. Increased clay + compaction towards base.
	2	10-20	Grading to dark brown silty clay humic compact towards base.
	3	20-30	Grading to orange/brown mottled silty clay.
	4	30-40	Increased clay, otherwise as above.
	5	40-50	Grading to orange clay.
4			
	1	0-10	Silty clay loam, grey/brown, would have been disturbed by pastoral activity.
	2	10-20	As above, with darker grey areas.
	3	20-30	As above.
	4	30-35	Silty clay slightly darker and more compact with some roots in spit.
	5	35-40	Silty clay slightly darker and more compact.
	6	40-50	Silty clay more compacted, can see the orange natural clay appearing.
	7	50-55	Silty clay more compacted, more orange clay appearing.
	8	55-60	Silty clay as above.
	9	60-65	Silty clay more of the orange/grey clay.
	10	65-70	Silty clay (grey/brown) cut into natural orange/grey clay.
5			
	1	0-10	Light grey/brown silty clay.
	2	10-20	Light grey/brown silty clay with more compacted.
	3	20-30	Charcoal inclusions grey/brown silty clay.
	4	30-40	Grey/brown silty clay.

Pit number	Spit number	Depth (cm)	Description
	5	40-50	As above.
	6	50-55	As above.
	7	55-60	As above.
	8	60-70	As above.
	9	70-75	Silty clay grey/brown/orange/grey clay.
	10	75-80	Orange/grey clay.
6			
	1	0-20	De-turfed – grass, some rocks, sandy clay loam medium brown.
	2	20-30	Brown sandy clay loam.
	3	30-40	As above.
	4	40-50	As above.
	5	50-55	As above.
	6	55-60	Brown sandy clay loam, charcoal.
	7	60-70	Brown sandy clay loam.
	8	70-80	Brown sandy clay loam, charcoal.
	9	80-90	Brown sandy clay more compact loam, charcoal.
	10	90-100	Brown sandy clay loam.
	11	100-110	As above.
	12	110-120	More compacted clay loam.
	13	120-130	More compacted lighter brown clay.
7			
	1	0-10	Grass/turf onto brown sandy loam, some charcoal noted.
	2	10-20	As above, tree roots.
	3	20-30	As above, tree roots continued.
	4	30-40	More clay with depth, more compact.
	5	40-50	As above.
	6	50-60	Grades to brown loamy silty clay.
	7	60-70	Brown sandy clay with some orange/brown mottles, tree roots continued.
8			
	1	0-10	Turf removed onto brown clayey loam, some orange mottles, and worms.
	2	10-20	Grades to mottled orange/brown and brown loamy clay.
	3	20-30	Grades to orange/brown silty clay.
9			
	1	0-10	Turf removed, onto brown clayey loam.
	2	10-20	Grades to mottled brown and some orange/brown clayey silty loam.
	3	20-30	Grades to silty clay, brown and orange/brown.
	4	30-40	Orange/brown sandy clay.
10			
	1	0-10	No turf, bare ground onto dark brown clayey loam.
	2	10-20	As above, slightly lighter with depth.
	3	20-30	As above, brown silty clay, black irrigation pipe.
	4	30-40	Grades to brown silty clay.

Pit number	Spit number	Depth (cm)	Description
11			
	1	0-10	Sparse turf onto brown loam, some gravel, more clay with depth
	2	10-20	Grades to orange/brown sandy clay.
12			
	1	0-10	Sparse turf onto brown loam, some gravel inclusions grades quickly to mottled loam and orange/brown silty clay.
	2	10-20	Grades to orange/brown silty clay.
13			
	1	0-10	Silty clay loam, large amount of rocks black/brown.
	2	10-20	Silty clay loam, dark black/brown with yellow inclusions, large amount of rocks.
	3	20-30	Silty clay loam, dark black/brown large amount of rocks.
	4	30-40	Silty clay loam, dark black/brown with some yellow inclusions, large amount of rock fill.
	5	40-50	Silty clay loam, dark black large amount of rock fill.
	6	50-60	Silty clay loam, dark black/brown large amount of rock fill.
	7	60-70	Silty clay loam, dark black/brown fill, lots of charcoal and large amount of rock.
	8	70-80	Silty clay loam, dark black/brown fill, wood, large amount of rock.
	9	80-90	Old star picket, fill becomes different, silty clay loam, dark black/brown large amount of rock, more organic material, lots of charcoal. Voids underneath – looks fairly modern, could be the result of the construction of the sports field.
14			
	1	0-10	Turf removed onto mixed loam and clay, some charcoal.
	2	10-20	Mixed loam, clay, some charcoal, some red soft stone (?) = fill ??, wood.
	3	20-30	Fill continued.
	4	30-40	As above.
	5	40-50	As above.
	6	50-60	Onto clayey fill, more clay, mixed some cobbles.
	7	60-85	Excavated to 85 – fill to base onto orange/brown sandy clay.
15			
	1	0-10	Cut turf onto brown clayey loam.
	2	10-20	As above, some worms.
	3	20-30	More clay with depth.
	4	30-40	As above, more orange colour with depth.
	5	40-50	As above.
	6	50-60	As above.
	7	60-70	Grades to orange/brown sandy clay with some brown mottling.
	8	70-80	Orange/brown sandy clay.

Pit number	Spit number	Depth (cm)	Description
16			
	1	0-10	Cut turf onto brown loam, some clay mixed some angular stones, some fill.
	2	10-20	Grades to more orange/brown clayey sand.
	3	20-30	As above, clayey sand orange/brown.
	4	30-40	As above.
	5	40-50	As above.
	6	50-60	Grades to sandy clay, orange/brown.
17			
	1	0-10	Turfed removed, onto brown loam.
	2	10-20	As above, more compact clayey loam.
	3	20-30	As above, some charcoal.
	4	30-40	Gradual change to orange/brown clayey sand, more clay with depth, more compact with depth.
	5	40-50	Orange/brown sandy clay.
18			
	1	0-10	De-turfed – Dark brown sandy clayey silt, grass roots.
	2	10-20	Continuing with increasing brown clays.
	3	20-30	Grading to orange/brown silty clay.
	4	30-40	Continuing, increasing orange/brown clay concentration + compaction.
	5	40-50	As above.
	6	50-60	Onto massive orange/brown sandy clays.
19			
	0	0-55/60	Fill removed, fill includes brick, rock, charcoal, clay etc.
	1	60-70	Yellow/brown sand, well sorted.
	2	70-80	As above.
	3	80-90	As above, some clay with depth, grades of clayey sand.
	4	90-100	As above, more clay with depth, some charcoal uneven over pit. Less clay in east side.
	5	100-110	Grades to sandy clay.
	6	110-120	Orange/brown sandy clay.
20			
	1	45-55	Top 45 is fill, including charcoal layer, Dark orange/brown clayey sand, a few sub-rounded gravel inclusions.
	2	55-65	Continuing.
	3	65-75	Continuing with slight increase in clay density.

Pit number	Spit number	Depth (cm)	Description
	4	75-85	Orange clayey sands continuing, layer of rounded cobbles appearing in base of spit (<150mm).
	5	85-95	Grading onto coarse orange sands, gravels + cobbles (<200mm).
	6	95-105	Gravels decreasing, grading back to a sandy orange clay.
21			
	1	0-10	Disturbed bank edge, some weeds/grass onto orange/brown clayey sand.
	2	10-20	As above, clay increases with depth some charcoal.
	3	20-30	As above.
	4	30-40	As above, more clay with depth to orange/brown sandy clay.
	5	40-50	Grades to damp sandy clay.
22			
	1	0-10	Sandy loam, brown, De-turfed.
	2	10-20	Sandy loam, slightly lighter brown.
	3	20-30	As above.
	4	30-40	As above
	5	40-50	As above
	6	50-60	As above
	7	60-70	As above
	8	70-80	As above
	9	80-100	Sandy brown loam
	10	100-110	As above.
	11	110-120	As above.
	12	120-220	No samples taken same as above.
	13	220-240	Pebbly – grey/brown sand, looks as though in line with river.
23			
	1	0-10	Brown De-turfed, sandy loam compacted.
	2	10-15	Brown sandy loam, some charcoal.
	3	15-20	Brown sandy loam.
	4	20-30	As above.
	5	30-40	As above.
	6	40-50	As above.
	7	50-300	NO SAMPLES.
	8	310-320	Brown sandy clay and more clay.
24			
	1	0-10	Brown sandy clay loam, De-turfed – some orange clay inclusions.

Pit number	Spit number	Depth (cm)	Description
	2	10-15	Brown sandy clay loam, coming down into grey/brown clay with orange clay inclusions.
	3	15-20	Grey brown clay with orange/yellow inclusions.
	4	20-25	Grey/brown clay.
25			
	1	0-10	De-turfed. Orange brown sandy clayey silt. Some small angular gravels.
	2	10-20	Onto massive orange/brown clays.
26			
	1	0-10	De-turfed – Thin layer of orange/brown sandy clayey silt. Quickly grading to a large silty sandy clay. Some grass roots.
	2	10-15	Onto compact orange/brown clay.
27			
	1	0-10	Turf onto brown loam with some fill mixed in.
	2	10-20	Clayey fill material, mottled brown/oranges and gravels.
	3	20-40	Excavated to check fill/mixing depth, mixed fill until solid clay at 35 cm.
28			
	1	0-10	De-turfed – Dark brown silty sandy clay, grass roots.
	2	10-20	Onto massive orange/brown clays.

G2B - Foxground and Berry bypass (PASA 14)

Pit number	Spit number	Depth (cm)	Description
1			
	1	0-10	Black/brown compacted clay loam de-turfed with red and yellow clay inclusions
	2	10-25	Black brown clay with yellow red clay inclusions
	3	25-39	Light yellow orange clay with few red inclusions
2			
	1	0-20	De-turfed, black brown clayey loam with red/yellow clay inclusions, some grass roots
	2	20-30	Black/brown clay with red/yellow clay inclusions
	3	30-40	Lighter black/brown clay more yellow/red clay inclusions
	4	40-50	Yellow/orange clay inclusions with some grey inclusions changed to a much sandier clay
	5	50-60	Yellow clay inclusions some charcoal inclusions
	6	60-70	Yellow clay
	7	70-80	Sandy yellow clay
3			
	1	0-20	De-turfed, a lot of gravel, maybe from road work, rich dark brown sandy clay loam
	2	20-30	Yellow bedrock
	3	30-40	Yellow clay
4			
	1	0-20	Rich dark brown clay loam, yellow and red clay inclusions
	2	20-30	Dark brown clay loam yellow clay appearing some red clay inclusions
	3	30-40	Yellow clay with some orange inclusions
5			
	1	0-10	Sandy clay loam de-turfed, base coming down onto yellow grey clay
	2	10-20	Clay yellow orange
6			
	1	0-10	Dark brown clay loam, pebbly inclusions.
	2	10-20	Dark brown clay loam, more yellow red clay, rocky inclusions.
	3	20-30	Clay yellow/grey.
7			
	1	0-10	Rich dark black/brown sandy clay loam (similar to first spits of PASA 14, pit 7) Coming onto yellow/orange clay.
	2	10-20	Rich dark black/brown sandy clay loam (as above) base coming onto yellow/orange clay.

Pit number	Spit number	Depth (cm)	Description
	3	20-30	Black/brown clay with a lot of yellow/grey clay.
	4	30-50	Yellow/grey clay.
8			
	1	0-10	Rich dark brown sandy clay loam, De-turfed, some grass roots.
	2	10-15	Rich dark brown, sandy clay loam.
	3	15-20	Dark brown, coming down onto yellow clay layer, red clay inclusions.
	4	20-30	Yellow/orange clay.
9			
	1	0-10	De-turfed, dark black/brown soil (clay sandy loam).
	2	10-15	Dark black/brown soil, starting to see yellow/orange clay inclusions.
	3	15-20	Yellow/orange clay, few red clay inclusions.
	4	20-30	Yellow/orange clay.
10			
	1	0-10	Very rich dark brown/black/brown sandy clay loam.
	2	10-20	Very rich dark brown/black sandy clay loam, some red clay inclusions.
	3	20-30	Rich dark brown black sandy clay loam, base of yellow and grey clay with some red inclusions.
	4	30-40	Yellow/red clay base.
11			
	1	0-10	Dark black/brown clay sandy loam.
	2	10-20	Dark black/brown clay coming onto red/yellow/orange clay.
	3	20-30	Dark black/brown
	4	30-40	Yellow orange clay.

G2B - Foxground and Berry bypass (PASA 15)

Pit number	Spit number	Depth (cm)	Description
1			
	1	0-10	De-turfed, rich dark brown sandy clay loam. Grass roots. Increasing brown clays with depth. Patches of burnt clay.
	2	10-20	Lump of red brick, patches of charcoal. Grading onto brown sandy clays. Roots continuing.
	3	20-30	Continuing with increasing reddy brown clays. Large patches of orange decaying bedrock
	4	30-40	Continuing, increasing compaction
	5	40-50	Grading onto massive red clays, decomposing bedrock
	6	50-60	Thick orange/red clays with patches of decomposing bedrock
2			
	1	0-10	De-turfed, rich dark brown sandy clayey loam, grass roots, some red and orange clay nodules
	2	10-20	Continuing with increasing orange/brown sandy clays. Nodules of red and orange clay continuing
	3	20-30	Grading to large brown/orange clays with patches of orange decomposing bedrock
	4	30-40	Grades onto orange/brown massive clays with decomposing bedrock
3			
	1	0-10	De-turfed dark brown sandy clayey loam. Grass roots, increasing clays with depth, gravels in base of spit.
	2	10-20	Continuing with increasing orange/brown sandy clays. Nodules of decaying orange bedrock in base
	3	20-30	Increasing orange/brown clays and compaction
	4	30-35	Grades onto compacted fine-grained orange/brown clays with nodules of decomposing bedrock
4			
	1	0-10	De-turfed, dark brown sandy loam, large tree roots. Flecks of decomposing bedrock in base.
	2	10-20	Continuing with some orange/brown clays appearing ~15cm.
	3	20-30	Grading onto large orange/brown mottled clay with flecks of decomposing bedrock.
	4	30-40	Grading onto massive orange/brown clays with red/white/orange decomposing bedrock.
5			
	1	0-10	De-turfed – Dark brown clayey sandy loam. Grass + tree roots.
	2	10-20	Continuing with increasing orange/brown clays, flecks of decomposing bedrock.

Pit number	Spit number	Depth (cm)	Description
	3	20-30	Grading onto orange/brown compacted clays with flecks of decomposing orange bedrock.
6			
	1	0-10	De-turfed – Dark brown sandy clayey loam with grass roots.
	2	10-20	Continuing with increasing clay content + appearance of gravels (rounded + sub-rounded). Some disturbance – 195? Brown glass bottle base. Flecks of decomposing bedrock.
	3	20-30	Continuing with increasing clays + bedrock, burnt wood.
	4	30-40	Mottled sediments, brown clays, orange sand – disturbed. Bottle, thick melted bottle glass, red brick.
	5	40-50	Grades onto yellow sandy clay.
7			
	1	0-10	De-turfed – Rich dark brown humic sandy clayey loam with grass roots. Some gravels + decomposing orange bedrock in base of spit. Tree roots.
	2	10-20	Grading to a brown sandy clay with increasing patches of decomposing bedrock. Roots continuing.
	3	20-30	Grading onto largely massive orange/brown clays + decomposing bedrock, patches of less compact orange clayey sand.
	4	30-40	Grades onto compact orange/brown clays decomposing bedrock.

G2B - Foxground and Berry bypass (PASA 16)

Pit number	Spit number	Depth (cm)	Description
1			
	1	0-10	De-turfed – (Thick green grass) Dark brown sandy clayey loam, nodules of red/orange clay; increasing clays at base of spit. Some fine roots.
	2	10-20	Increasing tree roots, increasing orange/brown heavily compacted clays with patches of decomposing orange bedrock. Roots disappearing ~18cm. Some angular gravels appearing ~25cm.
	3	20-25	Grading onto massive heavy gravelly clays.
2			
	1	0-10	De-turfed – Dark brown sandy clayey loam, grass roots and some tree roots. Red/orange clay nodules + decaying bedrock. Grading to orange/brown sandy gravelly clay ~8cm.
	2	10-20	Grading onto large brown/orange sandy gravelly clay, tree roots decreasing.
	3	20-25	Grades onto compacted massive gravelly orange clays.
3			
	1	0-10	Dark brown sandy clayey loam with grass roots + tree roots. Increasing orange/brown clays with depth. Some sub angular cobbles (<100mm) appearing in base of spit, nodules of orange clay + burnt roots.
	2	10-20	Increasing brown/orange clays with nodules of decomposing bedrock. Tree roots continuing.
	3	20-30	Grading onto compacted gravely bedrock/clay. Some tree roots in base of spit.
	4	30-40	Tree roots at ~32cm compacted clays + decomposing bedrock.
4			
	1	0-10	Rich dark brown sandy clayey loam with grass roots, sub angular cobbles in base of spit.
	2	10-20	Increasing orange/brown clays + gravels. Some tree roots. Nodules of decaying orange/bedrock.
	3	20-30	Large amounts of decaying bedrock, in orange/brown sandy clays.
	4	30-40	Continuing with increasing decaying bedrock.
	5	40-45	Grading to a compact sandy clay + bedrock.
5			
	1	0-10	Dark brown sandy gravelly clayey loam. Patches of orange/brown clay in base of spit. Nodules of red clay.
	2	10-20	Increasing orange/brown clays compacted sandy orange/brown clay in base of spit.
	3	20-30	Grading onto massive sandy orange/clays with red/yellow decaying bedrock.

Pit number	Spit number	Depth (cm)	Description
6			
	1	0-10	De-turfed – Rich dark brown sandy clayey loam, grass roots. Sparse nodules of orange clay. Moist.
	2	10-20	Increasing orange/brown sandy clays, some small gravels.
	3	20-30	Grades onto compacted orange clays with decomposing bedrock (red/orange/yellow) burnt roots.

G2B - Foxground and Berry bypass (PASA 18)

Pit number	Spit number	Depth (cm)	Description
1			
	1	0-10	Patchy grass covering grey brown silty clay loam, grass roots
	2	10-20	As above, increasing compaction, occasional red clay nodules
	3	20-28	Grading to very light grey brown sandy clay loam occasional charcoal flecking
	4	28-34	As above increasing compaction, small roots persist
	5	34-42	Large tree roots, grading to heavy yellow clay
	6	42-50	As above
2			
	1	0-10	Grass over grey brown silty clay loam, grass roots
	2	10-20	As above, increasing compaction, gravels and cobbles, sub-angular, appears towards base
	3	20-30	Light grey brown silty clay loam with gravels and cobbles
	4	30-38	As above grading yellow clay at base
	5	38-45	Heavy yellow clay
3			
	1	0-10	Patchy grass over grey/brown silty clay loam, grass roots throughout.
	2	10-20	Grading to light grey/brown silty clay loam, occasional charcoal, occasional sub-angular gravels.
	3	20-28	As above, increase compact towards base, occasional roots.
	4	28-36	Increase clay + increase lighter yellow towards base. Increase charcoal flecks.
	5	36-44	Grading to yellow clay towards base occasional charcoal flecks.
	6	44-50	Heavy yellow clay.
4			
	1	0-10	Thick grass over grey/brown silty clay loam, occasional charcoal flecks + sub angular gravels at base grass roots.
	2	10-20	As above, increase compact towards base.
	3	20-30	As above, increase compact grading to light grey/brown silty clay loam, increase clay towards base.
	4	30-40	As above, increase clay + increase compact towards base.
	5	40-47	As above, grading to yellow clay towards base.
	6	47-52	Heavy yellow clay.
5			
	1	0-20	De-turfed, grey sandy clay.

Pit number	Spit number	Depth (cm)	Description
	2	20-30	Grey sandy clay loam, coming down onto yellow/grey clay, large red clay inclusions.
6			
	1	0-10	De-turfed – Medium grey/brown sandy clay loam base of yellow/grey clay.
	2	20-30	Medium grey/brown sandy clay loam base of yellow/grey clay.
	3	30-40	Yellow/grey clay.
7			
	1	0-10	De-turfed – Grey/brown sandy clay loam.
	2	10-20	Grey/brown sandy clay loam.
	3	20-30	Grey/brown sandy clay loam, coming down onto yellow clay base.
8			
	1	0-10	De-turfed – grass, leaves, lots of vegetation, grey/brown. Some grass roots, sandy clay loam.
	2	10-20	Grey/brown sandy clay loam coming down onto yellow/grey clay.
	3	20-30	Grey/brown clay loam with a lot of yellow clay.

G2B - Foxground and Berry bypass (PASA 20)

Pit number	Spit number	Depth (cm)	Description
1			
	1	0-12	Thick grass covering over red/brown silty loam gravels, cobbles <15cm increase towards base.
	2	12-20	As above gravels, cobbles <16cm increase in density occasional charcoal flecks.
	3	20-30	As above, occasional charcoal <20cm.
	4	30-40	Increasing clay, increase compact grading to orange/brown sandy clay with gravels + cobbles (high density).
	5	40-45	As above.
2			
	1	0-10	Thick grass covering over red/brown silty sandy loam gravels cobbles <10cm increasing towards base.
	2	10-18	As above, gravels cobles increasing in density + size. Clay content increase towards base <16cm.
	3	18-26	As above, grades to orange/brown sandy clay with gravels + cobbles <15cm.
	4	26-31	As above, increase clay, cobbles increase in density (high).
	5	31-36	As above – very compact.
3			
	1	0-12	Thick grass covering red/brown silty clay loam. Increasing clay towards base. Occasional cobbles (decaying bedrock at base) <12cm fine grass roots throughout.
	2	10-12	Increase clay charcoal pieces <1.5cm, increase at base. Cobbles increase in density, gravels towards base, grass roots + occasional small tree roots.
	3	20-28	Grades red/brown sandy clay, increase gravels, decreasing cobbles, occasional charcoal fleck – decrease in size + density.
	4	28-35	As above, grading to red clay.
	5	35-40	As above, heavy red clay occasional tar + orange nodules.
4			
	1	0-10	Thick grass over dark brown silty clay loam, fine grass roots.
	2	10-18	As above, cobbles and gravels <10cm at base. Occasional charcoal flecks increase towards base, increase clay.
	3	18-28	As above, increase clay. Few red clay orange + orange sandy clay nodules at base. Decreasing charcoal flecks.
	4	28-40	As above, grading to mottled red/brown sandy clay at base.
	5	40-50	As above, grading quickly to heavy red clay. Occasional gravels (decaying bedrock at base.

Pit number	Spit number	Depth (cm)	Description
5			
	1	0-10	Thick grass onto dark red/brown silty clay loam. Fine grass roots throughout. Clay increase towards base.
	2	10-20	Grading to red/brown clay loam, occasional charcoal flecks, clay increase towards base. Gravels + cobbles <6cm. At base.
	3	20-30	As above, increase clay, occasional charcoal flecks, gravel continued (occasional) – Decreasing towards base occasional red clay nodules at base.
	4	30-40	Grading to heavy red clay.
6			
	1	0-10	Thick grass onto dark brown silty clay loam. Grading into red brown/brown silty clay loam. Increase clay towards base.
	2	10-20	As above, increase clay increase density occasional charcoal flecks + cobbles (<6cm – probably decaying bedrock) towards base.
	3	20-30	Quickly grading to heavy red clay – increase compact, decreased charcoal.
	4	30-40	As above, increase compact.
7			
	1	0-8	Thick grass (De-turfed) onto dark brown silty clay loam. Clay increase to bottom half. Fine grass roots 0-5cm depth.
	2	8-20	Grading to red/brown clay loam, occasional charcoal, gravels appearing + increased towards base.
	3	20-30	As above, increase clay, gravels + cobble <7cm.
	4	30-38	As above, increased clay, increased gravels + increased density.
8			
	1	0-10	Dark brown silty clay loam under thick grass covering.
	2	10-18	Grading to red/brown clay loam.
	3	18-28	As above, gravels increase clay.
	4	28-35	Grades to heavy red clay cobbles <10cm at base.
9			
	1	0-10	Thick grass over dark brown silty clay loam, cobbles appear at base <15cm.
	2	10-20	As above – grading to red/brown silty clay loam. Gravels + cobbles increase towards base <16cm charcoal <2cm at base.
	3	20-28	As above, clay increase.
	4	28-36	Grading to heavy red clay gravels + cobbles increase in density.
10			
	1	0-10	Thick grass (decayed) over dark red/brown silty clay loam, cobbles + gravels at base <12cm.

Pit number	Spit number	Depth (cm)	Description
	2	10-20	As above, increase clay cobbles, gravels increase density.
	3	20-30	Grading to red/brown sandy clay gravels.
	4	30-40	Quickly grading to red clay increase compact.
11			
	1	0-10	Thick grass over dark brown silty clay loam cobbles + gravels appearing at base (sub-angular <15cm).
	2	10-20	As above, increase compact.
	3	20-28	As above, gravels + cobbles at high density.
	4	28-36	As above.
	5	36-44	Quickly.
12			
	1	0-10	Dark brown silty clay loam. Occasional charcoal bits + gravels appearing at base.
	2	10-20	As above, gravels + cobbles (sub angular) appearing halfway + increasing south end. Uneven surface.
	3	20-30	Clay still unevenly distant.
	4	30-36	Clay across whole pit, increased density towards base.
13			
	1	0-12	Dark brown silty clay loam under thick grass. Sub-angular gravels appearance towards base, grading to sandy clay loam (dark brown).
	2	12-24	As above, sudden transition to orange clay at base (uneven across pit – sloping surface) Gravels/cobbles cease quickly approx. 20cm depth.
	3	24-34	Heavy orange clay.
14			
	1	0-10	Dark brown silty clay loam, increase compact and gravels (sub-angular) + charcoal flecks appear towards base.
	2	10-20	Transition – grading to sandy clay loam (dark brown).
	3	20-30	Orange sandy clay appears suddenly at base.
	4	30-40	Heavy orange.
15			
	1	0-10	Thick grass onto dark red brown silty clay loam, increase clay. Gravels + cobbles at base.
	2	10-20	As above, orange sandy clay appearing at base(still mottled brown).
	3	20-30	Mottled orange + brown sandy clay, high density gravels (sub-angular)
	4	30-45	As above, increase compact decaying bedrock at base.
16			
	1	0-10	De-turfed some roots. Silty clay loam, rich dark brown.

Pit number	Spit number	Depth (cm)	Description
	2	10-20	Yellow grey clay with orange clay inclusions motley.
	3	30-40	Light cream clay.
17			
	1	0-12	Red/brown clay loam under thick grass roots through first half.
	2	12-22	Occasional charcoal flecks appearing towards base. Otherwise as above – increasing clay towards base.
	3	22-32	As above.
	4	32-40	As above, increasing clay + increased compact.
	5	40-50	As above.
	6	50-56	As above increased compact.
	7	56-62	As above increased clay increased compact.
	8	62-70	Gradual slight colour change towards base (lighter)
	9	70-78	As above, increased compact – gradual transition to orange/brown clay.
	10	78-84	As above, very compact.
18			
	1	0-10	Rich dark brown silty clay loam, de-turfing.
	2	10-20	Rich dark brown silty clay loam.
	3	20-30	Rich dark brown silty clay loam – more compacted.
	4	30-40	Rich dark brown silty clay loam.
	5	40-55	Rich dark brown.
	6	55-70	Rich dark brown silty clay loam.
	7	70-80	Compacted brown clay (lighter and redder).
19			
	1	0-10	Thick grass (De-turfed) over red/brown silt loam.
	2	10-18	Grading to red/brown sandy loam increase compact.
	3	18-28	As above, occasional charcoal flecks, small tree roots.
	4	28-38	As above.
	5	38-44	As above.
	6	44-52	As above, increased compact.
	7	52-60	Gradual colour change – lighter increased clay – light red/brown sandy clay loam, increasingly compact towards base.
	8	60-68	Snake hole east wall in the spit, as above increased compact.
	9	68-78	As above.
	10	78-90	Grading to lighter orange sandy gravels + cobbles <8cm sub-rounded cobbles increase in density.
	11	90-100	As above, gravels + cobbles increase in density.

Pit number	Spit number	Depth (cm)	Description
	12	100-110	As above, gravels + cobbles <10cm sub angular – sub-rounded.
	13	110-120	As above, gravels cobbles boulders <26cm sub-rounded.
	14	120-130	As above, gravels cobbles boulders sub-rounded increase density.
	15	130-140	As above.
20			
	1	0-10	Dark grey/brown sandy clay loam under thick grass covering. Fine grass roots throughout (decreasing).
	2	10-22	Gravels appear towards base, clay increase towards base. Quickly appearing orange/brown mottled sandy clay loam.
	3	22-30	Continuing as above, increase clay, high density gravels, increase density.
	4	30-35	Increase clay – orange, increase density, cobbled decaying bedrock at base.
21			
	1	0-10	De-turfed, rich dark brown loam (sandy) some grass roots.
	2	10-20	Rich dark brown sandy loam.
	3	20-30	Rich dark brown sandy loam (more clayey)
	4	30-40	Dark brown sandy clay loam.
	5	40-50	Lighter brown sandy clay.
	6	50-60	Lighter brown sandy clay rubble.
	7	60-70	Red brown clay.
22			
	1	0-10	De-turfed, rich dark brown sandy loam, some roots.
	2	10-20	Rich dark brown sandy loam.
	3	20-30	Rich dark brown sandy loam.
	4	30-40	Lighter brown sandy clay loam.
	5	40-50	Rich dark brown sandy clay (still quite sandy, but getting more compact)
	6	50-60	Lighter brown/yellow clay.
23			
	1	0-10	De-turfed, rich dark brown sandy loam, some roots.
	2	10-20	Rich dark brown sandy loam.
	3	20-30	Rich dark brown sandy loam.
	4	30-40	Rich dark brown sandy loam, getting lighter in colour pebbles.
	5	40-50	Lighter dark brown-compacted clay.

G2B - Foxground and Berry bypass (PASA 23)(incorporates PASA 21 and 22)

Pit number	Spit number	Depth (cm)	Description
1			
	1	0-10	De-turfed rich red brown sandy clayey humic 10cm with grass roots + tree roots.
	2	10-20	Continuing with increased sands + clays (decreased humics) tree roots continuing.
	3	20-30	Continuing increasing orange/brown clays, nodules of orange clay in base of spit.
	4	30-40	As above
	5	40-50	As above
	6	50-60	Increasing clays, increasing compaction.
	7	60-70	As above
	8	28-36	Grades onto compact smooth rich brown sandy clay.
2			
	1	0-10	Grass onto brown loam.
	2	10-20	As above, some clay with depth some charcoal noted.
	3	20-30	Grades to lighter yellow/brown loamy clayey sand.
	4	30-40	Grades to yellow/brown clayey sand.
	5	40-50	As above.
3			
	1	0-10	De-turfed rich dark brown humic sandy clayey loam grass.
	2	10-20	Increasing red brown sandy clay content with depth.
	3	20-30	Increasing orange brown clays, increasing compaction
	4	30-40	Compacted orange/brown sandy clay appearing in base of spit.
	5	40-45	Grading onto compact orange/brown sandy clay.
4			
	1	0-10	Grass onto brown loam.
	2	10-20	As above, grades to lighter yellow/brown clayey sandy loam.
	3	20-28	Grades to yellow/brown clayey sand, some charcoal noted.
	4	28-36	Clay increase in clay with depth to sandy clay.
5			
	1	0-10	De-turfed dark brown humic sandy clayey loam with grass.
	2	10-20	Increasing red orange brown sandy content + compaction.
	3	20-30	Grading to a compact orange/brown sandy loam.
6			
	1	0-10	Grass onto brown sandy loam lighter with depth.

Pit number	Spit number	Depth (cm)	Description
	2	10-20	Grades onto yellow/brown clayey sand some charcoal.
	3	20-30	Grades to yellow/brown sandy clay
7			
	1	0-10	De-turfed rich brown sandy clayey loam, grass roots, sparse orange clay nodules.
	2	10-20	Continuing with increasing clays, no clay nodules present.
	3	20-30	Grading onto compact orange/brown clays.
8			
	1	0-10	Grass onto brown loam.
	2	10-20	As above, more sandy with depth.
	3	20-30	Grades to yellow/brown sandy clay some charcoal & pieces degrading wood.
9			
	1	0-10	De-turfed rich dark brown sandy clayey loam with grass roots.
	2	10-20	Increasing orange brown clays + compactness.
	3	20-22	Grading onto compact orange brown sandy clay.
10			
	1	0-10	Thick grass onto brown clayey loam charcoal flecks & some ironstone gravel.
	2	10-20	Grades to yellow/brown sandy clay with ironstone gravel inclusions
11			
	1	0-10	De-turfed rich brown loamy sandy clay, slightly moist some fine grass roots.
	2	10-20	Continuing increasing yellow brown sandy clay with depth some fine gravels.
	3	20-27	Grading onto compact yellow/brown gravelly sandy clay.
12			
	1	0-10	Grass onto light brown sandy loam.
	2	10-20	Grades to yellow/brown sandy clay with ironstone gravel inclusions.
13			
	1	0-10	Rich dark brown sandy clayey loam, grass roots, nodules of burnt clay, burnt roots.
	2	10-20	Increasing clay with depth small gravels appearing, continuing to base of spit. Increasing yellow brown clay content & density gravels include ironstone.
	3	20-28	Grading onto large yellow brown gravelly sandy clays.
14			
	1	0-20	Grass onto brown sandy loam

Pit number	Spit number	Depth (cm)	Description
	2	20-40	Grades quickly to yellow/brown sandy clay some ironstone gravels
15			
	1	0-10	De-turfed – dark brown sandy clayey loam with grass roots.
	2	10-20	Continuing with increasing yellow/brown clay, some small gravels.
	3	20-25	Grading onto compact yellow/brown clays.
16			
	1	0-10	Thick grass onto brown sandy loam.
	2	10-20	As above.
	3	20-30	Grades to yellow/brown sandy clay.
17			
	1	0-10	De-turfed – dark brown humic sandy clays, grass roots.
	2	10-20	Increasing orange/brown clays and some small gravels increasing compaction.
	3	20-30	Grades onto solid orange/brown gravelly sandy compacted clays.
	4	30-40	
18			
	1	0-10	Grass onto brown loam.
	2	10-20	Grades to lighter brown clayey sandy loam.
	3	20-30	Grades to yellow/brown sandy clay.
19			
	1	0-10	De-turfed, rich dark brown humic sandy clayey loam, some fine grass roots.
	2	10-20	Continuing with increasing sandy clay.
	3	20-30	As above, increasing compaction.
	4	30-40	As above.
	5	40-50	Grading to dense massive orange/brown clay.
20			
	1	0-10	Grass onto brown loam.
	2	10-20	As above.
	3	20-30	As above, some charcoal noted.
	4	30-40	As above.
	5	40-50	As above.
	6	50-60	More sandy with depth, some clay and some charcoal noted.
	7	60-70	Grades to brown clayey sand, some charcoal.

G2B - Foxground and Berry bypass (PASA 24)

Pit number	Spit number	Depth (cm)	Description
1			
	1	0-10	De-turfed (thick green grass) rich dark brown clayey loam, grass roots moist.
	2	10-20	Continuing, mild clay increase with depth, grading to a dark brown silty sandy clay.
	3	20-30	Continuing increasing clays.
	4	30-40	Continuing.
	5	40-50	Continuing with some orange/grey clays appearing. Some small fine crystal fragments.
	6	50-55	Grading onto orange/brown compacted smooth massive clays.
2			
	1	0-10	De-turfed rich dark brown sandy clayey loam, grass roots.
	2	10-20	Continuing with increasing clay.
	3	20-30	Continuing sparse orange/clay nodules.
	4	30-40	Continuing clay nodules decreasing orange/brown clay content + compaction increasing.
	5	40-50	Grades onto smooth on compact orange/brown clay.
3			
	1	0-10	De-turfed (thick green grass) dark brown sandy clayey loam, fine grass roots, fine grained.
	2	10-20	Continuing with increasing orange-brown clay content.
	3	20-30	As above.
	4	30-40	Continuing slight orange/brown clay increase.
	5	40-50	As above.
	6	50-60	Grading onto compact orange/brown clay.
4			
	1	0-10	De-turfed – rich dark sandy clayey loam, grass roots.
	2	10-20	Continuing with increasing orange/brown clays.
	3	20-30	As above.
	4	30-40	As above increasing clays decreasing sand.
	5	40-50	Grading onto a compact smooth orange/brown clay.
5			
	1	0-10	De-turfed – dark brown sandy clayey loam, fine with grass roots.
	2	10-20	Continuing with increasing red brown clays.
	3	20-30	Continuing with increasing compaction.
	4	30-40	As above, tiny crystals in sandy clay.

Pit number	Spit number	Depth (cm)	Description
	5	40-45	Grading onto a compact orange/brown clay.
6			
	1	0-10	De-turfed – dark rich brown sandy clayey loam, grass roots.
	2	10-20	Continuing with increasing red brown clay content and compaction.
	3	20-30	As above.
	4	30-40	Grading onto compact orange/brown clays – hammerstone + flecked cobble found at ~33cm sitting on compacted clay.
7			
	1	0-10	De-turfed – dark brown sandy clayey humic loam with grass roots- (pit on slight gradient, deeper at south end).
	2	10-20	Continuing with increasing orange/brown clay content notably ~12cm increasing sand content.
	3	20-30	As above, increasing compaction + clay density decreasing sands.

G2B - Foxground and Berry bypass (PASA 25)

Pit number	Spit number	Depth (cm)	Description
1			
	1	0-10	Dark brown sandy clay loam grass roots (fine) De-turfed thick grass covering.
	2	10-18	Decreasing clay.
	3	18-28	Gravels occasional charcoal flecks grading to dark orange/brown clay loam.
	4	28-32	Occasional orange clay nodules towards base dark orange as above with increase clay.
	5	32-42	Grades to grey clay (compact) with gravels occasional charcoal flecks.
2			
	1	0-10	Silty dark brown clay loam, fine grass roots, under thick grass De-turfed.
	2	10-20	As above, increase clay, increase compaction.
	3	20-28	Increase charcoal <5cm thick compact at base. Orange clay nodules at base.
	4	28-36	Increase compaction, increase orange clay nodules.
	5	36-44	Grades to heavy orange/grey clay increase in compact towards base. Decreasing charcoal.
3			
	1	0-10	Dark brown silty clay loam under thick grass (De-turfed) fine grass roots to base.
	2	12-22	As above, increase clay increase compaction.
	3	22-30	Increase clay – grades to orange/brown silty clay, increase compaction.
	4	30-40	Increase compaction, increase clay grades to heavy orange clay.
4			
	1	0-10	Dark brown silty clay loam under thick grass (De-turfed) five grass roots throughout increase clay content at base.
	2	10-20	Increase clay + compaction sporadic fine grass roots continued. Charcoal. Flecks at base.
	3	20-28	Increase clay – graded to orange/brown silty clay.
	4	28-36	As above.
	5	36-44	As above – orange/brown silty clay appearing at base.
	6	44-54	Grades to orange clay mottle beginning of spit. Gravels appearing at base, decaying bedrock.
5			
	1	0-10	Thick grass onto brown silty clayey loam.
	2	10-20	As above, more clay & orange/brown with depth.

Pit number	Spit number	Depth (cm)	Description
	3	20-30	Grades to lighter orange/brown silty clayey loam, more clay with depth.
	4	30-40	As above, more clay with depth.
	5	40-50	Grades to orange/brown silty loamy clay some cobbles.
	6	50-60	Grades to silty clay.
6			
	1	0-10	Thick grass onto brown loam.
	2	10-20	As above, more orange/brown with depth more clay, some charcoal, lighter with depth.
	3	20-30	As above.
	4	30-40	As above, clay increases with depth to brown clay silt.
	5	40-50	More clay with depth to loamy silty clay artefacts in pit.
	6	50-60	Grades to orange/brown silty clay.
7			
	1	0-10	Grass onto brown silty clayey loam.
	2	10-20	Grades to orange/brown silty clayey loam.
	3	20-30	As above, more orange clay with depth.
	4	30-40	As above.
	5	40-50	As above, more clay with depth.
	6	50-60	Grades to brown red silty clay somewhat loose.
8			
	1	0-10	Thick grass onto brown clayey silty loam.
	2	10-20	Grades to orange/brown clayey loamy silt, less loamy with depth.
	3	20-30	As above.
	4	30-40	As above, more clay with depth to a silty loamy clay.
	5	40-50	Grades to loamy clay.
9			
	1	0-10	Thick grass (removed) onto brown friable loam.
	2	10-20	Grades to higher yellow/brown clayey loam.
	3	20-30	Grades to yellow/brown silty clay.

G2B – Foxground and Berry Bypass (PASA27 – incorporates PASA26)

Pit number	Spit number	Depth (cm)	Description
1			
	1	0-10	Dark brown clay loam, grass roots throughout.
	2	10-20	As above, increased clay content, increased moisture grading to orange/brown clay loam.
	3	20-28	As above.
	4	28-35	As above, increase clay gravels < 1cm.
	5	35-40	As above.
	6	40-48	Grading to heavy clayey brown clay.
2			
	1	0-10	De-turfed (thick green grass) rich dark brown clayey loam, moist some fine roots.
	2	10-20	Continuing gradual clay increase, gradual moisture increase.
	3	20-30	Gradual change to orange/brown clayey loam continuing.
	4	30-40	Grading onto a smooth grey clay moist compact.
3			
	1	0-10	De-turfed rich dark black/brown clay loam, moist some fine roots.
	2	10-20	Continuing with slight orange/brown clay increase.
	3	20-30	Continuing with increasing clay, grading onto grey compacted clay.
4			
	1	0-10	Dark brown clay loam, fine grass roots throughout.
	2	10-20	As above, occasional charcoal flecks, increased clay, increased moisture, grading to orange/brown clayey loam.
	3	20-28	As above.
		28-38	Increased clay increased compact.
	4	38-48	Grades to heavy grey/brown clay.
5			
	1	0-10	Thick grass onto brown silty loam.
	2	10-20	As above, less loam with depth at <15cm grades quickly to lighter grey/brown gravels clayey silt.
	3	20-30	Grades to yellow/brown silty sandy clay, ironstone gravels.
6			
	1	0-10	Grass onto brown silty loam.
	2	10-20	As above, less loamy with depth some gravel to gravelly silt some charcoal.
	3	20-30	Grades to yellow/brown silty gravelly clay.
7			

Pit number	Spit number	Depth (cm)	Description
	1	0-10	Thick grass onto brown clayey loam.
	2	10-20	Grades quickly to yellow/brown sandy silty clay.
8			
	1	0-10	De-turfed, dark orange/brown clayey sandy loam, increasing clay content at base.
	2	10-20	Continuing increasing clays grading to solid smooth orange/grey clay.
9			
	1	0-10	Thick grass onto brown clayey silty loam.
	2	10-20	Grades quickly to yellow/brown silty sandy clay, some charcoal & gravel – no sample taken.
10			
	1	0-10	De-turfed, dark orange/brown sandy silty clayey loam, fine grained evenly sorted.
	2	10-20	Continuing with increasing clays compact.
11			
	1	0-10	Dark brown clay loam, fine grass roots.
	2	10-18	As above, decreasing clay gravels.
	3	20-30	Grading to heavy orange clay at base.
12			
	1	0-10	Grass onto brown loam with rubbish included with stone, brick and plastic.
	2	10-20	(Area may have been altered – creek dug and spoil put into bank) Artefact.
	3	20-30	Grades to yellow/brown sandy clay.
	4	30-40	As above, more clay with depth.
13			
	1	0-10	Thick grass onto brown loam.
	2	10-20cm	As above, lighter with depth.
	3	20-30cm	As above, some gravel noted.
	4	30-40cm	Grades to loamy silty clay, some gravels.
14			
	1	0-10cm	Thick grass onto brown loam.
	2	10-20	As above, slightly lighter colour, more clay with depth.
	3	20-30	As above.
	4	30-40	As above.
	5	40-50	Grades to yellow/brown loamy clay.
15			
	1	0-10	Thick grass onto brown loam.

Pit number	Spit number	Depth (cm)	Description
	2	10-20	As above, lighter clayey yellow/brown in base.
	3	20-30	Grades to yellow/brown sandy silty clay.

G2B - Foxground and Berry bypass (PASA 28)

Pit number	Spit number	Depth (cm)	Description
1			
	1	0-10	Grass onto dark brown clayey loam, cobbles, lots of worms.
	2	10-25	Grades to orange/brown loamy clayey sandy silt.
	3	25-35	As above, increase in clay with depth, cobbles continued.
	4	35-55	Grades to orange/brown clay.
2			
	1	0-15	Grass onto brown clayey loam, cobbles some gravel.
	2	15-30	More yellow with depth, cobbles continued.
	3	30-40	Grades onto orange/brown clay some cobbles.
3			
	1	0-10	Grass onto brown clayey loam large cobbles.
	2	10-20	Grades slowly to yellow/brown clayey loam to loamy clay. Uneven change, large cobbles continued.
	3	20-30	Grades onto orange/yellow/brown clay over whole pit.
4			
	1	0-10	Grass onto brown clayey loam cobbles of large stones.
	2	10-20	As above, lots of cobbles, charcoal uneven change to orange/brown clay over some of pit.
	3	20-30	Onto orange/brown clay, rocks and cobbles.
5			
	1	0-10	Thick grass onto brown damp clayey loam, large stones & cobbles.
	2	10-20	As above, many large angular cobbles.
	3	20-30	Onto yellow/grey/brown clay & large stones.
6			
	1	0-10	Thick grass onto brown clayey loam large angular cobbles.
	2	10-20	As above, large stone boulder in centre of pit some charcoal.
	3	20-30	Grades to brown & orange/brown clay.
7			
	1	0-10	Thick grass onto brown clayey loam.
	2	10-20	As above, friable, some gravel.
	3	20-28	Grades quickly onto yellow/brown sandy clay with orange & yellow inclusions.
8			
	1	0-10	Thick grass onto brown loam.
	2	10-20	As above, some gravel.

Pit number	Spit number	Depth (cm)	Description
	3	20-30	Grades quickly onto yellow/brown gravelly clay with orange & yellow inclusions degrading bedrock.
9			
	1	0-10	Thick turf onto brown clayey loam some gravel, friable.
	2	10-20	Tree roots, as above, gravels increases with depth.
	3	20-30	Grades to yellow/brown mottled gravelly clay, some charcoal.
10			
	1	0-10	Thick turf onto brown clayey loam some gravel.
	2	10-20	As above, gravel increases with depth ironstone type gravel.
	3	20-30	Grades quickly onto yellow/brown gravelly clay.
11			
	1	0-10	Thick turf onto brown gravelly loam.
	2	10-20	As above, more gravel with depth clay increases.
	3	20-30	Grades quickly onto yellow/brown gravelly clay.
12			
	1	0-10	Thick turf onto brown clayey loam, some gravel.
	2	10-20	As above.
	3	20-30	Grades quickly onto red/brown clay with degrading stones.
13			
	1	0-10	Thick grass onto brown loam.
	2	10-20	Grades quickly onto red/orange/brown clay.
14			
	1	0-10	Thick grass onto brown clayey loam.
	2	10-20	Grades at c.17cm onto orange/brown massive clay.
15			
	1	0-10	Thick grass onto damp brown clayey loam.
	2	10-20	Grades quickly at c17cm to orange/brown massive clay
16			
	1	0-10	Thick grass onto brown clayey loam.
	2	10-20	Grades quickly onto orange/brown clay.
17			
	1	0-10	Thick turf onto brown clayey loam.
	2	10-20	Grades onto yellow/brown clay some stones.

G2B - Foxground and Berry bypass (PASA 29)

Pit number	Spit number	Depth (cm)	Description
1			
	1	0-10	Dark brown clayey loam, grass roots throughout.
	2	10-18	Continuation of same, sub-angular inclusions.
	3	18-22	Dark brown clayey loam decreasing clay content occasional red clay nodules. Assorted <5cm sub-angular gravels occasional charcoal flecks.
	4	22-35	Continuation of same, decreasing gravel, increasing sand content, increase red clay nodules, occasional charcoal flecks.
	5	35-44	Orange brown sandy clay (grades to)
	6	44-54	Increase clay content, occasional charcoal flecks.
	7	54-64	Orange clay, increase charcoal inclusions <5cm.
2			
	1	0-14	Dark brown clayey loam, orange clay nodules increase towards base. Grass roots throughout charcoal flecks.
	2	14-23	Mottled clay + Loam, sub-angular gravel (5cm or less) charcoal flecks present.
	3	23-31	Still mottled sandy clay, increase sub-angular gravels, increasingly compact (lighter orange/brown).
	4	31-40	Gravelly clay fill, dark brown clay loam at base occasional cobbles.
	5	41-50	Dark brown clay loam (friable) red clay nodules (occasional) + occasional flecks.
	6	50-58	Grading to orange brown towards base, increasing clay content, increase compact.
	7	58-64	As above.
	8	64-67	Grades to heavy orange clay.
3			
	1	0-12	Dark brown clay loam, grass roots throughout.
	2	12-30	As above.
	3	30-36	Decreasing clay increasing sand, occasional red clay nodules, charcoal flecks.
	4	36-45	Grading to orange/brown sandy clay at base, charcoal inclusions in size towards base <5 cm
	5	45-54	Large concentration charcoal on north wall, increase clay, sub-angular gravels <5cm occasional charcoal flecks.
	6	54-62	Gravelly sandy clay grading to decomposing bedrock at base.
4			
	1	0-10	Dark brown clay loam grass roots.
	2	10-21	Continuation occasional red clay nodules at base occasional fleck.

Pit number	Spit number	Depth (cm)	Description
	3	21-30	Decreasing clay content otherwise as above.
	4	30-41	Grading to orange/brown sandy clay at base.
	5	41-46	Orange/brown sandy clay, increase clay content increase compaction.
5			
	1	0-11	Dark brown clay loam, grass roots throughout, red clay nodules (occasional) at base.
	2	11-21	As above, with increase clay content towards base occasional flecks towards base.
	3	21-32	Increase sand + sub-angular gravel <5cm.
	4	32-43	Orange/brown sandy clay increase clay + compaction towards base.
6			
	1	0-10	Dark brown clay loam, sand increase at base, occasional sub-angular cobbles 5-15cm towards base.
	2	10-20	Dark brown clay loam grading to heavy orange/brown sandy clay. Occasional charcoal flecks increase compaction, decaying bedrock appearing in south wall at base.
7			
	1	0-10	Dark brown clay loam, grass roots throughout.
	2	10-21	As above, occasional + red clay nodules towards base, decreasing clay increase sand.
	3	21-31	Continued same, increase charcoal + red clay nodules.
	4	31-40	Orange/brown sandy clay, increase clay compaction.
8			
	1	0-10	Dark brown clay loam, gravels, cobbles, boulders (less than equal to 24cm sub-angular) grass roots throughout.
	2	10-24	As above, increase in density cobbles + boulders <26cm.
	3	24-27	As above, gravel cobbles boulders <68cm.
	4	27-35	Grading to orange/brown sandy clay (compact) occasional charcoal flecks.
9			
	1	0-10	Dark brown clay loam, grass roots throughout.
	2	10-20	As above, charcoal.
	3	20-28	Increase charcoal flecks + orange clay nodules.
	4	28-38	Increase sand + charcoal + compact towards base on south wall. Loamy clay still continues north half.
	5	38-43	Increase clay + increase sand towards base grading to orange/brown compact sandy clay at base throughout.
10			
	1	0-10	De-turfed dark brown clayey loam, grass roots nodules of orange clay.

Pit number	Spit number	Depth (cm)	Description
	2	10-20	Continuing with increasing clay content.
	3	20-30	Grading to a massive orange-brown/brown compacted clay.
11			
	1	0-10	De-turfed dark brown humic clayey loam, grass roots.
	2	10-20	Increasing clays, gravels, cobbles and boulders (450mm), decaying orange/white rocks.
	3	20-30	Grading onto a sandy gravelly orange clay, rock size decreasing, clay size increasing.
	4	30-35	Grades onto orange/brown compacted clay with decaying bedrock.
12			
	1	0-10	Location: De-turfed, rich dark brown humic clayey loam, sub-angular cobbles appearing in base of spit (<100mm).
	2	10-20	Continuing with increasing cobble and boulder size (250mm) increasing clays.
	3	20-30	Continuing patches of decaying orange/white bedrock decreasing rock size.
	4	30-40	Grading onto compact brown clays with embedded decaying bedrock.
13			
	1	0-10	De-turfed (thick green grass) dark brown humic clayey loam, grass roots. Patched of grey/black decomposing conglomerate rock.
	2	10-20	Continuing with increasing clay, decreasing loam. Increasing cobbles and boulders appearing (<150mm) decaying orange/white bedrock nodules in base of spit.
	3	20-28	Increasing clays (size+density) large streaks of decaying white/orange rock in base of spit.
14			
	1	0-10	De-turfed, dark rich brown clayey humic loam, grass roots, some sub-angular gravels + cobbles.
	2	10-20	Continuing with increasing clays + increasing cobbles + boulders (<250mm).
	3	20-30	Continuing with increasing clays + decreasing cobble size (<100mm). Patches of decaying bedrock and lumps of orange brown clay.
	4	30-40	Grading onto compacted orange/brown clay + decomposing bedrock.
15			
	1	0-10	De-turfed rich dark brown clayey loam with grass roots, sub angular gravels, nodules + cobbles up to 300mm25cm.
	2	10-20	Continuing with increasing cobbles and sub-rounded boulder (<450mm) decaying white/orange bedrock.
	3	20-28	Increasing rock content, decreasing rock size, grading onto decaying orange/white bedrock + clay.

Pit number	Spit number	Depth (cm)	Description
16			
	1	0-10	De-turfed dark brown humic clayey loam with grass roots specks of orange decaying rock in base of spit.
	2	10-20	Continuing with increasing clay content + size gravels + sub-angular cobbles appearing (<200mm), large patches of decaying orange bedrock.
	3	20-30	Continuing with increasing clays + bedrock.
	4	28-36	Continuing grading to massive brown clays with nodules of decaying bedrock.
17			
	1	0-10	De-turfed dark brown clayey humic loam, lots of fine grass roots.
	2	10-20	Continuing with increasing dark brown clay content, roots continuing clump of decaying orange bedrock pebbles <50mm.
	3	20-30	Grading onto a chunky orange brown clay.
18			
	1	0-10	De-turfed dark brown humic clayey loam with grass roots, specks of orange clay.
	2	10-20	Continuing with increasing sub-angular gravels, increasing orange/brown clay content and nodules of orange/red.
	3	20-30	Continuing with gravels, increasing clay content + size specks of orange + white decaying bedrock (<5mm).
	4	30-40	Grading onto compact red/brown massive clay.
19			
	1	0-10	De-turfed dark brown clayey humic loam, grass roots bits of charcoal.
	2	10-20	Continuing with increasing clay content, nodules of orange clay, some small gravels.
	3	20-30	Grading onto compact massive orange brown clay.
20			
	1	0-10	De-turfed dark brown clayey humic loam with grass roots.
	2	10-20	Continuing with increasing clay content.
	3	20-30	Continuing increasing orange/brown clay content + size some gravels, specks of red + orange clay.
	4	30-40	Decreasing gravels increasing orange/brown clays to massive clays with some fine roots.
21			
	1	0-10	De-turfed (thick green grass) dark brown humic clayey loam, grass roots, some orange clay nodules.
	2	10-20	Continuing fine roots, increasing clay content, some cobbles <200mm.
	3	20-30	Continuing with increasing orange clay content + clay size, small nodules of charcoal and burnt + red clay.
	4	30-35	Grades onto massive orange/brown clays.
22			
	1	0-10	De-turfed dark brown clayey loam, humic-rich slightly moist.

Pit number	Spit number	Depth (cm)	Description
	2	10-20	Continuing with increasing clay content, decreasing roots, some spots of burnt roots + burnt clay nodules, some orange/brown clay lumps appearing in base.
	3	20-30	Continuing with increasing orange/brown clay content, some sub-angular cobbles (<100mm) in base of spit nodules of red clay.
	4	30-40	Continuing with increasing orange/brown clay density and clay size. Flecks of orange clay, small gravels appearing in base of spit.
	5	40-50	Grading to a massive orange brown clay.

G2B - Foxground and Berry bypass (PASA 40)

Pit number	Spit number	Depth (mm)	Description
1			
	1	0-10	Grass onto brown loam grades quickly onto yellow/brown gravelly silty clay, charcoal flecks, some rubbish.
	2	10-20	As above, yellow/grey/brown silty clay with some gravel & charcoal flecks.
2			
	1	0-10	Grass onto brown loam, grades at base yellow/brown silty clay.
	2	10-20	Yellow/grey/brown silty clay some gravel charcoal noted.
3			
	1	0-10	Grass onto brown loam, some charcoal some yellow/brown clay in base.
	2	10-20	Grades quickly to yellow/brown silty clay some gravel, large charcoal patch in centre of pit.
4			
	1	0-10	.Grass onto brown loam, some charcoal.
	2	20-35	Onto yellow/grey/brown silty clay.
5			
	1	0-10	Grass onto brown loam, tree roots.
	2	10-20	Grades to yellow/brown silty clay at base.
	3	20-30	Grades to yellow/grey/brown silty clay some charcoal.
6			
	1	0-10	Grades onto brown loam.
	2	10-20	As above.
	3	20-30	Grades onto dark brown silty clay some water table.
8			
	1	0-10	De-turfed dark brown sandy clayey loam with fine roots water logged.
	2	10-20	Continuing with increasing clays, some gravels + burnt clay nodules in base of spit.
	3	20-30	Patches of orange/brown sandy clay, ground water in southern portion of pit. Continuing nodules of burnt clay.
	4	30-40	Grades onto large orange/brown clays, patches of decomposing bedrock, water logged.
10			
	1	0-10	De-turfed dark brown humic sandy clayey loam, fine roots nodules of clay.
	2	10-20	Continuing with increasing clay + compaction.
	3	20-30	Grading onto massive compacted orange/brown clays.
11			
	1	0-10	De-turfed rich dark brown sandy loamy clay, moist grass roots, small charcoal fragments.

Pit number	Spit number	Depth (mm)	Description
	2	10-20	Continuing with increasing smooth fine grained brown clays, flecks of charcoal.
	3	20-30	Continuing with patches of orange+brown sandy clay appearing in base of spit. Patches of charcoal.
	4	30-40	Grades onto massive orange/brown clays, flecks of orange decaying bedrock.
12			
	1	0-10	De-turfed rich dark brown sandy loamy clay, moist grass roots, small charcoal fragments.
	2	10-20	Continuing with increasing smooth fine grained brown clays, flecks of charcoal.
	3	20-30	Continuing with patches of orange+brown sandy clay appearing in base of spit. Patches of charcoal.
	4	30-40	Grades onto massive orange/brown clays, flecks of orange decaying bedrock.
13			
	1	0-10	Deturfed. Dark grey brown loamy sandy clay, fine-grained, grass roots. Flecks of burnt clay and charcoal.
	2	10-20	Continuing with increasing gravels and clays, patches of orange-brown sandy clay.
	3	20-30	Grades onto massive yellow brown sandy clays
14			
	1	0-10	Dark grey-brown sandy clayey loam with grass roots, grading onto a grey brown silty sandy gravelly clay.
	2	10-20	Continuing, grading onto large yellow brown clays, burnt roots, burnt clay nodules. Water table in patches
	3	20-25	Massive yellow brown clays and water table reach in half of the pit
15			
	1	0-10	Very thin layer of dark brown sandy clayey loam, ~5cm grades onto thick orange brown massive clays
16			
	1	0-10	Deturfed. Dark brown sandy loamy clays, flecks of orange clay, grass roots, bottle glass present
	2	10-20	~18cm grades onto a thick orange brown massive sandy clay
17			
	1	0-10	Deturfed. Orange grey brown loamy sandy clays. Grass roots. Some gravels in base of pit
	2	10-20	Grading onto massive yellow-brown sandy clays

G2B - Foxground and Berry bypass (PASA 41)

Pit number	Spit number	Depth (mm)	Description
1			
	1	0-10	De-turfed rich dark brown humic clayey 10cm, some sub-angular cobbles, fine roots + tree roots.
	2	10-20	Continuing with increasing clays + cobbles, spots of burnt roots + clays.
	3	20-30	Grading to a compact orange/brown sandy clay, gravels decreasing. *Artefacts.
	4	30-40	Increasing compaction, patches of decomposing bedrock.
	5	40-45	Grades onto compact sandy clay.
2			
	1	0-10	De-turfed rich dark brown humic clay 10cm. Some gravels appearing at base of spit, Grass roots
	2	10-20	Increasing clay with depth, roots continuing.
	3	20-30	Grading to orange/brown compact sandy clays.
	4	30-40	Increasing red brown sandy clays, increasing compaction.
	5	40-45	Grading onto compact red/brown clays.
3			
	1	0-10	De-turfed thin layer of dark brown sandy clayey loam, grading to mottled red brown large sandy clays ~ 2cm. Nodules of orange/grey clay. Grass roots, lots of glass fragments, charcoal lump.
	2	10-20	~12cm grades to dark brown gravelly loam, roof tile fragments.
	3	20-30	Continuing with increasing clays + appearance of gravels.
	4	30-40	Increasing clays red/brown compacted sandy clays in base of spit. Few flecks of decomposing orange bedrock.
	5	40-50	Grades onto compacted red-brown sandy clay.
4			
	1	0-10	.De-turfed rich dark brown sandy clayey loam, some gravels in base of spit. Grass roots, lots of glass fragments, continuing into base of spit.
	2	10-20	Increasing red-brown sandy clays in base of spit, glass continuing, roots continuing.
	3	20-30	Grades onto massive red/brown sandy clays.
5			
	1	0-10	De-turfed rich dark brown-black humic sandy clayey loam, grass roots.
	2	10-20	Continuing with increasing grey/brown clays. Specks of charcoal, patches of orange/brown sandy clay.
	3	20-30	Grading onto orange-brown sandy clays, some brown clay mottling.
	4	30-40	Onto massive orange-brown clays.

Pit number	Spit number	Depth (mm)	Description
6			
	1	0-10	Black grass roots, silty loam, organic soil.
	2	10-20	As above
	3	20-30	Black decreasing grass roots, black silty loam decreasing, surface is mottled lighter brown sandy loam with grass roots.
	4	30-37	Mid-brown sandy clay loam, some grass roots, much lighter than above, 3 spits, sticky and damp.
	5	37-47	Light to mild brown, charcoal lots inclusions, sticky and damp
	6	47-55	Decreasing charcoal, yellow clay, sticky loam.
7			
	1	0-10	Black-grey brown silty clay loam, De-turfed some grass roots.
	2	10-20	Black/grey clay.
	3	20-30	Black/grey clay loam.
	4	30-40	Yellow/grey clay.
8			
	1	0-10	.De-turfed rich dark brown-black sandy clayey loam, grass roots.
	2	10-20	~15cm grading to orange-grey brown sandy clays, fine-grained roots continuing.
	3	20-30	Grading to orange-brown sand clay, some brown mottling.
	4	30-40	Onto heavy orange clay.
9			
	1	0-05	Dark black/brown silty clay loam, De-turfed.
	2	05-10	Black dark brown silty clay loam.
	3	10-20	Black dark brown silty clay loam, coming down onto grey clay.
	4	20-30	Brown grey clay.
10			
	1	0-10	Black grassy organic soil, sandy loam.
	2	10-16	Dark brown, charcoal inclusions, sandy loam.
	3	16-26	Some charcoal inclusions, dark brown spit 2 decreasing, yellow clay coming through at surface.
	4	26-36	Charcoal inclusions, yellow brown sandy silty clay.
	5	36-40	Large charcoal inclusions, yellow light brown clay.
	6	40-45	Large charcoal inclusions, same as above.
	7	45-50	Yellow clay base, a few charcoal bits remain.

Pit number	Spit number	Depth (mm)	Description
11			
	1	0-10	Silty clay loam, De-turfed dark brown black.
	2	10-20	Silty clay loam, dark black brown.
	3	20-30	Silty clay dark brown loam.
	4	30-40	Dark brown silty clay loam with base of grey brown clay.
12			
	1	0-10	Black organic soil grass roots, silty loam.
	2	10-20	As above, some iron-clay inclusions.
	3	20-28	As above, more of a sandy loam.
	4	28-39	Mid-brown sandy clay loam
	5	39-45	Base is light brown-yellow some iron-rich clay inclusions, occasional charcoal speck.
	6	45-49	Light brown/yellow clay base a few charcoal specks.
13			
	1	0-10	Dark brown black silty clay loam.
	2	10-20	Dark brown black silty clay loam coming down onto a grey clay.
	3	20-30	Dark brown black silty clay loam more grey/orange clay coming through.
	4	30-40	Dark brown black silty clay, more grey loam orange clay.
	5	40-50	Orange grey clay base with a grey clay inclusion.

G2B - Foxground and Berry bypass (PASA 42)

Pit number	Spit number	Depth (mm)	Description
1			
	1	0-10	Grass onto brown loam.
	2	10-20	As above, drier with depth, angular large gravels & cobbles on base, lots tree roots.
	3	20-28	Grades quickly onto yellow/brown clay.
2			
	1	0-10	Thick grass onto brown loam, some large gravel in ½ pit.
	2	10-20	Grades quickly onto decomposing rock, gravel & clay, yellow/brown & orange.
3			
	1	0-10	Thick grass onto brown friable loam.
	2	10-20	Grades quickly at c17cm onto yellow/brown clay, tree roots, some degrading cobbles.
4			
	1	0-10	Thick grass onto brown friable loam some gravel.
	2	10-20	Grades onto clay & gravel at c17cm.
5			
	1	0-10	Thick grass onto brown loam, friable.
	2	10-20	Grades to yellow/brown clay.
6			
	1	0-10	Thick grass onto brown loam.
	2	10-20	Grades quickly onto yellow/brown clay, tree roots some gravel & cobbles.

G2B - Foxground and Berry bypass (PASA 43)

Pit number	Spit number	Depth (mm)	Description
1			
	1	0-10	Some turf onto brown sandy loam, grades quickly at base to orange/brown sandy clay.
	2	10-20	Orange/brown sandy clay.
2			
	1	0-10	Bare ground, some gravel on surface, brown loam, some orange/brown clay with depth worms.
	2	10-20	Mixed loam and orange/brown sandy clay.
	3	20-30	Orange/brown sandy clay, tree roots.
3			
	1	0-10	Bare loam some gravels, grades to mixed with orange/brown sandy clay base.
	2	10-20	Orange/brown clay.
4			
	1	0-10	Bare loam, some gravel, more orange/brown clay with depth.
	2	10-20	Brown clayey loam.
	3	20-30	As above, more orange with depth, tree roots continued.
	4	30-40	Grades to orange/brown sandy clay.
5			
	1	0-10	Bare loam some gravel, more orange clay with depth.
	2	10-20	As above, more clay with depth, tree roots.
	3	20-30	As above.
	4	30-40	More sandy clay with depth.
	5	40-50	Grades to orange/brown sandy clay.
6			
	1	0-10	Bare brown loam, some gravel, more clay with depth, damp.
	2	10-20	As above, tree roots, more compact.
	3	20-30	More orange clay with depth.
	4	30-40	As above, sandy clay, orange/brown tree roots, some charcoal.
	5	40-50	Grades to orange/brown sandy clay.
7			
	1	0-10	Bare brown loam, damp.
	2	10-20	As above, some charcoal, more orange clay with depth, tree roots.
	3	20-30	As above, sandy with depth.

Pit number	Spit number	Depth (mm)	Description
	4	30-40	Grades to orange/brown sandy clay.
	5	40-50	Orange/brown sandy clay.
8			
	1	0-10	Stubble onto brown friable loam.
	2	10-20	As above.
	3	20-30	As above.
	4	30-40	More sand with depth. Pit filled in at end of clay and emptied on 23/08/11 and continued.
	5	40-50	As above, more clay with depth.
	6	50-60	As above.
	7	60-70	As above, some orange/brown mottling some charcoal.
	8	70-80	Grading slowly to orange/brown sandy clay.
	9	80-90	Orange/brown sandy clay.
9			
	1	0-10	Weeds etc. onto brown loam.
	2	10-20	As above.
	3	20-30	As above, tree roots.
	4	30-40	Slightly lighter brown, some increase in clay.
	5	40-50	Grades to more orange/brown clayey sand.
	6	50-60	Grades to orange/brown sandy clay.
10			
	1	0-10	Rich dark brown sandy clayey loam. Recently ploughed.
	2	10-20	Continuing with dark black/brown clays increasing.
	3	20-30	Continuing, increasing clays + compaction.
	4	30-40	Grading onto large orange/brown sandy clays.
	5	40-50	Onto solid orange/brown sandy clays.
11			
	1	0-10	Rich dark brown sandy clayey loam. Recently ploughed.
	2	10-20	Continuing, increasing compaction + orange/brown sandy clays.
	3	20-30	Continuing, some tree roots.
	4	30-40	As above, roots decreasing.
	5	40-50	As above.
	6	50-60	Some orange/brown sandy compact clays in base.
	7	60-70	Large orange/brown sandy clays.

Pit number	Spit number	Depth (mm)	Description
12			
	1	0-10	Recently ploughed field, brown loose loam onto slightly orange/brown loam, more compact.
	2	10-20	As above, tree roots.
	3	20-30	As above, more compact, more clay.
	4	30-40	As above, more orange colour & clay with depth.
	5	40-50	Grades to orange/brown sandy clay.
13			
	1	0-10	Recently ploughed loose loam, more compact with depth.
	2	10-20	As above, more orange colour, more clay.
	3	20-30	As above, tree roots, some charcoal noted.
	4	30-40	As above, tree roots.
	5	40-50	As above.
	6	50-60	More clay & orange colour with depth clayey silt.
	7	60-70	Grades to orange/brown clay sandy.
14			
	1	0-10	Rich dark brown sandy clayey loam. Recently ploughed.
	2	10-20	Continuing with increasing brown clays.
	3	20-30	Increasing orange/brown clays + compaction, flecks of charcoal, tree roots in base of spit.
	4	30-40	Continuing, tree roots continuing into base of spit.
	5	40-50	Continuing clay size increasing.
	6	50-60	Increasing compaction.
	7	60-70	Large heavily compact orange/brown sandy clays.
15			
	1	0-10	Rich dark brown sandy clayey loam, some tree roots.
	2	10-20	Continuing with increasing orange/brown sandy clay.
	3	20-30	Increasing clays + compaction, decaying roots.
	4	30-40	Continuing.
	5	40-50	Grading onto compact orange/brown sandy clays in base of spit.
	6	50-60	Onto compact large sandy clays.
16			
	1	0-10cm	Ploughed brown loose loam, more compact with depth.
	2	10-20cm	As above, charcoal, patch of charcoal in centre of pit with burnt clay nodules linear feature.
	3	20-30cm	As above, charcoal ends some flecks in base, darker brown.

Pit number	Spit number	Depth (mm)	Description
	4	30-40cm	As above, darker brown from charcoal & burning, charcoal noted, clay + compactions increasing with depth
	5	40-50cm	As above.
	6	50-60cm	As above more clay with depth.
	7	60-70cm	Grades to orange/brown sandy clay.
17			
	1	0-10cm	Dark brown sandy clayey loam, fine roots.
	2	10-20cm	Grading to compact orange sandy clays, patches of brown silty clays (possible tree roots) Some tree roots.
	3	20-30cm	Onto large sandy orange clays.
18			
	1	0-10cm	Rich dark brown sandy clayey loam with grass roots.
	2	10-20cm	Continuing, increasing clays.
	3	20-30cm	As above.
	4	30-40cm	Grading onto thick orange/brown sandy clays.
	5	40-50cm	Heavy orange/brown clays.
19			
	1	0-10cm	Thick grass onto brown loam.
	2	10-20cm	Grades to mixed loam & sandy clay.
	3	20-30cm	Grades to orange/brown sandy clay.
20			
	1	0-10cm	Thick grass onto brown loam.
	2	10-20cm	Grades to mixed loam & orange/brown sandy clay.
	3	20-30cm	Orange/brown sandy clay.
21			
	1	0-10cm	Deturfed, rich dark brown sandy clayey loam grass roots. Some gravels in base of spit.
	2	10-20cm	Increasing orange/brown sandy clays with depth.
	3	20-30cm	Grading onto heavy orange/brown sandy clays.
	4	30-35cm	Massive orange clays.
22			
	1	0-10cm	Thick grass onto brown loam, damp.
	2	10-20cm	As above, some charcoal, sandy & clay.
	3	20-30cm	As above, soft section (rabbit burrow).
	4	30-40cm	As above, soft section in north end.
	5	40-50cm	As above, grades to brown sand, some clay.

Pit number	Spit number	Depth (mm)	Description
	6	50-60cm	As above, coarser sand in eastern end.
	7	60-70cm	As above, small burrow in centre some charcoal.
	8	70-80cm	Darker brown clayey sand, damp, some charcoal, burrow continued.
	9	80-90cm	As above, more damp.
	10	90-100cm	Grades quickly onto grey sandy clay, wet.
23			
	1	0-10cm	Thin layer of dark brown sandy clayey loam, grading to an orange/brown clayey sand with small (<50mm) sub-rounded cobbles.
	2	10-20cm	Orange/brown clayey sands+ cobbles continuing tree roots.
	3	20-30cm	Increasing clays, roots continuing cobbles decreasing.
	4	30-40cm	As above, rounded cobbles (<60mm) in base of spit.
	5	40-50cm	Increasing clay density patches of decomposing re + yellow rock.
	6	50-60cm	Continuing gravels increasing.
	7	60-70cm	Increasing gravels + patches of coarse sand.
	8	70-80cm	Grades onto orange & gravelly sands in western side of pit, brown silty sandy clay on eastern side.
	9	80-90cm	Orange clayey gravelly sands across base of spit.
24			
	1	0-10cm	Thick grass onto brown loam.
	2	10-20cm	As above, more clay with depth.
	3	20-30cm	As above.
	4	30-40cm	Grades to dark brown sandy clay.
	5	40-50cm	Dark brown clay, compact.
	6	50-60cm	Some orange nodules of clay.
	7	60-70cm	As above.
	8	70-80cm	Grades onto brown damp sandy clay, ironstone gravels, dark brown patch in centre.
	9	80-90cm	As above, water table reached.
25			
	1	0-10cm	Rich dark brown sandy clayey loam, grass roots.
	2	10-20cm	Increasing clays + compaction.
	3	20-30cm	Orange/brown sandy clays grading in at 26cm.
	4	30-40cm	Increasing clays, moist patches of decaying roots.
	5	40-50cm	Onto massive orange clays.
26			
	1	0-10cm	Rich dark brown sandy gravelly clayey loam with grass roots.

Pit number	Spit number	Depth (mm)	Description
	2	10-20cm	Continuing gravels decreasing clay increasing.
	3	20-30cm	Increasing orange/brown sandy clays.
	4	30-40cm	Increasing density, increasing clays.
	5	40-50cm	Orange large chunky sandy clays in base of spit.
	6	50-55cm	Onto massive orange clays with flecks of decomposing bedrock.
27			
	1	0-10cm	Thick grass onto brown clayey loam.
	2	10-20cm	As above, worms.
	3	20-30cm	As above, some rounded pebbles.
	4	30-40cm	As above.
	5	40-50cm	As above, darker brown clayey silty sand.
	6	50-60cm	As above, some orange/brown clay flecks, some charcoal.
	7	60-70cm	As above.
	8	70-80cm	As above, more clay with depth.
	9	80-90cm	As above.
	10	90-100cm	Grades to brown sandy clay.
	11	100-110cm	Brown sandy clay.
28			
	1	0-10cm	Deturfed orange/brown clayey silt, some tree roots.
	2	10-20cm	Increasing compaction, tree roots continuing.
	3	20-30cm	Grading to orange clayey sands, roots continuing.
	4	30-40cm	Increasing clay concentration + compaction massive.
29			
	1	0-10cm	Thick grass onto brown loam.
	2	10-20cm	As above, grades to brown & orange/brown loam & clay, some gravel.
	3	20-28cm	Grades onto orange/brown sandy clay, some ironstone gravel.
30			
	1	0-10cm	Deturfed dark brown fine grained clayey silt with grass roots.
	2	10-20cm	Increasing brown clays, flecks of decaying roots + bedrock.
	3	20-30cm	~25cm grades onto large yellow/brown sandy clays with flecks of decomposing rock.
31			
	1	0-10cm	Thick grass onto brown loam, some yellow clay in base.
	2	10-20cm	Grades quickly onto yellow brown sandy clay.

Pit number	Spit number	Depth (mm)	Description
32			
	1	0-10cm	Deturfed rich dark brown clayey silt with grass.
	2	10-20cm	Increasing brown clays + compaction, some small decomposing gravels.
	3	20-30cm	Onto large orange & sandy clays.
33			
	1	0-10cm	Thick grass onto brown loam.
	2	10-20cm	As above, grades to yellow/brown clayey silt.
	3	20-30cm	Grades onto brown sandy clay.

G2B - Foxground and Berry bypass (PASA 44)

Pit number	Spit number	Depth (mm)	Description
1			
	1	0-10cm	Deturfed, thin layer of dark brown sandy clayey silt grading onto compact sandy clay ~5cm, grass roots.
	2	10-20cm	Grading onto large orange brown compact clays.
2			
	1	0-10cm	Deturfed, thin layer of dark brown sandy clayey silt, quickly grading onto dark brown compact sandy clays.
	2	10-20cm	Grades onto massive orange/brown sandy clay.
3			
	1	0-10cm	Dark brown sandy clayey silt, increasing clays towards bottom of a spit.
	2	10-20cm	Continuing with increasing clays.
	3	20-30cm	Grading onto large orange/brown clays.
4			
	1	0-10cm	Deturfed, grey brown clay loam.
	2	10-20cm	Getting lighter grey clay loam.
	3	20-30cm	Grey clay loam with some orange clay inclusions. Charcoal.
	4	30-40cm	Light grey orange clays, white-ware ceramic piece.
5			
	1	0-10cm	Deturfed, dark brown silty clay loam in centre.
	2	10-20cm	Dark brown silty clay loam, coming down onto yellow/grey clay.
6			
	1	0-20cm	Top layer of light orange/grey clay, silty clay loam (dark black/brown) deturfed.
	2	20-30cm	Silty clay loam (dark black/brown) coming down onto clay (yellow/grey) some red clay inclusions.
	3	30-40cm	Dense clay, mottled colour red inclusions, some charcoal, clay – mainly yellow/grey.
7			
	1	0-10cm	Dark brown silty clay loam, charcoal inclusions, deturfed.
	2	10-20cm	Dark brown silty clay loam, getting more compact, charcoal inclusion, yellow/grey clay appearing.
	3	20-35cm	Brown silty clay loam, coming down onto yellow grey clay.
8			
	1	0-10cm	Deturfed, rich dark orange/brown sandy clayey loam, increasing clay + compaction at base of spit. Grass roots.

Pit number	Spit number	Depth (mm)	Description
	2	10-20cm	Increasing clays + compaction.
	3	20-30cm	Grades onto compact yellow/brown massive clays.
9			
	1	0-10cm	Deturfed, orange/brown sandy clayey loam, grass roots.
	2	10-20cm	Increasing orange brown clays + compaction.
	3	20-30cm	Grades onto heavy brown/orange massive clays.

Appendix F

Artefact inventory (raw data)

Artefact inventory (raw data)

Key to Raw Data Table

Types

Fl	Flake
Rt	Retouched
Rd	Redirecting
HF	Heat fragment
RS	Ridge straightening
SP	Single platform
S-D	Semi-discoidal
Bi	Bipolar
Mp	Multiplatform
Ha	Hammerstone
An	Anvil
Co	Core
Bk	Backed
Asy Bk	Asymmetric backed artefact
Sy Bk	Symmetric backed artefact
FCR	Fire cracked rock
Bu	Burin
No	Notch
Si	Side
En	End
Sc	Scraper
Mbl	Microblade
FP	Flake piece
Rt FP	Retouched flaked piece
BTF	Biface thinning flake
EGAF	Edge ground axe flake

Breakage

C	Complete
B	Broken
P	Proximal fragment
M	Medial fragment
D	Distal fragment
S	Surface fragment
Ma	Marginal fragment
L	Left half
R	Right half
RP	Right proximal fragment
LP	Left proximal fragment
L	Left medial fragment
RM	Right medial fragment
LD	Left distal fragment
RD	Right distal fragment

Raw material type

Si	Silcrete
Cht	Chert
Chl	Chalcedony
Snd	Sandstone
And	Andesite
Qtz	Quartz
Qtzt	Quartzite
Ba	Basalt
Slg	Slag
Mds	Mudstone

Termination type

F	Feather
H	Hinge
S	Step
O	Outrépassé
Cr	Crushed

Heat shattered

Y	Yes

Platform preparation

OR	Overhang removal
F	Faceting
B	Overhang removal and faceting

Cortex type

R	Rounded
A	Angular
I	Irregular

Cortex location

P	Platform of core or flake
D	Dorsal surface of flake
B	Platform and dorsal surfaces of flake
F	Core face
D	Distal end of core
F&D	Face and distal of core
P&D	Platform and distal of core
P&F	Platform and face of core

Platform type

SC	Single conchoidal
C	Cortical
Cr	Crushed
F	Focalised
MC	Multiple conchoidal
C&S	Cortical and single conchoidal
F&S	Focalised and single conchoidal
F&M	Focalised and multiple conchoidal
NFS	Non-flaked surface
HC	Heat cracked

Retouch location

V	Ventral only
D	Dorsal only
B	Bidirectional
L	Lateral (Burinate)
VF	Ventral first
DF	Dorsal first
Alt	Alternating
DVD	Dorsal-ventral-dorsal
VDV	Ventral-dorsal-ventral

Contact material

H	Hide
W	Wood

Action

T	Transverse

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
1	41	13	1	flake	Chert	broken		left			6.58	32.44				6.8			
2	41	8	3	flake	Chert	complete			yes	pot lidded	9.09	27.48	23.29	24.12	16.59	11.95	1.14	13.90	1
3	41	2	2	core	Quartzite	complete					45.27	48.31		37.18		24.89	1.30		
4	41	6	3	flake	Chert	broken	medial		yes	pot lidded	0.68	16.63							
5	41	3	1	flake	Chert	broken		marginal	yes	pot lidded	0.46	12.62							
6	41	4	1	retouched glass artefact	Glass	broken	side of bottle				6.68	36.51		29.35		4.96	1.24		
7	41	5	2	flake	Chert	broken		left proximal			8.8	27.09							
8	41	1	3	fire cracked rock	Sedimentary	broken					35.72	47.98							
9	41	1	3	flake	Chert	broken		marginal	yes	surface	1.29	21.98							
10	41	1	3	flake	Chert	broken		marginal	yes	pot lidded	1.24	20.53							
11	41	1	3	flake	Chert	broken	distal				0.64	18.65							
12	41	1	2	flake	Quartz	broken	proximal				0.68	14.51	10.2					38.73	
13	41	1	2	flake	Chert	complete					0.08	6.07	5.47	7.45	6.27	1.32	0.81	-7.54	
14	41	1	3	flaked piece	Chert	broken					0.11	8.09							

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
15	16	4	3	flake	Quartz	broken		right			0.28	12.3				3.64			
16	16	4	3	flake	Quartz	broken	proximal				0.18	10.5							
17	16	4	2	flaked piece	Chert	broken					0.62	22							
18	16	4	2	flaked piece	Quartz	broken					0.75	17.27							
19	16	4	2	flaked piece	Quartz	broken					0.36	11.45							
20	16	1	2	flake	Chert	broken		marginal			0.18	9.61							
21	16	2	3	flake	Chert	complete					11.24	39.78	15.94	26.35	18.39	10.68	1.51	-3.53	
22	16	2	3	flake	Chert	complete					1.4	23.99	6.09	12.35	10.29	4.09	1.94	-10.01	1
23	16	2	3	flake	Chert	complete					0.28	10.63	9.77	10.67	6.41	2.23	1.00	17.96	
24	16	2	3	flake	Chert	complete					0.73	17.67	13.85	11.1	5.24	2.93	1.59	27.38	1
25	16	2	3	heat fragment	Chert	broken			yes	shattered piece	4.52	33.18							
26	16	2	3	flake	Chert	broken	distal				0.1	9.52		5.05	4.02	2.63	1.89	-23.84	1
27	16	2	2	microblade	Silcrete	complete					1.47	31.1	2.14	7.27	7.5	4.89	4.28	-9.85	2
28	16	2	2	flake	Chert	broken		marginal			1.74	23.97							
29	16	2	2	flake	Chert	broken		right proximal			0.45	14.58							
30	16	2	2	flaked piece	Chert	broken					2.65	40.51							

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	ongitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
31	16	2	4	flake	Chert	broken	proximal				0.72	14.6	10.26		12.67	3.94		-9.44	
32	16	2	4	flaked piece	Chert	broken					0.8	13.42							
33	16	2	4	flake	Chert	broken		marginal			1.03	21.4							
34	25	8	4	flake	Chert	broken		left	yes	pot lidded	0.36	16.54							
35	25	8	2	core	Mudstone	complete					104.68	67.95		55.53		27.16	1.22		
36	25	8	2	flake	Quartz	broken		right			4.11	23.5				7.84			
37	25	8	2	flake	Chert	broken					1.17	15.92	14.91					50.19	
38	25	8	2	flake	Chert	complete					0.66	9.36	9.16	9.77	5.25	4.3	0.96	23.60	
39	25	4	5	flake	Chert	broken					0.94	19.95	10.52	7.33	0	6.46	2.72	29.54	1
40	25	5	1	flake	Chert	complete					0.87	19.58	8.8	14.36	7.96	2.74	1.36	2.46	
41	25	5	4	multiplatform core	Mudstone	complete					347.69	34.1		90.39		63.48	0.38		
42	25	6	2	flake	Chert	complete					36.64	44.41	27.07	33.1	14.11	15.49	1.34	16.60	
43	25	6	2	flake	Quartz	complete					0.49	13.15	6.28	8.42	7.17	3.76	1.56	-3.88	
44	25	7	1	flake	Chert	complete					3.71	24.19	9.72	18.54	22.69	4.94	1.30	-30.01	
45	25	7	1	flake	Silcrete	complete					1.45	19.28	8.66	15.71	8.58	4.32	1.23	0.24	

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
46	25	7	2	retouched flake fragment	Chert	broken		marginal	yes	pot lid	0.58	16.55							
47	25	1	4	redirecting flake	Mudstone	complete					0.51	5.98	9.59	10.79	10.22	4.92	0.55	-6.03	
48	25	1	4	flaked piece	Chert	?					1.9	22.77							
49	20	16	2	redirecting flake	Chert	complete					0.98	20.5	3.42	11.45	2.03	5.12	1.79	3.88	
50	20	23	5	flake	Quartz	broken	proximal				0.2	7.36							
51	20	18	1	flake	Volcanic?	complete					0.29	7.72	11.87	8.07	1.46	2.64	0.96	67.98	
52	20	20	1	bipolar core?	Chert	complete					4.83	23.72							
53	20	20	3	heat fragment	Chert	broken			yes	shatter	0.57	12.35							
54	20	20	3	heat fragment	Chert	broken			yes	surface	0.45	18.77							
55	20	20	2	flaked piece	Chert	broken					15.77	41.92							
56	20	20	2	flaked piece	Sandstone	broken					1.23	15.28							
57	20	20	2	flake	Chert	complete					1.08	9.64	12.4	20.29	11.66	3.62	0.48	4.40	
58	20	20	2	flake	Chert	broken		right			0.57	15.1							1
59	20	12	3	hammerstone	Metamorphic (Granite?)	broken					68.26	49.27							
60	20	12	3	flake	Chert	complete					23.81	36.45	29.67	38.84	37.63	16.37	0.94	-12.46	

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
61	20	12	3	flake	Chert	broken		mesial			0.6	18.39							
62	20	12	1	flaked piece	Chert	?					7.17	33.72							
63	20	12	2	flaked piece	Chert	broken					0.36	13.17							
64	20	12	3	flake	Silcrete	broken	proximal				0.52	15.08	12.41					44.73	
65	20	4	2	hammerstone and anvil	Mudstone	complete					356.91	92.71		73.31		44.87	1.26		
66	20	4	2	heat fragment	Chert	broken			yes	shatter	32.11	53.33							
67	20	4	2	heat fragment	Chert	broken			yes	shatter	1.77	28.55							
68	20	17	3	retouched flake fragment	Chert	broken			yes	surface	2.12	26.26							
69	20	17	8	flake	Quartz	broken	proximal				1.43	16.42							
70	20	19	12	flaked piece	Chert	broken					0.47	13.23							
71	20	3	3	flake	Quartz	broken					3.2	27.62							
72	20	19	13	flake	Chert	complete					1.64	10.6	17.81	15.85	5.27	5.3	0.67	61.21	
73	20	5	3	flake	Chert	broken		marginal			3.08	34.93							
74	20	5	3	flake	Quartz	broken	proximal				0.96	16.74							
75	20	13	1	flake	Chert	complete					4.59	32.57	9.21	12.09	11.29	7.67	2.69	-3.66	
76	20	13	1	redirecting flake	Chert	complete					0.87	19.59	3.26	9.74	8.12	5.25	2.01	-14.14	1

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
77	20	3	3	flaked piece	Quartz	broken					0.35	10.76							
78	20	3	3	heat fragment	Chert	broken			yes	shatter	0.55	13.12							
79	20	14	2	flake	Sandstone	broken	distal				1.08	23.98							
80	20	11	4	flake	Chert	complete					5.86	20.74	12.21	19.4	11.69	8.51	1.07	1.44	
81	20	11	4	flaked piece	Volcanic?	broken					1.06	14.93							
82	20	11	4	flake	Quartzite	broken	distal				17.69	41.38							
83	20	11	4	flake	Chert	complete					75.85	71.09	25.46	36.88	27.12	19.96	1.93	-1.34	
84	20	2	4	ochre crayon	Ochre	complete					20.86	38.79		28.67		17.98	1.35		
85	20	2	4	hammerstone?	Metamorphic (Granite?)	broken					70								
86	20	10	1	flake	Quartz	broken		right proximal			0.45	13.62							
87	20	9	2	flake	Chert	broken	p				5.42	33.01	23.91					39.82	
88	20	9	2	flake	Chert	complete					0.63	9.56	5.1	12.43	18.04	5.12	0.77	-68.18	
89	28	1	3	flake	Volcanic?	broken	proximal				3.16	27.83							
90	28	1	2	flake	Sandstone	broken	medial				0.79	19.37							
91	28	3	1	heat fragment	Chert	broken			yes	surface	1.28	22.94							

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
92	28	2	3	flake	Chert	broken	distal		yes	pot lid removal	1.35	26.51							
93	28	21	4	heat fragment	Chert	broken			yes	surface	0.82	23.48							
94	28	13	1	flake	Chert	broken		marginal			0.15	11.45							
95	28	8	1	flake	Chert	complete					6.29	24.62	13.88	24.88	25.94	9.52	0.99	-27.52	
96	28	8	3	flake	Chert	complete					6.03	24.06	17.46	23.72	20.4	6.88	1.01	-6.99	
97	14	3	3	flake	Chert	broken	distal				0.93	15.18							
98	14	12	4	pot lid	Chert	broken			yes	pot lid	0.13	9.34							
99	14	10	2	flake	Chert	complete			yes	pot lid removal	6.26	18.84	36.43	23.63	12.46	6.81	0.80	64.92	
100	14	6	3	flake	Chert	complete					0.71	13.35	7.55	10.31	10.32	3.39	1.29	-11.85	
101	14	6	1	flake	Chert	complete					1.06	11.86	13.6	18.5	22.97	3.78	0.64	-43.11	
102	14	8	2	flake	Chalcedony	complete					0.72	13.42	8.16	12.57	18.06	3.33	1.07	-40.49	
103	14	8	2	flake	Chert	broken	distal				0.4	16.46							
104	14	8	2	flake	Chert	broken	proximal				1.03	23.55							
105	14	8	2	flake	Chert	broken	proximal				1.49	22.75							
106	14	8	2	flake	Chalcedony	broken	distal				1.07	16.7							

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
107	14	8	2	flake	Chert	complete					0.29	13.34	4.81	10.28	9.36	1.78	1.30	-19.36	
108	14	8	2	flaked piece	Chert	broken					0.09	8.86							
109	14	8	6	heat fragment	Chert	broken			yes	shatter	0.2	12.85							
110	14	8	6	heat fragment	Chert	broken			yes	shatter	0.2	10.48							
111	14	9	3	redirecting flake	Chert	broken		right			9.2	32.75							
112	14	9	3	flake	Chert	complete					7.78	35.24	13.45	23.85	19.16	6.75	1.48	-9.26	
113	14	9	3	flaked piece	Chert	broken					0.19	10.67							
114	14	11	2	flake	Chert	complete					2.38	21.47	18.6	16.35	5.18	5	1.31	34.71	
115	21	8	11	asymmetric backed	Chert	complete					0.41	16.87	0	7.92	0	3.71	2.13		
116	43	20	6	flaked piece	Chert	broken					0.1	10.94							
117	43	31	2	flake	Chert	complete				pot lid removal	6.02	24.5	20.75	23.94	22.07	7.73	1.02	-3.09	
118	43	30	1	burin spall	Chert	broken	distal				2.8	36.21							
119	43	30	1	flake	Volcanic?	complete					3.55	25.49	8.24	22.08	11.38	6.68	1.15	-7.05	
120	43	30	1	flake	Chert	broken		marginal			0.2	12.51							
121	43	30	1	flake	Chert	complete					0.78	11.84	10.01	12.54	5.98	2.91	0.94	19.32	
122	43	30	1	flaked piece	Chert	broken			yes	surface	0.62	18.9							

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
123	43	30	1	flaked piece	Chert	broken					0.2	11.83							
124	43	30	1	flaked piece	Chert	broken					0.15	10.94							
125	43	30	2	flake	Chert	complete					1.8	16.37	10.52	12.8	14.53	7.36	1.28	-13.97	
126	18	1	4	flake	Chert	broken		right			1.21	17.99				3.12			
127	18	3	1	flaked piece	Chert	broken					0.54	17.54							
128	15	3	3	flake	Chert	broken	proximal				3.75	30.96							
129	15	1	4	flaked piece	Chert	broken					0.37	10.57							
130	15	5	2	flake	Chalcedony	complete					1.26	21.18	21.47	17.21	11.25	2.49	1.23	27.13	
131	15	5	1	flake	Chert	broken	medial				0.18	13.06							
132	13	22	1	flake	Chert	complete					1.22	14.48	13.36	11.59	6.46	5.55	1.25	26.80	
133	13	13	7	flake	Chert	complete					1.31	8.25	6.95	8.83	6.83	7.62	0.93	0.83	1
134	24	6	4	flake (split cobble)	Quartzite	complete					790	131.33	120.81	140.15	88.96	22.94	0.94	13.83	
135	24	6	4	multiplatform core	Mudstone	complete					620	119.22		90.55		45.92	1.32		
136	24	3	6	flake	Mudstone	complete					11.1	47.31	25.79	20.49	0	7.69	2.31	30.49	1
137	24	3	6	flake	Chert	complete					0.07	5.79	8.2	905	7.92	1.15	0.01	2.77	
138	24	3	6	flake	Quartz	complete					0.54	13.56	4.54	15.44	8.05	2.94	0.88	-14.75	

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
139	24	3	6	flake	Chert	broken		marginal			0.11	9.66							
140	24	3	6	flake	Chert	broken		marginal			0.26	13.4							
141	24	3	6	flake	Chert	broken	distal				0.05	8.38							
142	24	3	6	redirecting flake	Chert	broken		marginal			0.18	10.61							
143	24	3	6	flake	Quartz	broken		mesial			0.29	12.9							
144	24	3	6	flake	Quartz	broken	proximal				0.26	10.48							
145	24	3	6	flake	Quartz	broken					0.16	10.98							
146	24	7	3	multiplatform core	Chert	complete					63.9	55.29		38.84		38.42	1.42		
147	24	2	4	flaked piece	Chert	broken					0.65	12.77							
148	27	12	1	retouched flake fragment	Silcrete	broken	proximal				21.26	52.18							
149	27	12	3	flake	Chert	complete					16.95	35.41	20.39	35.72	20.9	10.64	0.99	-0.83	1
150	27	12	3	redirecting flake	Chalcedony	complete					3.67	15.3	7.76	19.11	19.35	7.29	0.80	-41.49	
151	27	12	3	end scraper	Chert	complete					1.8	17.87	13.66	14.09	4.96	6.66	1.27	27.36	
152	27	12	2	flake	Chert	broken	distal		yes	pot lid removal	0.32	12.24							
153	27	12	4	flake	Chert	broken		right			0.66	20.34							
154	27	12	4	flake	Chert	broken		left			0.85	15.93							

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
155	27	3	4	flake	Chert	complete					0.58	13.34	80.4	10.75	6.7	2.93	1.24	140.20	
156	27	3	4	flake	Chert	broken		right proximal			0.46	17.19							
157	27	3	4	flaked piece	Chert	broken			yes	pot lid removal	0.75								
158	27	3	4	flaked piece	Chert	broken					3.32	23.67							
159	27	5	3	flaked piece	Quartz	broken					2.36	16.86							
160	29	17	1	flake	Chert	complete					2.05	18.42	10.34	18.77	26.07	5.36	0.98	-46.24	
161	29	16	3	pot lid	Chert	broken			yes	pot lid	0.28	15.87							
162	29	16	3	flaked piece	Chert	broken					0.4	11.83							
163	29	15	1	flake	Silcrete	broken	distal				0.1	10							
164	29	5	1	bipolar flake	Silcrete	broken	proximal				0.63	14.43							
165	29	3	2	notch	Chert	broken		marginal			48.76	60.2							
166	29	3	2	flaked piece	Chert	broken					0.48	13.54							
167	29	3	2	flake	Chert	complete					0.21	8.27	8.44	5.59	0	2.35	1.48	54.07	
168	29	9	2	flake	Chalcedony	broken		left distal			0.64	19.7							
169	29	7	3	flake	Chert	broken	surface		yes	surface	0.41	0.02							
170	29	7	4	flake	Chert	broken		proximal mesial			0.67	0.67	17.78					171.38	

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
171	29	7	4	flake	Chert	broken		right			0.56	17.32							
172	29	7	4	retouched flaked piece	Chert	broken					2.09	20.6							
173	40	16	1	flake	Chert	broken		right	yes	pot lid removal	3.82	24.76							
174	44	4	3	flaked piece	Chert	broken					0.75	15.33							
175	44	4	3	heat fragment	Chert	broken			yes	shatter	0.58	0.58	14.03					170.55	
176	44	4	3	flake	Chert	broken		marginal			1.85	19.04							
177	44	4	3	flaked piece	Chert	broken	surface		yes	surface	0.56	15.6							
178	23	18	1	flaked piece	Quartz	broken					0.2	9.81							
179	23	18	2	redirecting flake	Chert	broken	distal		yes	pot lid removal	4.54	26.53							
180	23	18	2	flake	Chert	complete					1.48	21.37	13.34	13.31	11.26	6.68	1.61	5.57	
181	23	18	1	flake	Volcanic?	broken					0.49	20.22							
182	23	18	1	flaked piece	Volcanic?	broken					2.34	27.48							
183	23	18	1	flaked piece	Volcanic?	broken					0.68	23.65							
184	23	18	1	flaked piece	Volcanic?	broken					0.27	10.85							
185	23	18	1	flaked piece	Quartz	broken					0.35	11.76							
186	23	18	1	flaked piece	Quartz	broken					0.19	10.2							

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
187	23	18	1	flake	Quartz	complete					0.22	11.21	7.93	8.66	2.19	1.36	1.29	28.72	
188	23	18	1	flake	Quartz	complete					0.19	7.2	4.94	10.82	8.84	2.29	0.67	-30.31	
189	23	17	1	flake	Chert	broken		marginal			1.59	26.61							
190	23	16	3	flake	Chert	complete					0.76	12.65	7.12	9.78	14.23	4.09	1.29	-31.39	
191	12	3	1	flake	Chert	complete					0.36	18.81	5.13	6.4	4.73	2.85	2.94	1.22	1
192	12	50	6	heat fragment	Chert	broken	surface		yes	surface	0.33	13.3							
193	12	50	3	flake	Chert	complete					0.32	7.38	8.86	10.27	11.07	3.26	0.72	-17.03	
194	12	50	4	flake	Chert	broken	distal				1.9	24.79							
195	12	48	4	flaked piece	Chert	broken					1.29	22.52							
196	12	47	3	flake	Chert	complete					0.58	19.87	8.05	6.82	6.9	3.07	2.91	3.32	1
197	12	47	2	retouched flake	Chert	broken					11.13	33.53							
198	12	47	2	flake	Chert	broken	proximal				0.76	18.9							
199	12	47	2	heat fragment	Chert	broken			yes	shatter	0.6	15.35							
200	12	46	2	flake	Chert	broken		marginal			0.16	12.56							
201	12	44	1	flake	Chert	complete					1.15	16.05	10.93	14.23	14.84	6.77	1.13	-13.89	
202	12	44	1	flake	Chert	complete					0.47	8.57	6.2	8.46	8.05	5.25	1.01	-12.32	

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
203	12	44	3	flake	Chert	broken		left			0.47	9.65							
204	12	44	2	flake	Chert	complete					0.42	15.19	5.07	7.85	3.04	3.8	1.94	7.65	
205	12	44	2	flake	Chert	complete					0.03	7.98	1.78	4.2	2.86	0.67	1.90	-7.74	
206	12	24	3	flake	Chert	complete					0.13	6.91	7.23	7.17	4.71	1.58	0.96	20.67	
207	12	24	3	pot lid	Chert	broken					0.23	9.53							
208	12	10	1	flake	Quartz	complete					0.76	17.71	4.83	1009	9.09	3.32	0.02	-13.72	
209	12	27	4	flaked piece	Chert	broken					0.56	11.76							
210	12	25	5	flake	Chert	broken	medial				0.5	12.69							
211	12	41	1	flake	Chert	complete					4.77	21.67	9.42	20.81	22.03	9.71	1.04	-32.45	
212	12	41	1	flake	Quartz	broken		left proximal			0.9	15.81							
213	12	40	1	flake	Chert	complete					0.45	12.73	10.2	16.67	12.88	2.69	0.76	-12.02	
214	12	40	1	flake	Volcanic?	complete					3.89	17.71	14.37	18.54	16.82	7.19	0.96	-7.91	1
215	12	40	1	flaked piece	Volcanic?	broken					1.64	23.76							
216	12	40	1	flake	Chert	complete			yes	pot lid removal	1.49	13.04	10.89	12.68	15.44	7.72	1.03	-19.79	1
217	12	40	1	flake	Chert	broken	surface		yes	surface	0.21	14.07							

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
218	12	40	1	flaked piece	Chert	broken					0.81	16.88							
219	12	40	1	flaked piece	Chert	broken					1.29	19.46							
220	12	40	1	flake	Chert	complete					0.19	4.84	8.27	6.4	5.21	3.43	0.76	35.09	
221	12	40	1	flake	Chert	broken	proximal				0.28	14.98							
222	12	40	1	pot lid	Chert	broken			yes	pot lid	0.04	6.1							
223	12	39	3	ventral side scraper	Chert	complete					19.9	28.05	22.19	38.19	20.81	12.66	0.73	2.82	
224	12	39	3	core fragment	Chert	broken			yes	pot lid removal	10.74	26.45							
225	12	39	2	flake	Chert	complete					0.08	6.65	5.35	5.88	5.58	1.27	1.13	-1.98	
226	12	39	2	heat fragment	Chert	broken			yes	shatter	0.83	13.86							
227	12	42	4	flake	Chert	broken	distal				0.14	11.46							
228	12	42	3	flake	Chert	complete					0.72	12.57	9.6	12.19	5.28	0.07	1.03	19.50	
229	12	42	1	pot lid	Chert	broken	surface		yes	surface	0.08	7.39							
230	12	42	1	flaked piece	Chert	broken	surface		yes	surface	0.84	16.67							
231	12	42	2	flaked piece	Chert	?					3.06	31.2							
232	12	42	2	flaked piece	Quartz	?					0.17	7.86							
233	12	42	2	flake	Silcrete	complete					0.21	13.52	3.75	5.62	3.05	2.09	2.41	2.97	1
234	12	42	2	flaked piece	Chert	broken					0.1	7.86							

Record Number	PASA	Pit	Spit	Type	Raw Material	Broken?	Transverse break	Longitudinal Break	Heat Related Damage?	Type of heat break	Weight	Length	Proximal Width	Medial Width	Distal Width	Thickness	Elongation	Marginal Angle	No. Dorsal Ridges
235	12	36	4	notched double side and end scraper	Chalcedony	complete					12.62	26.59	15.95	22.09	17.96	13.86	1.20	-4.33	
236	12	36	5	bipolar flake?	Quartz	complete					4.34	19.85	8.28	14.61	19.7	9.19	1.36	-32.10	

Appendix G

Lithic terminology

Lithic terminology

Type **-** Classification of artefacts was based on technical criteria. The following classes have been identified in the assemblage:

Core: Cores are a piece of rock from which flakes have been detached. Cores are characterised by negative flake scars where flakes have been detached.

Edge-ground axe: implement shaped on at least one margin by grinding against another surface. Such implements are often shaped by flaking, pecking, flaking and pecking or grinding and/or burnishing around much of their exterior.

Flake: A sharp edged piece of stone detached from a core by the application of force. Flakes are characterised by a number of features which may include a platform, bulb of percussion, a bulbar scar, ripple marks and fissures on the ventral surface and negative flake scars on the dorsal surface.

Flaked piece: A flaked piece is an artefact that exhibits features such as negative flake scars but does not have any other features that would allow differentiation between a flake, a retouched flake or core.

Retouched flake: An artefact which has had flakes removed subsequent to its original manufacture.

Backed artefact: A retouched flake possessing one or more margins, which have been retouched on a steep angle; that margin is situated opposite to the unretouched sharp edge.

Anvil: A piece of stone, usually a pebble or cobble, which possesses pitting or furrowing indicative of hard hammer impacts.

Hammer: An artefact, usually a pebble or cobble, identified by characteristic pitting and negative scars indicative of percussive force on one or more ends

Manuport: An unmodified piece of rock situated away from its original context; assumed to have been humanly transported by an Aboriginal person.

Raw material **-** The raw material of each artefact is categorized according to the following:

Colour – The purpose of recording the colour of raw material is to assist during analysis in identifying source material (if possible), related objects within an episode or episodes of stone reduction and to infer heat treatment.

Raw material – The following raw materials were identified to be present in the assemblage:

Silcrete: This rock is formed by the impregnation of a sedimentary layer with silica; it consists of quartz grains in a matrix of either amorphous or fine-grained silica. The flaking qualities of silcrete are dependent of the size of the quartz grains.

Chert: A cryptocrystalline siliceous rock of organic or inorganic origin. Chert is isotropic and brittle. It is accordingly a highly favoured rock for artefact manufacture.

Quartz: The mineral quartz is crystalline silica with a hardness value of 7 (Mohs' hardness scale). Given this property quartz flakes possess highly durable sharp edges. However, given quartz possesses internal flaws and cleavage planes it typically flakes in an unpredictable manner.

Quartzite: Quartzite is formed by the cementing together of siliceous grains through pressure or chemical processes.

Hornfels: Altered volcanic rock characterised by inclusions in a fine grained groundmass

Quality – Raw material has been classified in terms of its quality based on size of mineral grains and homogeneity (in regard to quartz quality refers to the presence or absence of internal flaws and the general homogeneity of the stone) as follows:

High; Medium; and Low.

Initiation type – The type of primary fracture initiation including the following:

Conchoidal: (Hertzian fracture) Formed when stone is struck by a hammer forming a ring crack; the ring crack forms a cone that bends backward towards the surface of the core.

Bending: Formed when the angle between the platform and surface of the core is acute. Flakes do not possess clear ring cracks or well defined bulbs of percussion.

Bipolar: A bipolar flake is formed as a result of compression forces. Bipolar flakes often show signs of impact on opposing ends and have compression rings moving in two directions towards each other.

Initiation surface = platform

Single: Single flake scar.

Multiple scars: With three or more scars.

Cortical: Retaining evidence of cortex.

Shattered: Damaged: platform attributes cannot be identified.

Facetted: Three or more flake scars in uniform arrangement.

Focused: Struck from close to the edge of the platform.

Bipolar: Flake or core with evidence of fracture initiation on both ends.

Termination type

Feather: Exhibits minimal thickness at the distal end and acute angle between ventral and dorsal surface.

Hinge: Forms when the fracture meets the surface of the core at c. 90º to the longitudinal axis of the flake.

Step: Forms when flake terminates abruptly in a right angle break.

Outré passé (plunge): Forms when the fracture plane curves away from the face of the core removing the base of the core.

Percentage of cortex – An estimate of the percentage of cortex present on an artefact. On flakes the estimate refers to the dorsal surface only; recorded as dorsal cortex present in 25 per cent increments.

Cortex type – The type of cortex (weather worn surface) on an artefact is listed. The following cortex types were identified in the assemblage:

Pebble: A water worn surface indicative of an alluvial origin. It is noted here that the majority of water worn cortex was observed to be minimally worn.

Terrestrial: A weathered surface indicative of terrestrial origin.

Breakage**:** Where artefacts were broken the portion of the artefact was classified using the following categories.

Flake distal: A broken flake: the distal end, exhibiting the termination.

Flake medial: A broken flake: the mid section, exhibiting dorsal scars and/or ventral surface features.

Flake proximal: A broken flake: the proximal end exhibiting the platform and initiation.

Longitudinal cone split: A broken flake: broken longitudinally; typically occurs during flaking event. Separate categories for left and right LCS portions were used to facilitate artefact number estimates.

Margin Missing: A broken flake where width cannot be measured due to missing marginal sections.

Platform shattered: A broken flake where percussion length cannot be measured due to shattered platform.

Core attributes - including**:**

Type of core: Refers to number of platform and/or initiation type.

Number of scars: Expressed numerically.

Length of longest complete scars: Measured in mm.

Comments **-** Comments are made in regard to the following:

The presence or absence of use-wear is noted.

Nature of breaks (along faults, orientation).

Damage and its antiquity or otherwise.

Specific descriptions of various attributes and features.

Associations between artefacts.

Appendix H

Aboriginal stakeholder responses

Jerrinja Local Aboriginal Land Council
PO Box 167
Culburra Beach NSW 2540
Phone: (02) 44 474207
Fax: (02) 44 474230

18th November 2011

To Ron de Rooy
Project Manager
RTA
Berry bypass

Dear Ron,

Jerrinja LALC would like to comment on the Draft Cultural Heritage Assessment Report for Foxground and Berry Bypass.

It is a fact that RTA is the biggest destroyer of Aboriginal artifacts in NSW. This is because the method of locating of artifacts is basically flawed.

Archeologists are engaged to dig test pits at likely locations and then analyze the results.

Jerrinja LALC feel there is inadequate participation of Aboriginal sites officers in the preliminary site excavations by RTA on new road construction.

Jerrinja LALC propose that, during the removal of the first 500mm- 1000mm of topsoil on new road construction, Aboriginal sites officers be present at all times to inspect for artifacts.

This improved practice would uncover more artifacts, limit the damage to artifacts and give the people of Australia, a clearer picture of pre-European settlement.

It is important for RTA to understand that in modern times, consultation with Aboriginal communities should not be seen as merely paying "lip service" to this process, but actually implementing the recommendations offered.

This would help demonstrate NSW government's true commitment to reconciliation with Aboriginal people.

Yours sincerely

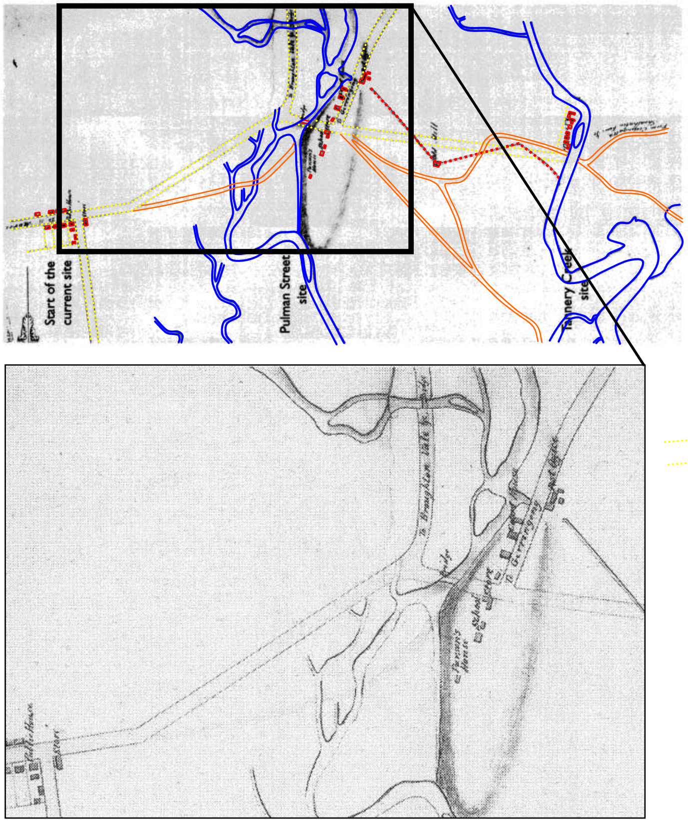
Andrew Harvey
CEO

Appendix I

Analysis of previous road construction disturbance zones in area of proposed roundabout at the intersection of Woodhill Mountain Road and the current Princes Highway

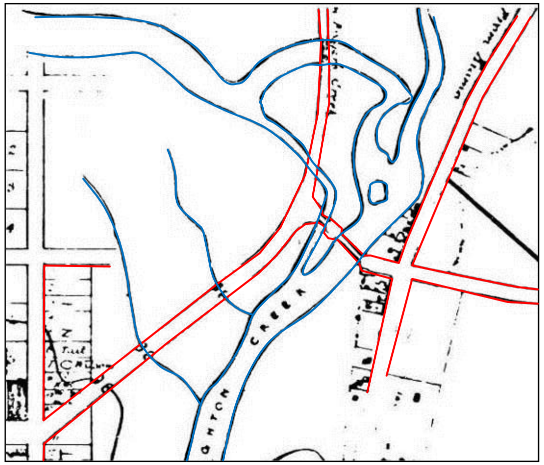
Tracings of disturbance from source material overlaid onto Google Pro (2006) aerial image

Early map of Broughton Creek Village area, probably 1870s (Berry Museum n.d.: 15)



Base image from Google Earth Pro 2012 (image date 1/30/2006)

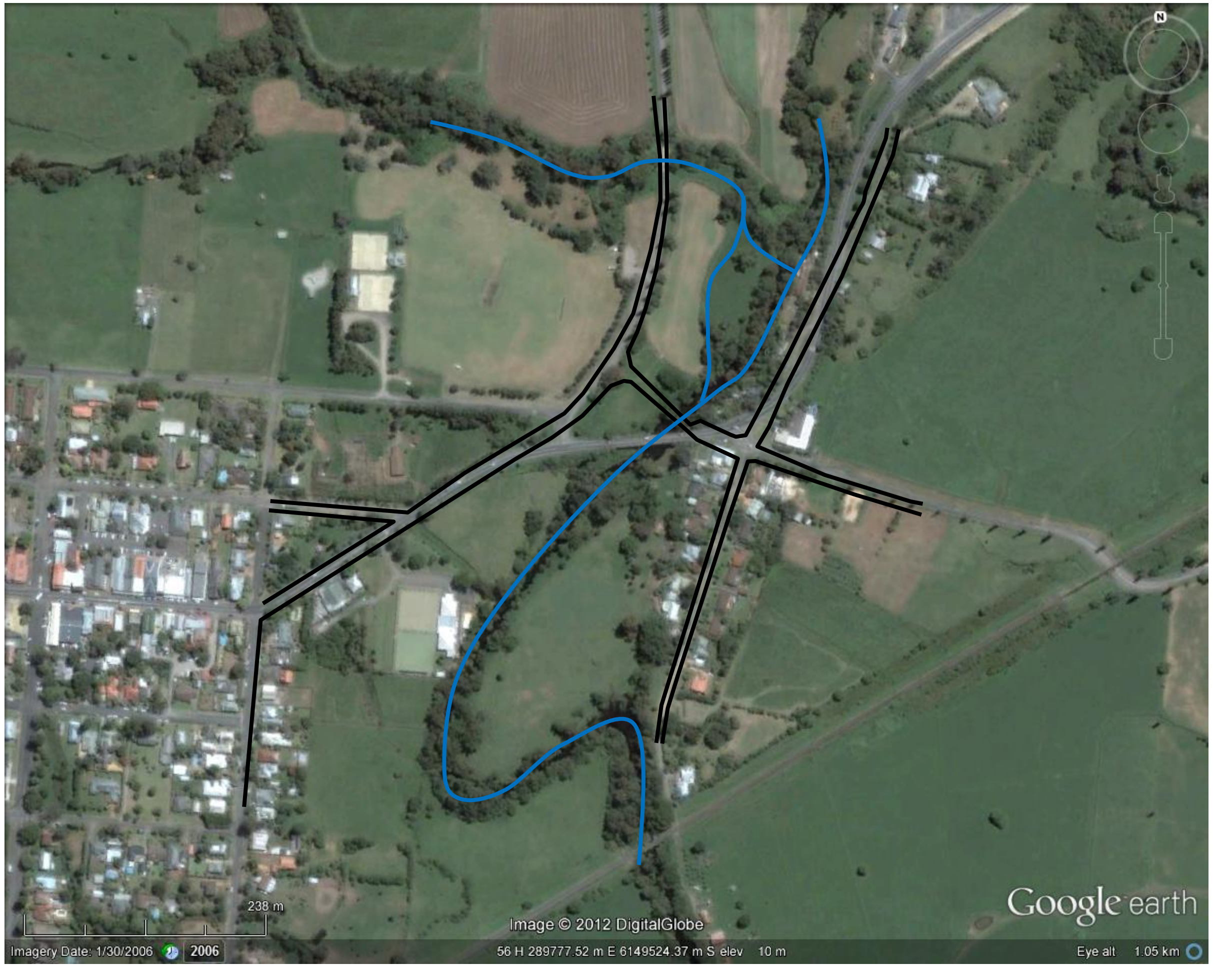
Sketch plan of Broughton Township 1883
(Lidbetter 1993:18)



Base image from Google Earth Pro 2012 (image date 1/30/2006)

1949 aerial photograph

SVY662/NOWRA Run 2, 5164 (I55-166) 4 Apl 1949



Base image from Google Earth Pro 2012 (image date 1/30/2006)

1958 aerial photograph

NSW 699-5036 SH.I DAPTO – ULLADULLA Run GKII 23/7/1958

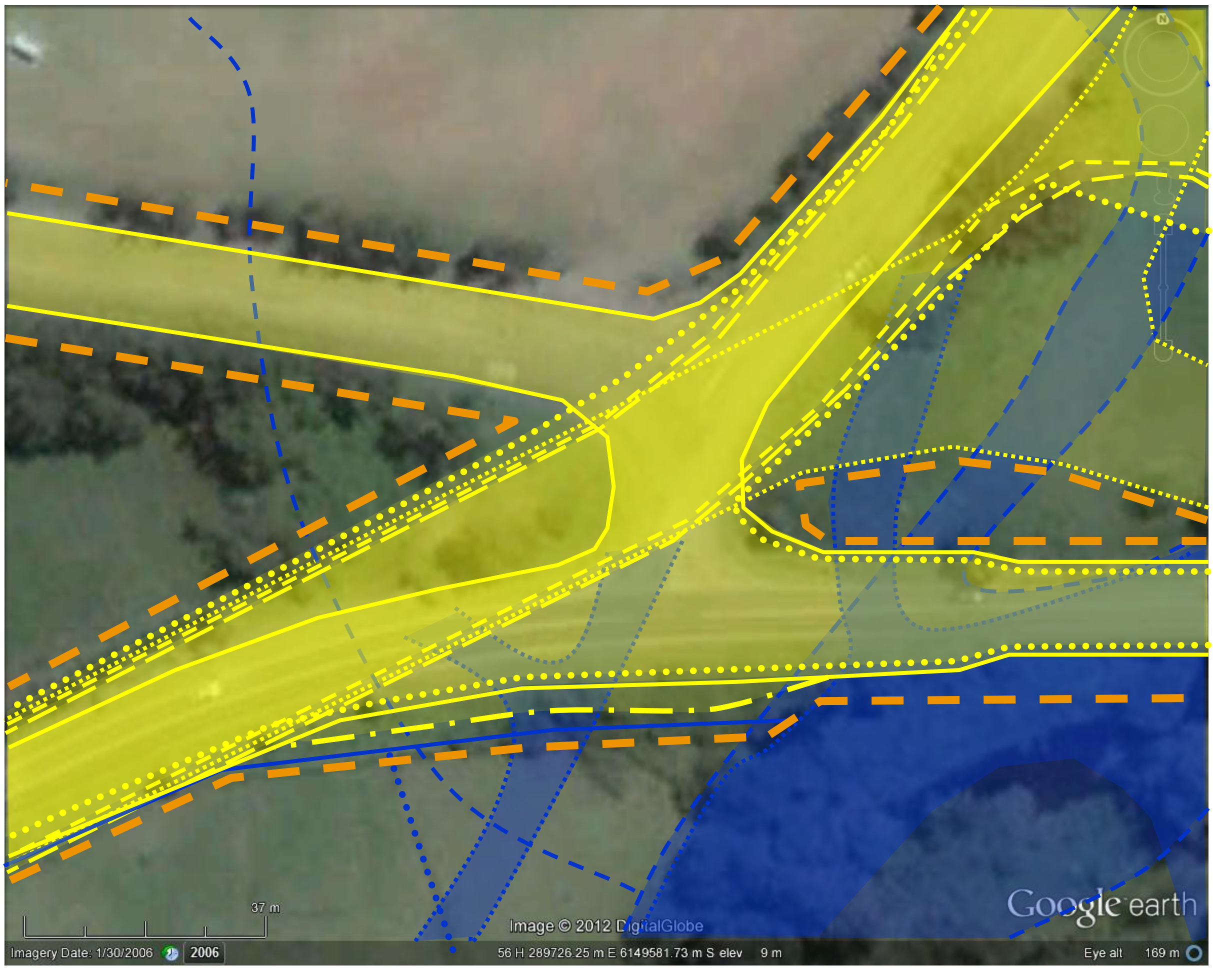
Base image from Google Earth Pro 2012 (image date 1/30/2006)

1986 aerial photography

NSW 2652-138 SHI – SUTHERLAND TO NOWRA
Run XD15 7/3/1986

Base image from Google Earth Pro 2012 (image date 1/30/2006)

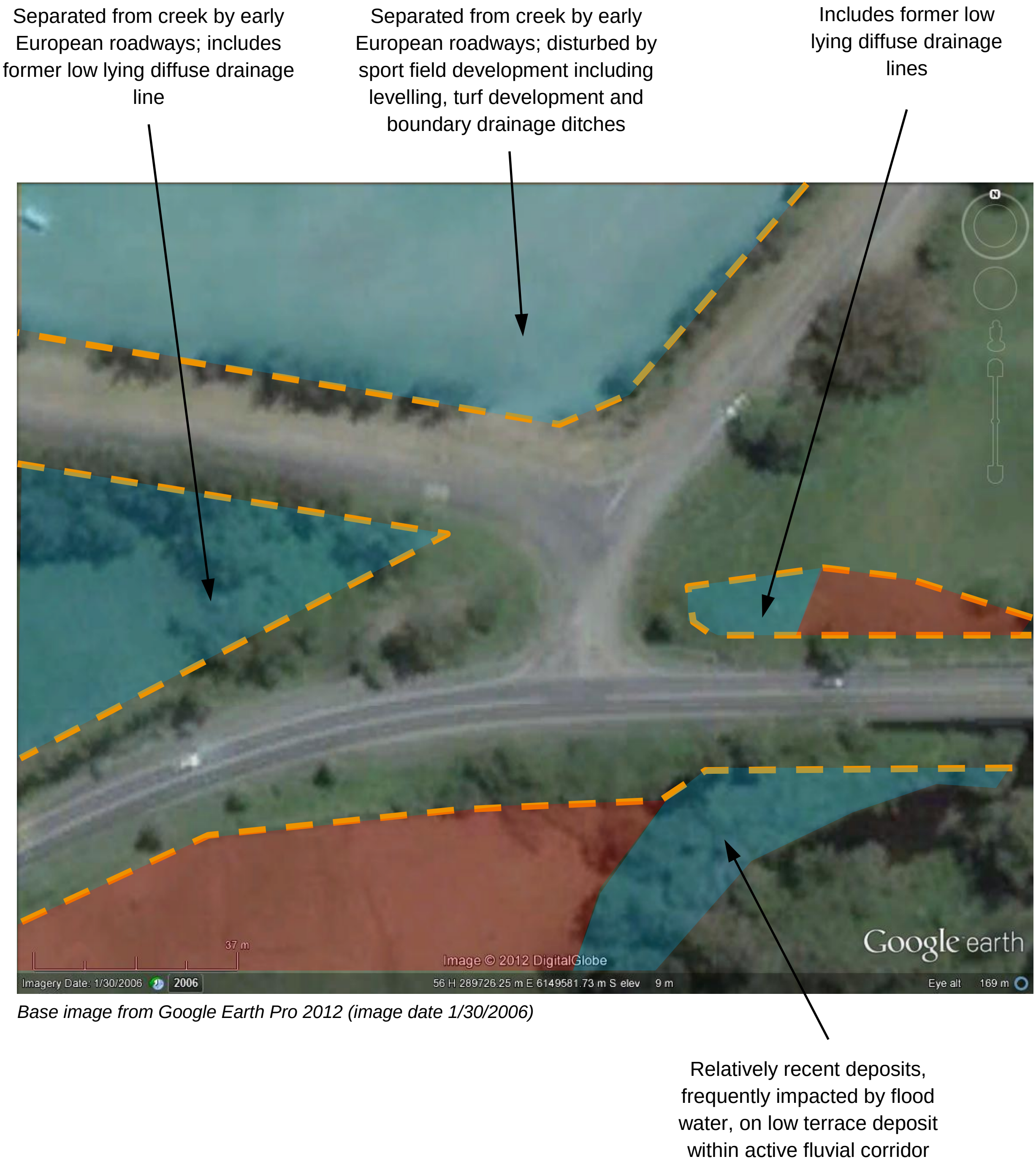
Detail of proposed roundabout area showing composite of past disturbance and drainage features (as interpreted from source material)



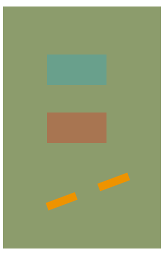
Base image from Google Earth Pro 2012 (image date 1/30/2006)

Water drainage	Roads & road platforms	
		1870s (approx. boundaries)
		1883 (approx. boundaries)
		1949
		1958
		1986
		2010 (extension to road platform for construction of footpath)
		Net boundary of previous disturbance (including road easements)

Archaeological sensitivity of surrounding areas outside of net disturbance boundary



Base image from Google Earth Pro 2012 (image date 1/30/2006)



Low potential for historical Aboriginal encampment remains

Greater than low potential for historical Aboriginal encampment remains

Net boundary of previous disturbance (including road easements)

Draft roundabout design relative to existing disturbance zones and adjacent historical Aboriginal archaeological sensitivity

Note placement of whole roundabout footprint within existing disturbance zone and no construction south of the existing footpath on southern edge of proposed works.

Base image and draft roundabout design provided by AECOM 13/8/2012)

Low potential for archaeological remains

Greater potential for archaeological remains

Net boundary of previous disturbance (including road easements)

Appendix J

Information from Keith Campbell relating to the *Boongaree* Aboriginal Encampment

Attn. N. Officer.
fax 6282 9416

SUBMISSION RE ROUTE OPTIONS, GERRINGONG TO BERRY PRINCE'S HIGHWAY UPGRADE

1. I wish to draw attention to the fact that a traditional Aboriginal camp site was located near Berry which I believe should be avoided by the proposed upgrade. The northern part of the camp site is close to or in the path of two of the existing proposed routes (the orange route and the brown route). I understand that another route, to the east and south of the township, is being proposed by Shoalhaven City Council. Such an option, depending on its exact route, might also run across land occupied by the camp.

2. The Aboriginal name of the camp was Boon-ga-ree. It was the birthplace of two well-known Aboriginal brothers of the early 19th century, Boger and Toodwick. Toodwick exchanged names with William Broughton, the Assistant Commissary General. As a result, he became universally known as Broughton. Broughton Creek and several other geographical features were named after him. The township of Berry was also named after him – it was known as Broughton Creek until the 1880s. Broger's Creek is named after his brother Broger.

3. The Aboriginal camp of Boon-ga-ree was apparently occupied permanently or at least semi-permanently in the first decade of European occupation of the area (in the 1820s). It was therefore almost certainly occupied permanently or semi-permanently in pre-colonial days. Broger was especially noted for being attached to Boon-ga-ree. He was widely known for calling the spot 'his place'.

4. The site was located on a clear area at the junction of Broughton Creek and Broughton Mill Creek. The area was not on the eastern and western banks of these creeks, but on the point between the two, and running north to where Pulman Street is today. The cleared area was surrounded by dense brush or rainforest.

5. I am unaware whether any archaeological work has been carried out at the site, but I believe it should be thoroughly examined before any major disturbance occurred there. I therefore would object to any change in plans to re-route the highway through this area at this stage.

6. Sources

   a) For reference to Boon-ga-ree as Broughton's birthplace, see letter of 8 April 1822, from Charles Throsby to Alexander Berry, in Berry Papers, (Mitchell Library), vol 46, p81.
   b) For reference to Broughton's birthplace extending from the junction of the creeks to the ridge (along which Pulman Street runs today) see "Recollections of the Aborigines" pp569-570, by Alexander Berry.
   c) For reference to Broger's claim that Boon-ga-ree was "his own place", see Criminal Investigations, T 146, at State Records.
   d) For references to thick brush surrounding the cleared area, see RF Pleaden, 'Coastal Explorers', p25 (note by Meehan on his map).

Keith Campbell

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Nowra

Appendix K

Archaeological survey coverage mapping and visibility variables

K.1 Table of survey coverage data

Survey Unit	Landform	Survey unit area (ha)	Proportion of unit surveyed (%)	Area of unit surveyed (ha)	Average Incidence of exposure %	Average visibility within Exposures %	Effective coverage area (ha) survey unit area x proportion surveyed % x inc. exp. % x exp. vis.%)	Effective Coverage % (effective coverage area / survey unit area x 100)
1	CU	3.0	80	2.4000	2.0	50	0.0240	0.8
2	MS	2.2	60	1.3200	5.0	65	0.0429	1.9
3	MS	0.7	55	0.3850	2.0	65	0.0050	0.7
4	BS	0.8	40	0.3200	10.0	60	0.0192	2.4
5	VF	4.0	20	0.8000	5.0	75	0.0300	0.7
6	CU	4.1	85	3.4850	5.0	70	0.1220	3.0
7	CU/RLC	2.5	30	0.7500	5.0	60	0.0225	0.9
8	MS	5.4	60	3.2400	8.0	30	0.0777	1.4
9	MS	2.0	0	0.0000			0.0000	0.0
10	MS	2.2	20	0.4400	5.0	45	0.0099	0.4
11	MS	2.7	10	0.2700	2.0	70	0.0073	0.3
12	CU	5.3	30	1.5900	1.0	30	0.0048	0.1
13	MS/RC	0.6	20	0.1200	15.0	75	0.0135	2.2
14	BS	3.4	60	2.0400	2.0	40	0.0163	0.5
15	VF/RC	4.4	30	1.3200	10.0	50	0.0660	1.5
16	VF/RC	12.4	30	3.7200	10.0	30	0.1116	0.9
17	CU/RC	0.4	80	0.3200	2.0	50	0.0032	0.8
18	CU	0.6	80	0.4800	2.0	30	0.0014	0.2
19	BS	3.6	50	1.8000	8.0	45	0.0648	1.8
20	VF	4.3	10	0.4300	15.0	65	0.0419	1.0
21	VF/RC	7.6	10	0.7600	5.0	45	0.0171	0.2
22	VF/RC	1.0	70	0.7000	2.0	45	0.0063	0.6
23	VF	0.3	80	0.2400	2.0	30	0.0014	0.5
24	VF/RC	8.5	65	5.5250	15.0	75	0.6216	7.3

Survey Unit	Landform	Survey unit area (ha)	Proportion of unit surveyed (%)	Area of unit surveyed (ha)	Average Incidence of exposure %	Average visibility within Exposures %	Effective coverage area (ha) survey unit area x proportion surveyed % x inc. exp. % x exp. vis.%)	Effective Coverage % (effective coverage area / survey unit area x 100)
25	CU	1.0	20	0.2000	5.0	45	0.0045	0.4
26	BS	3.2	10	0.3200	5.0	30	0.0048	0.1
27	MS	3.2	20	0.6400	5.0	30	0.0096	0.3
28	CU	3.6	65	2.3400	5.0	50	0.0585	1.6
29	MS	6.5	30	1.9500	10.0	50	0.0975	1.5
30	CU	0.2	20	0.0400	5.0	85	0.0017	0.8
31	MS	1.3	30	0.3900	8.0	60	0.0187	1.4
32	CU	0.2	25	0.0500	8.0	50	0.0020	1.0
33	MS	1.4	10	0.1400	5.0	50	0.0035	0.2
34	CU	1.5	10	0.1500	2.0	25	0.0007	0.05
35	BS	1.0	20	0.2000	2.0	25	0.0010	0.1
36	VF	2.3	45	1.0350	2.0	25	0.0052	0.2
37	BS	0.1	75	0.0750	5.0	45	0.0017	1.7
38	CU	0.5	85	0.4250	15.0	30	0.0191	3.8
39	MS	0.3	80	0.2400	8.0	30	0.0058	1.9
40	CU	1.3	60	0.7800	20.0	60	0.0936	7.2
41	MS	2.0	20	0.4000	5.0	45	0.0090	0.4
42	CU	1.0	45	0.4500	10	25	0.0112	1.1
43	MS	0.7	80	0.5600	5.0	20	0.0056	0.8
44	BS	0.9	60	0.5400	10.0	50	0.0270	3.0
45	MS	3.2	70	2.2400	10.0	45	0.1008	3.1
46	CU	0.2	60	0.1200	2.0	35	0.0008	0.4
47	CU/RLC	9.0	60	5.4000	10.0	65	0.3510	3.9
48	MS	0.4	60	0.2400	2.0	45	0.0022	0.5
49	MS	4.4	5	0.2200	2.0	45	0.0020	0.05

Survey Unit	Landform	Survey unit area (ha)	Proportion of unit surveyed (%)	Area of unit surveyed (ha)	Average Incidence of exposure %	Average visibility within Exposures %	Effective coverage area (ha) survey unit area x proportion surveyed % x inc. exp. % x exp. vis.%)	Effective Coverage % (effective coverage area / survey unit area x 100)
50	CU/RLC	4.7	80	3.7600	15.0	35	0.1974	4.2
51	MS	0.2	75	0.1500	5.0	65	0.0049	2.4
52	MS	0.5	50	0.2500	25.0	75	0.0469	9.4
53	BS	1.6	60	0.9600	15.0	60	0.0864	5.4
54	VF	1.2	30	0.3600	65.0	80	0.1872	15.6
55	VF/RC	8.8	50	4.4000	20.0	65	0.5720	6.5
56	MS/RC	0.9	70	0.6300	5.0	35	0.0110	1.2
57	VF	5.4	20	1.0800	35.0	75	0.2835	5.2
58	VF/RC	18.8	35	6.5800	15.0	65	0.6415	3.4
59	VF/RC	2.0	0	0.0000			0.0000	0.0
60	VF	2.7	15	0.4050	95	90	0.3463	12.8
61	VF	3.0	10	0.3000	2.0	15	0.0009	0.03
62	VF	1.9	10	0.1900	10.0	45	0.0085	0.4
63	VF	0.6	0	0.0000			0.0000	0.0
64	VF	0.1	60	0.0600	10.0	50	0.0030	3.0
65	VF	0.6	0	0.0000			0.0000	0.0
66	VF	0.8	60	0.4800	10.0	65	0.0312	3.9
67	VF/RC	1.6	35	0.5600	2.0	35	0.0039	0.2
68	BS/RC	0.5	20	0.1000	2.0	15	0.0003	0.1
69	MS	0.2	20	0.0400	2.0	15	0.0001	0.1
70	CU	0.8	25	0.2000	10.0	45	0.0090	1.1
71	MS	1.7	35	0.5950	10.0	40	0.0238	1.4
72	BS	1.7	55	0.9350	10.0	55	0.0514	3.0
73	VF	0.4	70	0.2800	15.0	45	0.0189	4.7
74	VF/RC	1.5	40	0.6000	3.0	30	0.0054	0.4

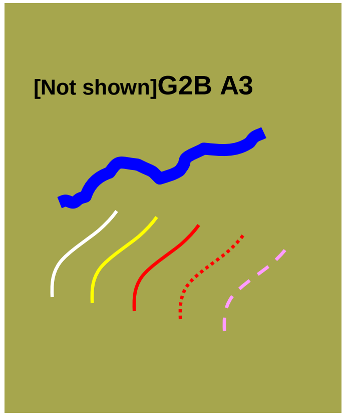
Survey Unit	Landform	Survey unit area (ha)	Proportion of unit surveyed (%)	Area of unit surveyed (ha)	Average Incidence of exposure %	Average visibility within Exposures %	Effective coverage area (ha) survey unit area x proportion surveyed % x inc. exp. % x exp. vis.%)	Effective Coverage % (effective coverage area / survey unit area x 100)
75	BS/RC	0.5	25	0.1250	5.0	30	0.0019	0.4
76	MS	0.2	10	0.0200	5.0	50	0.0005	0.2
77	CU	0.3	10	0.0300	5.0	50	0.0007	0.2
78	MS	0.4	5	0.0200	5.0	30	0.0003	0.1
79	BS/RC	0.3	0	0.0000			0.0000	0.0
80	VF/RC	0.9	5	0.0450	2.0	15	0.0001	0.01
81	VF	0.1	0	0.0000			0.0000	0.0
82	BS	0.4	20	0.0800	2.0	15	0.0002	0.1
83	MS	0.8	85	0.6800	15.0	45	0.0459	5.7
84	CU	0.6	10	0.0600	5.0	45	0.0013	0.2
85	MS	0.4	10	0.0400	5.0	30	0.0006	0.1
86	BS	0.1	10	0.0100	5.0	30	0.0001	0.1
		198.6 ha (100%)		***75.625 ha (38.1%)***			***4.753 ha (2.4%)***	***2.4***

K.2 Summary table of and sampled areas

Landform (not all categories are mutually exclusive)	**Landform area (ha)**	**Area of unit surveyed (ha)**	**Area effectively surveyed (ha) (effective coverage area)**	**% Landform effectively surveyed (area effectively surveyed / landform area x 100)**	**Number of sites**
Basal slopes (BS)	18.1	7.5050	0.2751	1.5	1
Crest and upper slopes (CU)	40.8	23.0300	0.9294	2.3	1
Mid slopes (MS)	44.5	15.2200	0.5450	1.2	1
Valley floor (VF)	95.2	29.8700	3.0035	3.1	
Ridgeline crest (RLC)	16.2	9.91	0.5709	3.5	
Riparian corridor (RC)	70.7	25.505	2.0754	2.9	1

K.3 Location of archaeological surface survey traverses relative to landform boundaries

KEY



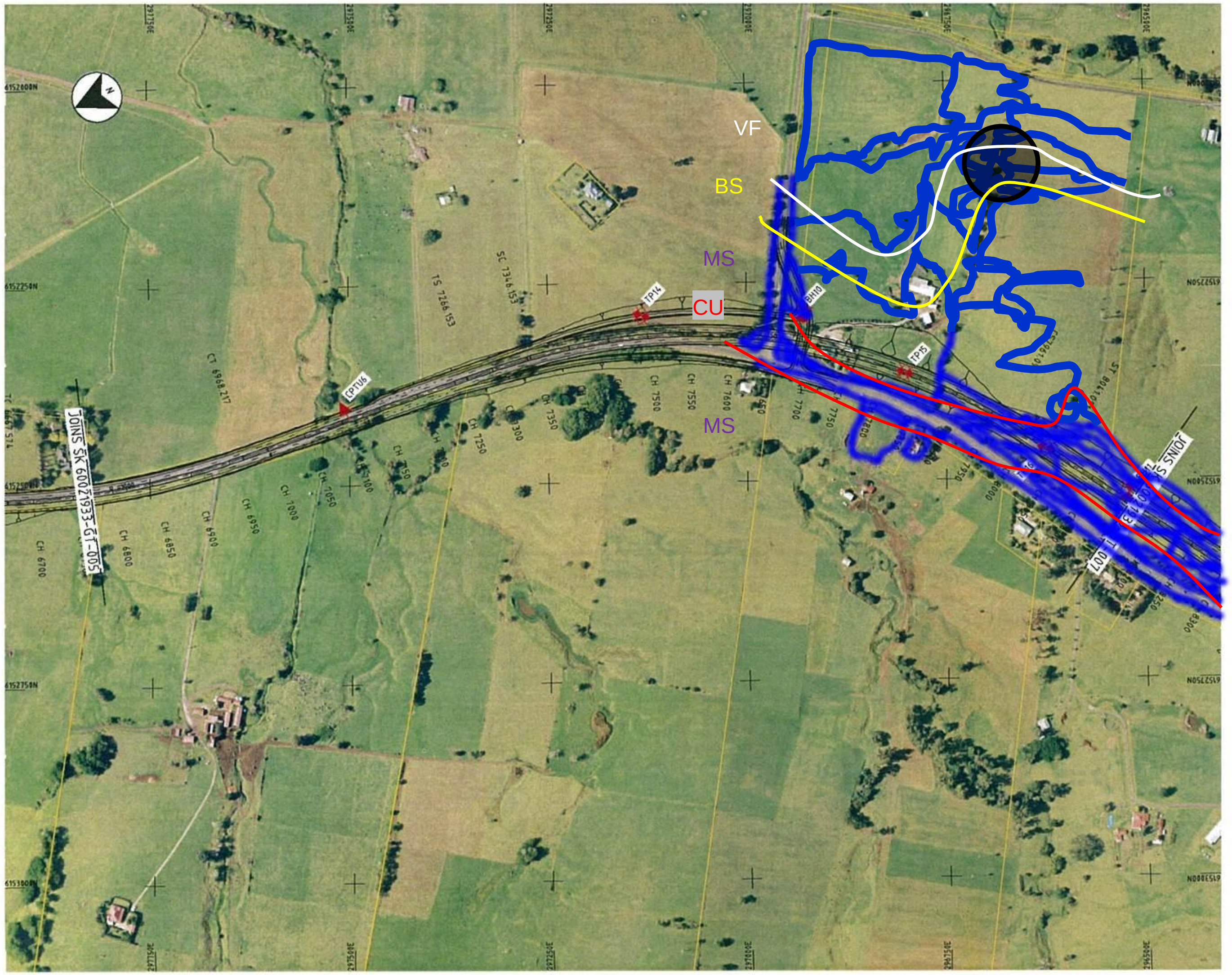
Aboriginal cultural heritage site and site code

Archaeological survey traverse

Landform unit boundaries:

VF – Valley Floor
BS – Basal Slopes
CU – Crest and Upper slopes
MS – Mid Slopes
RC – Riparian Corridor
RLC – Ridge Line Crest

NOTE: The base mapping shown in this Appendix dates from the time of the main survey and does not reflect the current project design. This original mapping is retained in order to illustrate the integrity of and justification for the survey traverses. Note also that the graphic scale (the graduated horizontal bar in the bottom, middle left of the Figures) is incorrect on these maps – the stated interval of 100m on this scale is actually only 50 metres. (Despite this, the marked chainage intervals along the alignment remain correct).



LEGEND

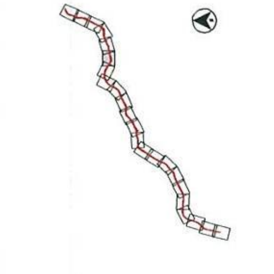
PROPOSED INVESTIGATION

- BOREHOLE (BH)
- TEST PIT (TP)
- CONE PENETRATION TEST WITH PIEZO CONE (CPTU)

PREVIOUS INVESTIGATION

- PREVIOUS BOREHOLE BY COFFEY (CBH)
- PREVIOUS TEST PIT BY COFFEY (CTP)
- PREVIOUS CPT BY COFFEY (CPT)
- PREVIOUS BOREHOLE BY GOLDER (GT)

KEYPLAN



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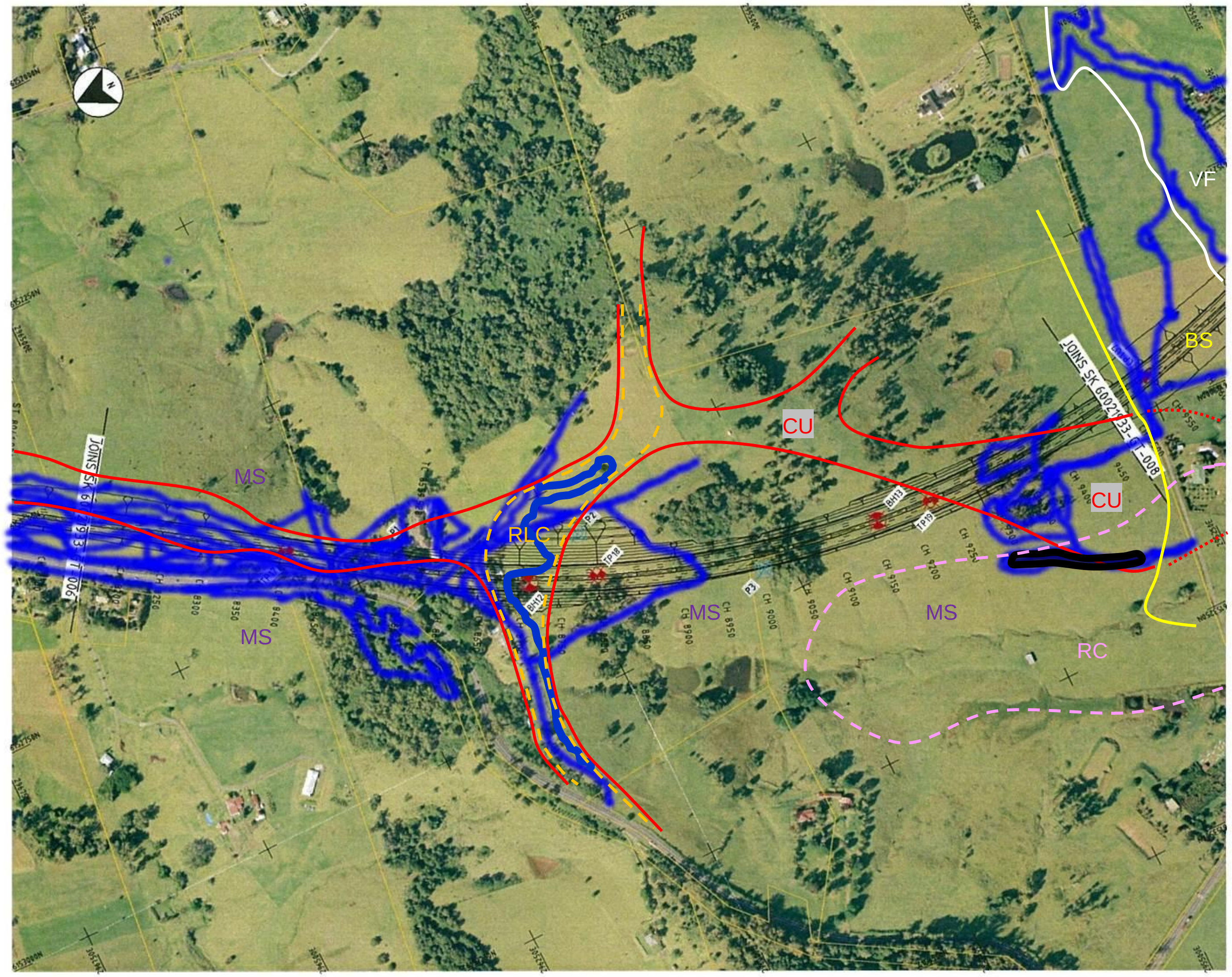

LEGEND

PROPOSED INVESTIGATION

- BOREHOLE (BH)
- TEST PIT (TP)
- CONE PENETRATION TEST WITH PIEZO CONE (CPTU)

PREVIOUS INVESTIGATION

- PREVIOUS BOREHOLE BY COFFEY (CBH)
- PREVIOUS TEST PIT BY COFFEY (CTP)
- PREVIOUS CPT BY COFFEY (CPT)
- PREVIOUS BOREHOLE BY GOLDER (GT)

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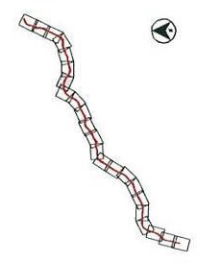

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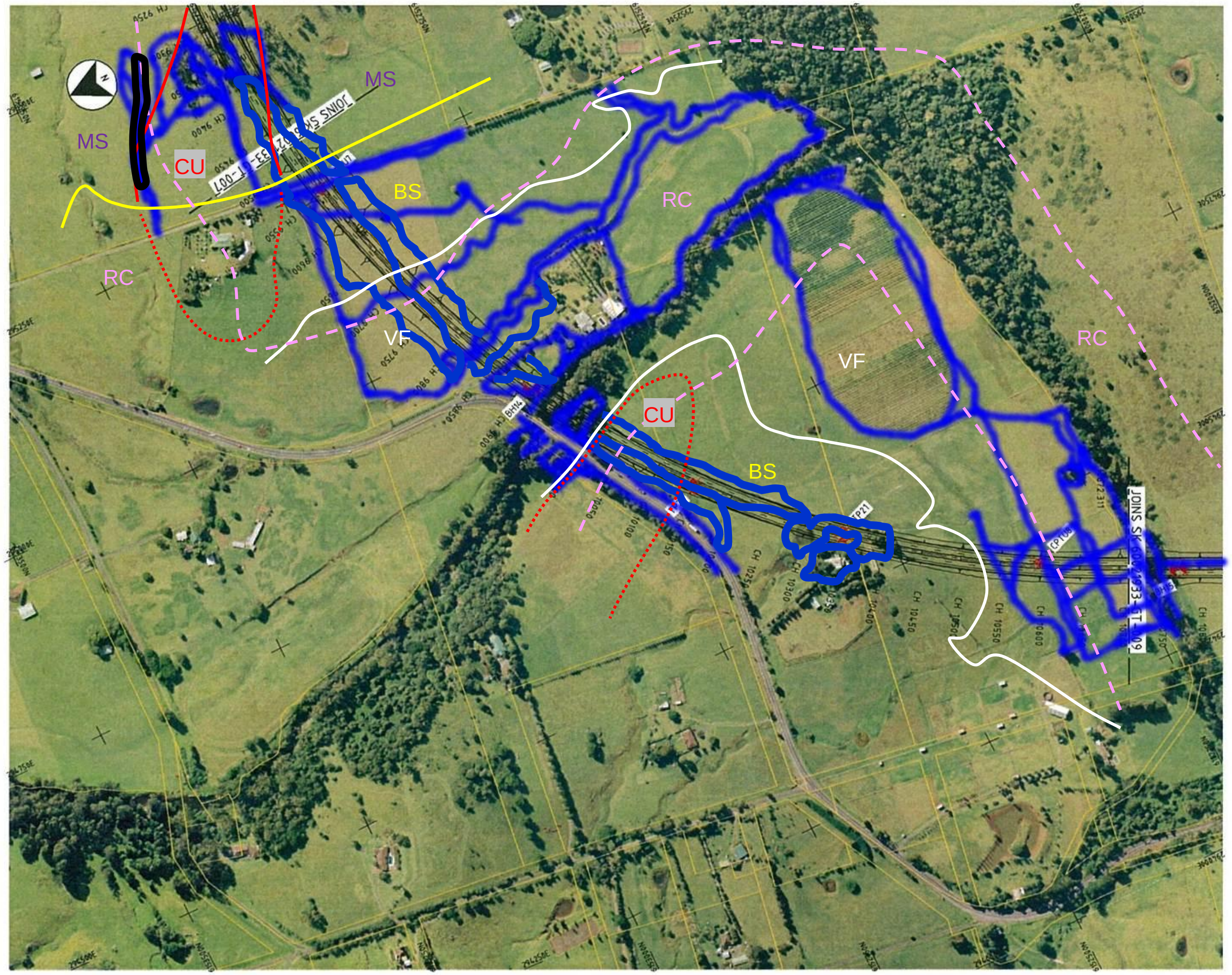


LEGEND

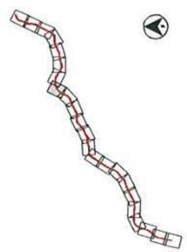
PROPOSED INVESTIGATION

- BOREHOLE (BH)
- TEST PIT (TP)
- CONE PENETRATION TEST WITH PIEZO CONE (CPTU)

PREVIOUS INVESTIGATION

- PREVIOUS BOREHOLE BY COFFEY (CBH)
- PREVIOUS TEST PIT BY COFFEY (CTP)
- PREVIOUS CPT BY COFFEY (CPT)
- PREVIOUS BOREHOLE BY GOLDER (GT)

KEYPLAN



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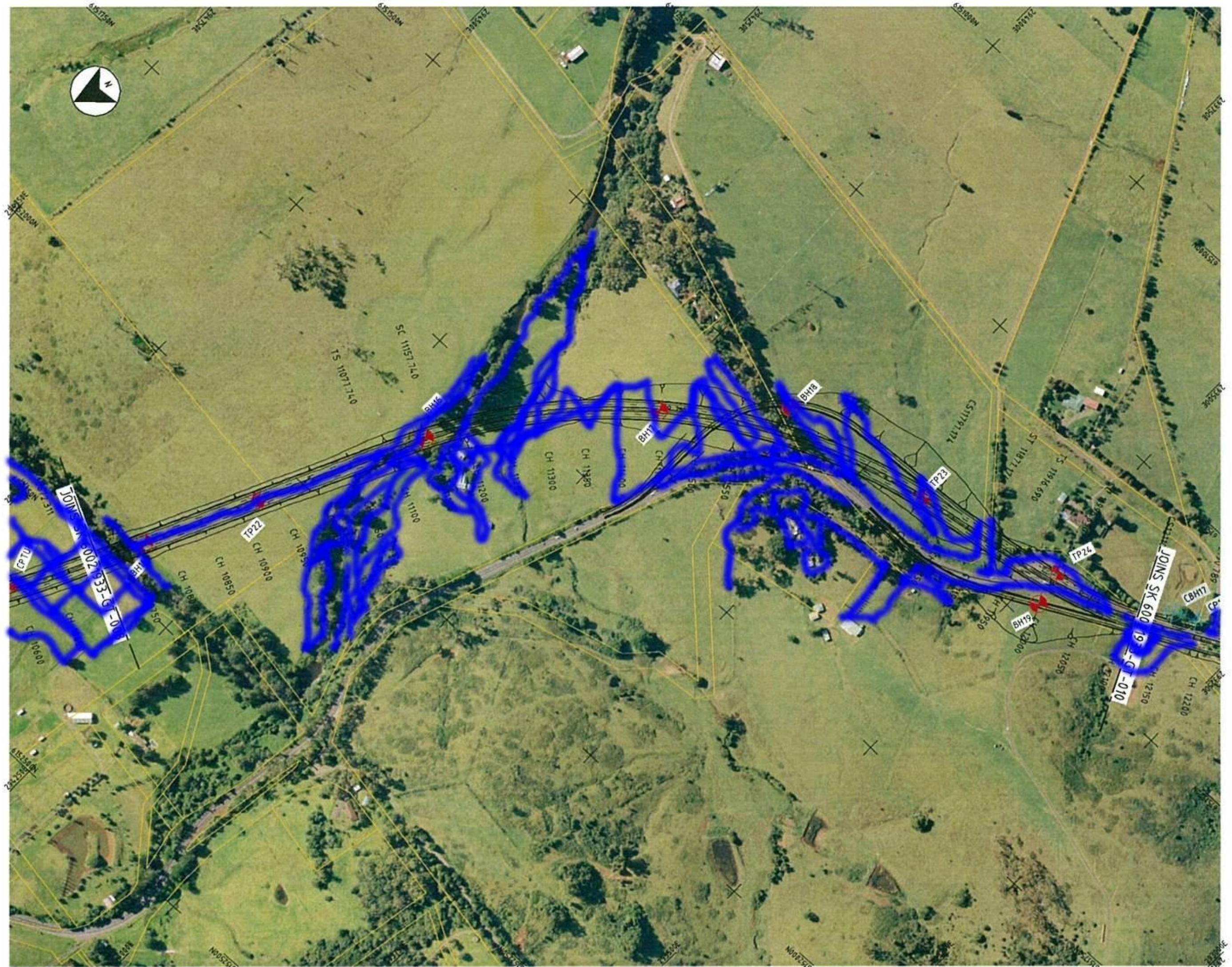

LEGEND

PROPOSED INVESTIGATION

BOREHOLE (BH)

TEST PIT (TP)

CONE PENETRATION TEST WITH PIEZO CONE (CPTU)

PREVIOUS INVESTIGATION

PREVIOUS BOREHOLE BY COFFEY (CBH)

PREVIOUS TEST PIT BY COFFEY (CTP)

PREVIOUS CPT BY COFFEY (CPT)

PREVIOUS BOREHOLE BY GOLDER (GT)

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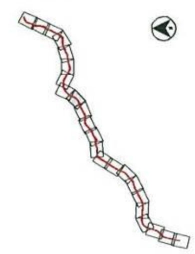

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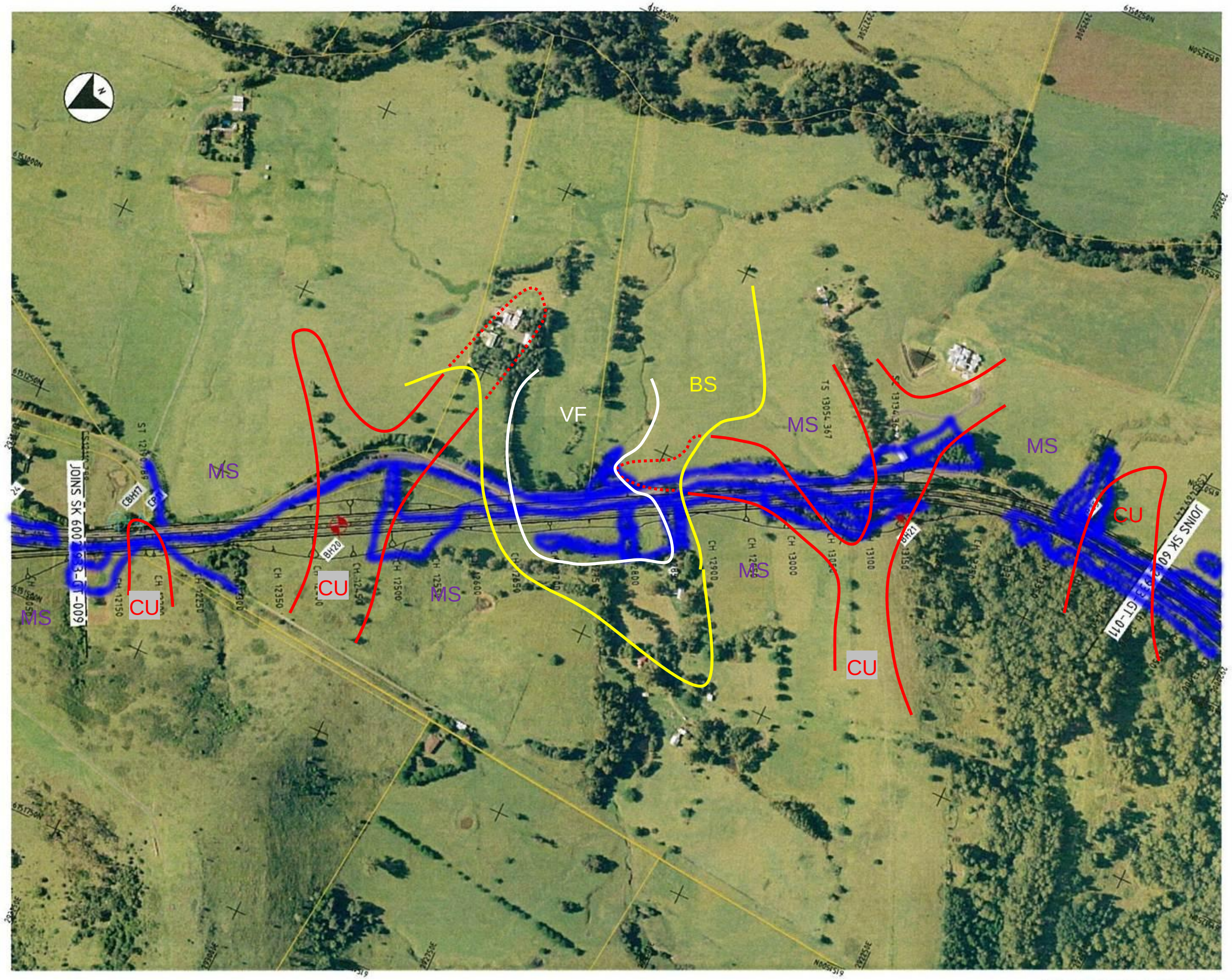

LEGEND

PROPOSED INVESTIGATION

BOREHOLE (BH)

TEST PIT (TP)

CONE PENETRATION TEST WITH PIEZO CONE (CPTU)

PREVIOUS INVESTIGATION

PREVIOUS BOREHOLE BY COFFEY (CBH)

PREVIOUS TEST PIT BY COFFEY (CTP)

PREVIOUS CPT BY COFFEY (CPT)

PREVIOUS BOREHOLE BY GOLDER (GT)

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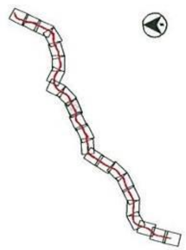

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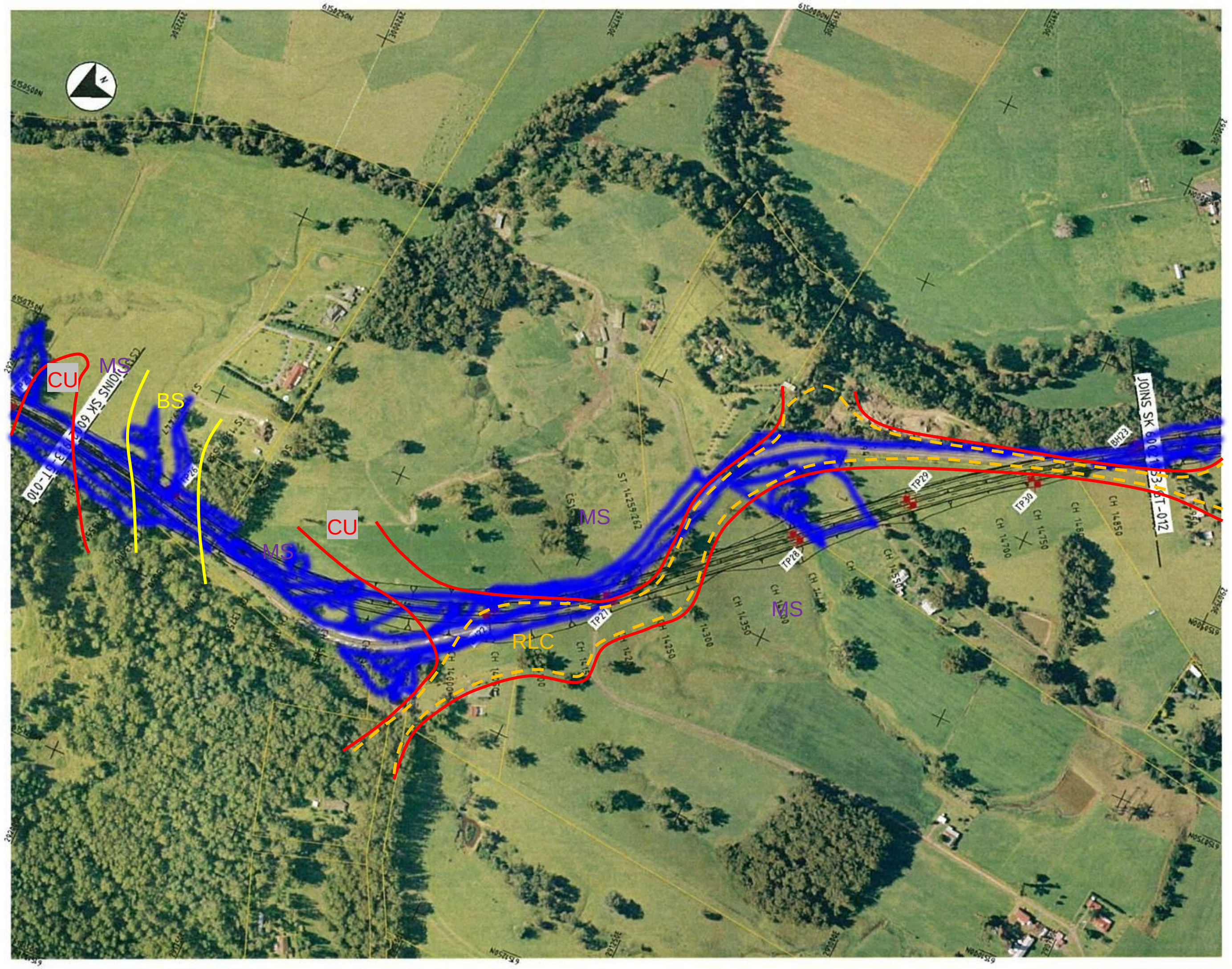


LEGEND

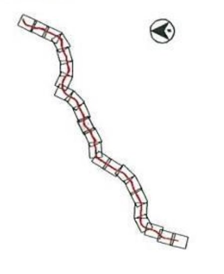
PROPOSED INVESTIGATION

- BOREHOLE (BH)
- TEST PIT (TP)
- CONE PENETRATION TEST WITH PIEZO CONE (CPTU)

PREVIOUS INVESTIGATION

- PREVIOUS BOREHOLE BY COFFEY (CBH)
- PREVIOUS TEST PIT BY COFFEY (CTP)
- PREVIOUS CPT BY COFFEY (CPT)
- PREVIOUS BOREHOLE BY GOLDER (GT)

KEYPLAN



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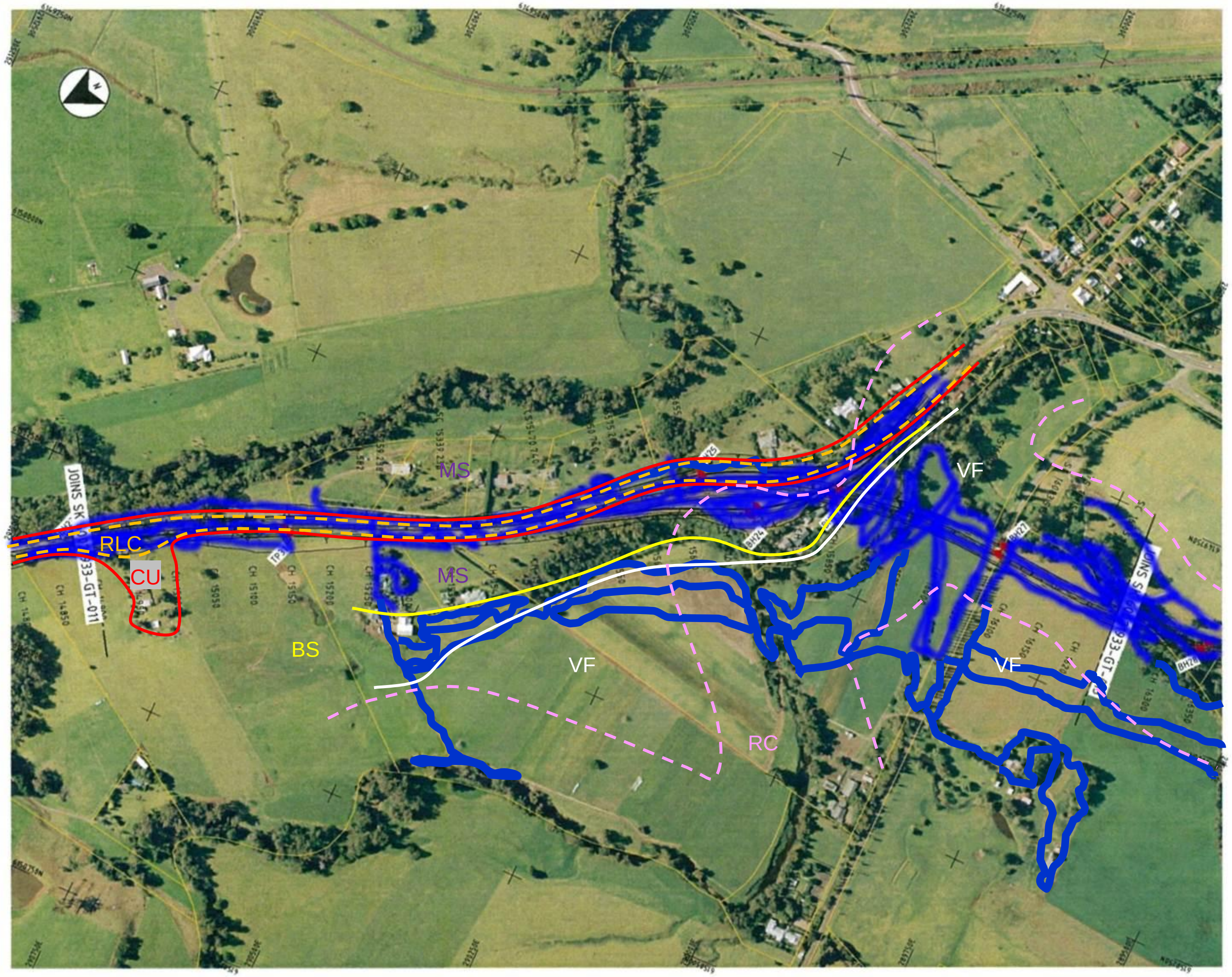


LEGEND

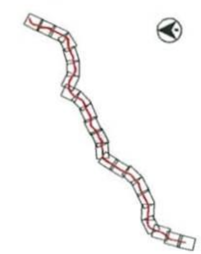
PROPOSED INVESTIGATION

- BOREHOLE (BH)
- TEST PIT (TP)
- CONE PENETRATION TEST WITH PIEZO CONE (CPTU)

PREVIOUS INVESTIGATION

- PREVIOUS BOREHOLE BY COFFEY (CBH)
- PREVIOUS TEST PIT BY COFFEY (CTP)
- PREVIOUS CPT BY COFFEY (CPT)
- PREVIOUS BOREHOLE BY GOLDER (GT)

KEYPLAN



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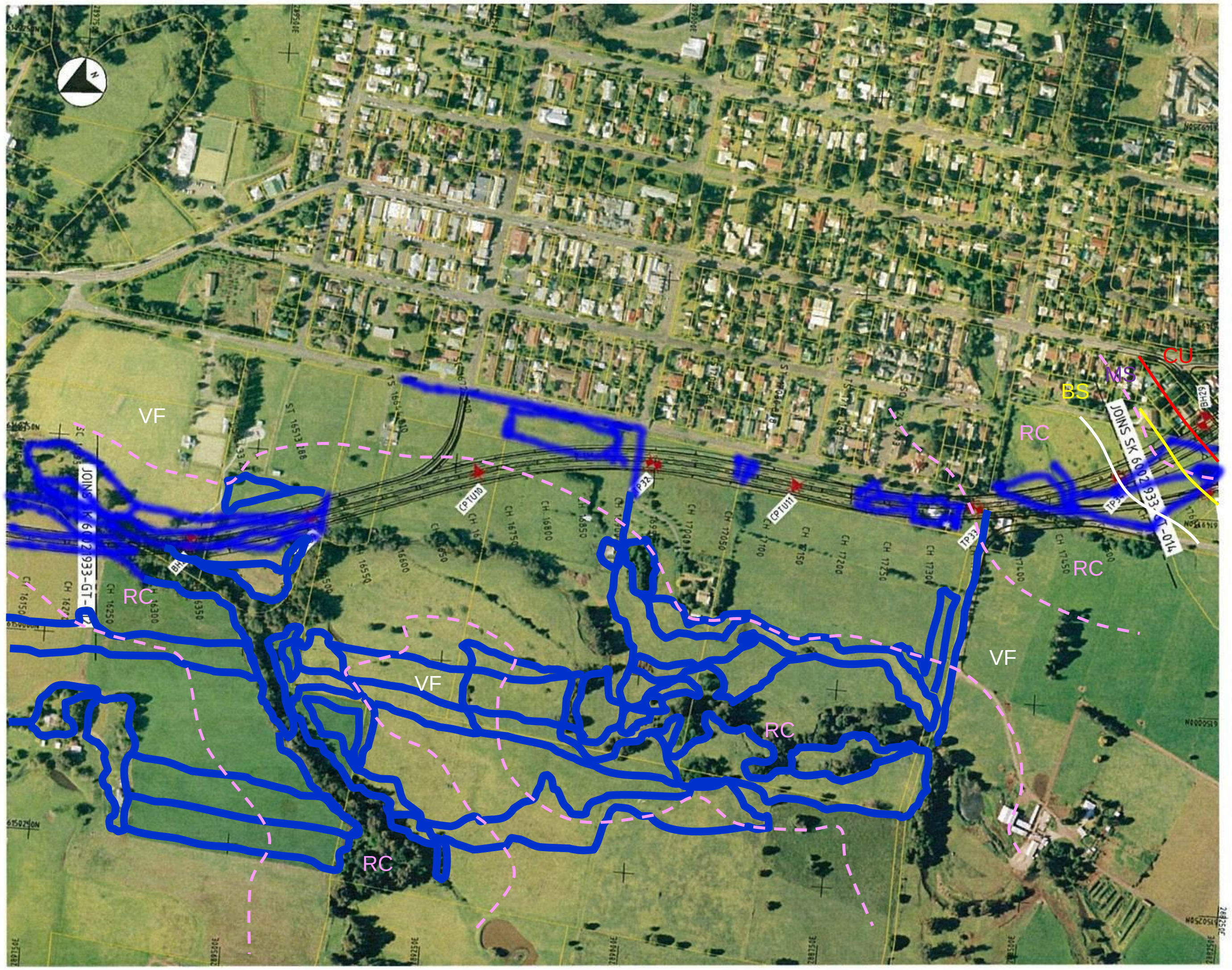


LEGEND

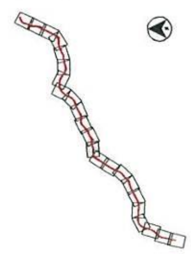
PROPOSED INVESTIGATION

- BOREHOLE (BH)
- TEST PIT (TP)
- CONE PENETRATION TEST WITH PIEZO CONE (CPTU)

PREVIOUS INVESTIGATION

- PREVIOUS BOREHOLE BY COFFEY (CBH)
- PREVIOUS TEST PIT BY COFFEY (CTP)
- PREVIOUS CPT BY COFFEY (CPT)
- PREVIOUS BOREHOLE BY GOLDER (GT)

KEYPLAN



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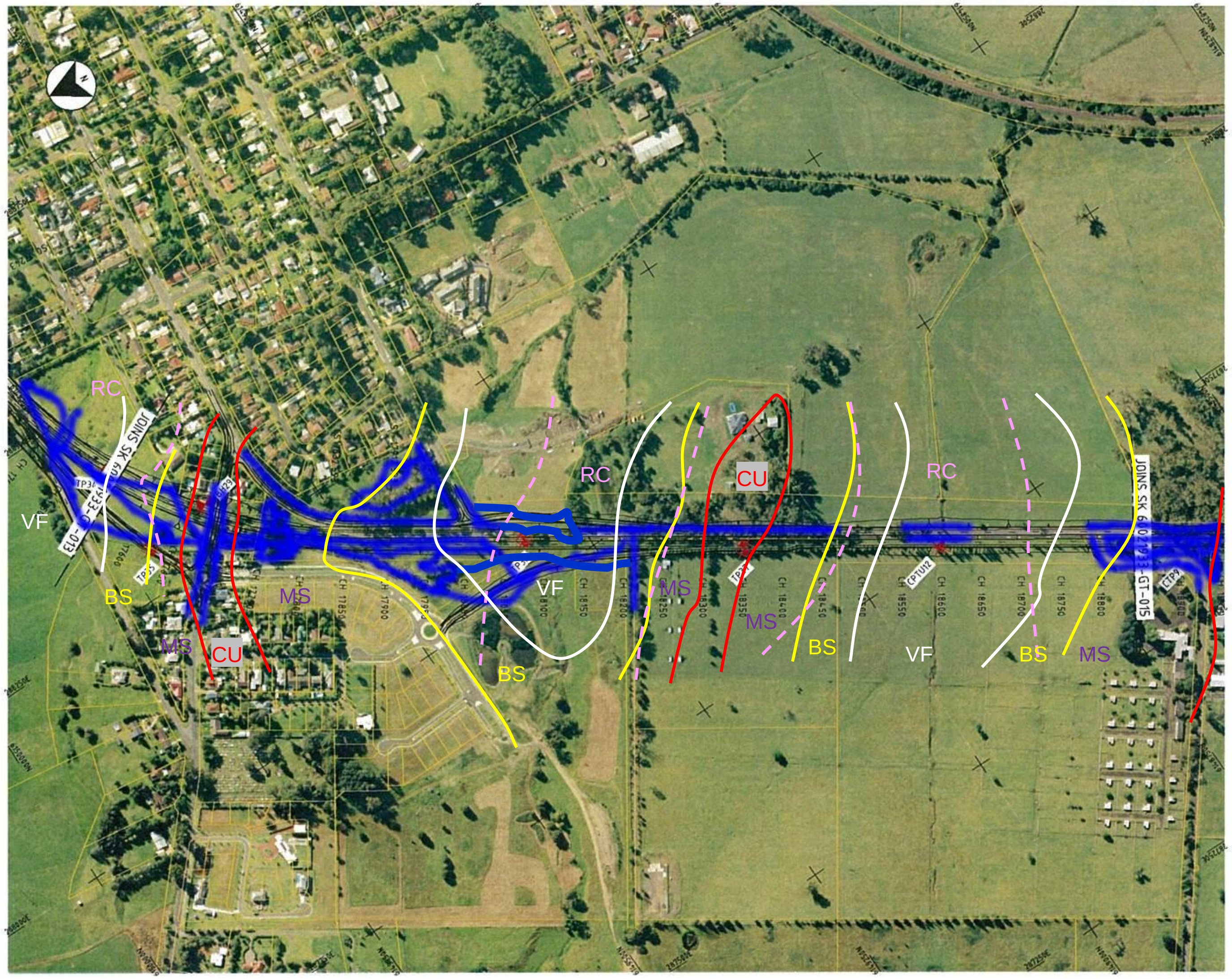
GERRINGONG TO BOMADERRY PRINCES HIGHWAY UPGRADE

PROPOSED GEOTECHNICAL INVESTIGATION SITES

SHEET 13

STATUS:	DRAWING NO:	REV:
SKETCH	60021933-GT-013	01



LEGEND

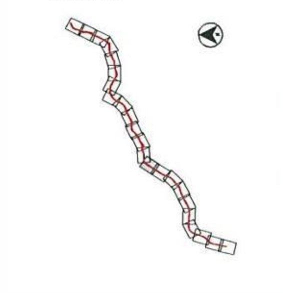
PROPOSED INVESTIGATION

- BOREHOLE (BH)
- TEST PIT (TP)
- CONE PENETRATION TEST WITH PIEZO CONE (CPTU)

PREVIOUS INVESTIGATION

- PREVIOUS BOREHOLE BY COFFEY (CBH)
- PREVIOUS TEST PIT BY COFFEY (CTP)
- PREVIOUS CPT BY COFFEY (CPT)
- PREVIOUS BOREHOLE BY GOLDER (GT)

KEYPLAN



REVISION IN PROGRESS

No.	BY	DATE	DESCRIPTION	APPD
01				

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GERRINGONG TO BOMADERRY PRINCES HIGHWAY UPGRADE

PROPOSED GEOTECHNICAL INVESTIGATION SITES

SHEET 14

STATUS: SKETCH | DRAWING NO: 60021933-GT-014 | REV: 01

MS
BS
RC
VF
CU
BS

Appendix L

Southeastern Australian sites used in (lithic analysis) richness comparison

Project name	Site name(s)	Map coordinates (GDA)	N° of excavated areas	N° of excavated pits	Total area excavated (m²)	Assemblage size	Assemblage diversity	Raw material diversity	Broken: complete artefacts
Sandon Point Sub-Surface Testing and Salvage Program, NSW south coast	Lot 235	308786.6199550	3	5	3000	2731	52	14	1.00
Coila Lake Salvage, NSW south coast	CPL1	240967.6007904	1	14	8	4081	47	13	1.47
Boardwalk, Newcastle, NSW south coast	NPWS Site #38-4-0559	384608.6356255	Not available	Not available	154	568	14	8	1.82
McCue Midden, Kurnell, NSW Central Coast	NPWS Site # 52-3-1110	331562.6233443	1	12	120	554	23	12	1.47
Banora Pt, NSW Far North Coast (SE Qld)	04-2-0017/166	554162.6878347	1	22	150	134	14	6	1.25
Dolphin Pt, NSW south coast	Stage 1 (Dolphin Point 2)	267638.6080637	1	36	90	1338	37	11	2.12
Lagoon Restaurant, Wollongong, NSW south coast	NPWS Site # 52-2-2189	306982.6109044 6	Not available	3	Not available	116	10	5	1.27
Conjola Regional Sewerage Scheme, NSW south coast	CS3; CS4; CS6; CS9; CS20; CS25; CS26; 58-2-241	267817.6098684	1	8	2	895	32	13	1.27
Gerroa Sand Mine, NSW South Coast	Conservation area B	298198.6149469	1	51	8	35	8	6	1.47
Wombeyan Caves Open Site, NSW south coast Hinterland	Wombeyan 1	773461.6200013	1	3	16	244	11	9	2.64
Tuross Pipeline, NSW south coast	TGPAD	242035.6006787	1	16	6	211	14	10	2.64

Project name	Site name(s)	Map coordinates (GDA)	N° of excavated areas	N° of excavated pits	Total area excavated (m^2)	Assemblage size	Assemblage diversity	Raw material diversity	Broken: complete artefacts
Tugun Bypass, SE QLD Coast	Tugun stages 1-3, Tugun Piers	549435.6883930	1	28	5600	1564	34	10	1.04
Coombabah Creek, SE Qld Coast	CC1	536480.6914558	1	29	81	456	31	11	0.6
Tidbinbilla, ACT	TDC1; TDC2; TDC4 (PAD)	672758.6073553 GDA	3	NA	NA	256	24	8	1.60
Gerroa STP, NSW south coast	STP; SPS682	298604.6149693	2	66	216	1961	19	9	1.6
Manyana, NSW south coast	MS1; MS2; MS3; MS4; MS5	273704.6095421	1	27	5	479	20	3	1.20
Bungendore Gas Pipeline, Eastern NSW	GMF1; GMF2; GMF4; GMF PAD1	717300.6085260	1	5	4000	728	26	10	0.60
Blacktown Olympic Park, NSW Central Coast	BOP PAD	301685.6261360	1	39	39	958	19	9	0.99
Bannaby, NSW south coast Hinterland	BA1; BA2; BA3; BA4; BA6; BA7; BA8; BA9, PAD BA7	775193.6182827	1	19	28	229	20	9	1.46
Eastern Creek, ACT	PAD1	301283.6258599	1	16	40	66	4	3	2.80
Barton Highway, ACT	BHDS1; BHDS2	693807.6100481	3	2	2	24	3	Not available	1.64
West Macgregor 1&2, ACT	MW3; MW4; MW5/PAD; MW6	682326.6101307	3	63	63	1799	34	13	9.39
Cotter Dam, ACT	UF330, UF332, ECRAs 6, 15, 17, 30 and 65	675420.6089946	15	305	50	2131	61	11	

Project name	Site name(s)	Map coordinates (GDA)	N° of excavated areas	N° of excavated pits	Total area excavated (m^2)	Assemblage size	Assemblage diversity	Raw material diversity	Broken: complete artefacts
Tintenbar to Ewingsdale, NSW North Coast	PADs 2, 6, 7, 23, 24 and 25	551890.6822512	6	42	7	26	3	1	11.00
Bulahdelah Pacific Hwy, NSW south coast	BPAD2; BPAD3; B8; B10; B15	425868.6414333	4	25	25	10	5	3	2.92
East Lake, ACT	E4	695206.6090351	1	7	7	11	2	1	
Bellambi STP, NSW south coast	Zone A; Zone D	309514.6195028	2	NA	200	444	38	3	2.77
G2B Gerringong Upgrade, Eastern NSW	PASA32; 33;37;38;39; G2B A5; G2B A6; G2B A7	300933.6153204	8	42	7	146	20	10	1.40
Stage 1 and 2 (NSW) Murrumbidgee to Googong Pipeline, ACT and NSW	M2G8, 15, 16, 17, 18, 24, 25, 26, 28, 31, 32, 33, 37, 55, 56, 57, 58, 59, 60, 61, 71	351635.6150908	22	99	16	570	17	6	1.13
C2B, Cootamundra, Eastern NSW	CB2, CB5, CB9, CB15 and at PAD CBPAD1	593871.6166475	5	125	20	381	22	7	1.92

Project name	Site name(s)	Map coordinates (GDA)	N° of excavated areas	N° of excavated pits	Total area excavated (m²)	Assemblage size	Assemblage diversity	Raw material diversity	Broken: complete artefacts
Bacchus Marsh, Southern VIC	WV028, WV092, WV094, WV095, WV108, WV116, WV123, WV138, WV139, WV140, WV141, WV142, WV143, WV144, WV145, WV146, WV147, WV149, WV150, WV151, WV152, WV153, WV154, WV155, WV157, WV85, WV86	271861.826036	27	Not available	Not available	340	24	4	1.60
Mt Gellibrand, Southern VIC	Not available	Not available	Not available	Not available	Not available	2227	29	7	9.00
G2B FBB	PASA12;13; 14;15;16;18; 20;21;23;24; 25;26;27;28; 29;40;41;43 & 44	290049.6149878	3	298	240	236	27	12	1.79
Mean						***791.09***	***23.38***	***8.32***	***2.69***

Appendix M

Unexpected finds procedure

STANDARD MANAGEMENT PROCEDURE

Unexpected Archaeological Finds

July 2012

About this release

RMS/ISBN numbers	RMS 12.003 | ISBN 9781922040305
Title	Unexpected Archaeological Finds Procedure

Approval and authorisation		Name
Prepared by	Environmental Officer (Heritage)	Gretta Logue
Revised by	Environmental Officer (Heritage)	Daniel Percival
Approved by	Manager Environmental Policy	Michael Crowley

Location	File name
G:\ENVIRNMNT\Policy\Heritage\Cultural Heritage (Non-Aboriginal)\Unexpected Finds Procedure\Procedure\Final July 2012	Unexpected Archaeological Finds Procedure.doc

Document status	Date
Final	23 July 2012

Version	Date	Revision Description
Final	1 November 2011	First Draft
Revised	23 July 2012	Amended to reflect that (a) unexpected finds do not include items covered by a relevant approval; (b) Aboriginal people must be consulted where an unexpected find is likely to be an Aboriginal object; (c) the Department of Planning and Infrastructure must be notified in accordance with Step 5 of this procedure for Part 3A and Part 5.1 projects.

Prepared by

Environment Branch

Roads and Maritime Services

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Please note

This procedure applies to all development and activities concerning roads, road infrastructure and road related assets undertaken by Roads and Maritime Services.

For advice on how to manage unexpected archaeological finds as a result of activities related to maritime infrastructure or projects, please contact the Senior Environmental Specialist (Heritage).

Contents

Unexpected Archaeological Finds Procedure

1. Purpose

The unexpected archaeological finds procedure has been developed to provide a consistent approach on how to proceed in the event of uncovering an unexpected archaeological find (both Aboriginal and non-Aboriginal) during Roads and Maritime Services' (RMS) activities. This includes RMS' heritage notification obligations under the following legislation: *Heritage Act 1977* (NSW), *National Parks and Wildlife Act 1974* (NSW), *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) and the *Coroner's Act 2009* (NSW).

This document provides relevant background information in Section 3, followed by the technical procedure in Sections 6 and 7. Associated guidance referred to in the procedure can be found in Appendices A-H.

2. Scope

This procedure assumes that an appropriate level of Aboriginal and non-Aboriginal cultural heritage assessment has been undertaken prior to project approval or determination. Such assessment would have identified all heritage items, including areas of archaeological potential, likely to be present within the project area.

However, in some cases, despite appropriate and adequate investigation, unexpected archaeological finds may be encountered during the project construction phase. When this happens, this procedure must be followed. This procedure provides direction on when to stop work, where to seek technical advice and how to notify the regulator, if required.

This procedure applies to all RMS construction and maintenance activities

This procedure **applies to**:

- The discovery of any unexpected archaeological find (usually during construction), where RMS does not have specific approval to disturb that find.
- All RMS projects that are approved or determined under Part 3A (including Transitional Part 3A Projects), Part 4, Part 5 or Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), or any development that is exempt under the Act.

This procedure must be followed by all RMS staff, RMS alliance partners (including Local Council staff working under Road Maintenance Council Contracts, [RMCC]), developers under works authorisation deeds or any person undertaking Part 5 assessment for the purposes of RMS.

This procedure **does not apply** to:

- The legal discovery and disturbance of archaeological finds as a result of investigations being undertaken in accordance with OEH's *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (2010); an Aboriginal Heritage Impact Permit (AHIP) issued under the *National Parks and Wildlife Act*

1974; or an approval issued under the *Heritage Act 1977*[1].

- The legal discovery and disturbance of archaeological finds as a result of investigations (or other activities) that are required to be carried out for the purpose of complying with any environmental assessment requirements under Part 3A (including Transitional Part 3A Projects) or Part 5.1 of the EP&A Act.
- The legal discovery and disturbance of archaeological finds as a result of construction related activities, where the disturbance is permissible in accordance with an AHIP[2]; an approval issued under the *Heritage Act 1977*; or the Minister for Planning's conditions of project approval.

All new Construction Environment Management Plans (CEMPs) must make reference to and/or include this procedure (often included as a heritage sub-plan). Where approved CEMPs exist they must be followed in the first instance. Where there is a difference between approved CEMPs and this procedure, the approved CEMP must be followed. Where approved CEMPs do not provide sufficient detail on particular issues, this procedure should be used as additional guidance. When in doubt always seek environment and legal advice on varying approved CEMPs.

3. Types of unexpected archaeological finds and their legal protection

Project, field and environment staff will be critical to the early identification and protection of unexpected archaeological finds. Appendix A illustrates the wide range of archaeological discoveries found on RMS projects and provides a useful photographic guide to this early identification. Subsequent confirmation of archaeological discoveries must then be identified and assessed by technical specialists (usually an archaeologist).

An 'unexpected find' is any unanticipated archaeological discovery, for which RMS does not have existing approval to disturb[3].

These discoveries are categorised as either:

(a) Aboriginal objects

(b) 'Non-Aboriginal' unexpected finds

(c) Human skeletal remains.

The relevant legislation that applies to each of these categories is described below.

3.1 Aboriginal objects

Unexpected archaeological finds may include 'Aboriginal objects'. The *National Park and Wildlife Act 1974* protects *Aboriginal objects* which are defined as:

---

[1] RMS' heritage obligations are incorporated into either the conditions of heritage approval or within the RMS standard consultant's brief for undertaking archaeological investigations.

[2] RMS *Procedure for Aboriginal cultural heritage consultation and investigation* (2011) recommends that Part 4 and Part 5 projects that are likely to impact Aboriginal objects during construction seek a whole-of-project AHIP. This type of AHIP generally allows a project to impact known and potential Aboriginal objects within the entire project area, without the need to stop works. It should be noted that an AHIP may exclude impact to certain objects and areas, such as burials or ceremonial sites. In such cases, the project must follow this procedure.

[3] This is considered to be any physical interference with the find such as manually picking it up and putting it back, moving it to another location near by, removing it from site, crushing or excavation it, or any other type of physical action that results in it being destroyed, defaced, damaged, harmed, impacted or altered in any way (this includes archaeological investigation activities).

> "*any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non Aboriginal extraction, and includes Aboriginal remains*"[4].

Examples of Aboriginal objects include stone tool artefacts, shell middens, axe grinding grooves, pigment or engraved rock art, burials and scarred trees.

> **IMPORTANT!**
>
> **All *Aboriginal objects* are subject to statutory controls and protections.**
>
> If any impact is expected to an Aboriginal object, an Aboriginal Heritage Impact Permit (AHIP) is usually required from the Office of Environment and Heritage (OEH)[5]. Also, when a person becomes aware of an Aboriginal object they must notify the Director-General of OEH about its location[6]. Assistance on how to do this is provided in Section 7 (Step 5).

3.2 Non-Aboriginal unexpected finds

Non-Aboriginal unexpected finds may include statutory 'relics' or other non-statutory archaeological features (ie works).

The *Heritage Act 1977* protects *relics* which are defined as:

> "*any deposit, artefact, object or material evidence that relates to the settlement of the area that comprises NSW, not being Aboriginal settlement; and is of State or local heritage significance*"[7].

Relics may relate to past domestic, industrial or agricultural activities in NSW, and can include items such as bottles, items of clothing, pottery, building materials and general refuse.

> **IMPORTANT!**
>
> **All *relics* are subject to statutory controls and protections.**
>
> If any impact is expected to a relic, a heritage approval is usually required from the NSW Heritage Council[8]. Also, when a person discovers a relic they must notify the NSW Heritage Council of its location[9]. Advice on how to do this is provided in Section 7 (Step 5).

Some non-Aboriginal archaeological features such as historic utilities and infrastructure are not considered to be 'relics'; instead they are considered to be 'works'. Examples

---

[4] Section 5(1) *National Park and Wildlife Act 1974*.
[5] Except when Part 3A, Division 4.1 of Part 4 or Part 5.1 of the *EP&A Act* applies.
[6] This is required under s89(A) of the *National Park and Wildlife Act 1974* and applies to **all projects** assessed under Part 3A, Part 4, Part 5 *and Part 5.1* of the *EP&A Act*, including exempt development.
[7] Section 4(1) *Heritage Act 1977*.
[8] Except when Part 3A, Division 4.1 of Part 4 or Part 5.1 of the *EP&A Act* applies.
[9] This is required under s146 of the *Heritage Act 1977* and applies to **all projects** assessed under Part 3A, Part 4, Part 5 and Part 5.1 of the *EP&A Act*, including exempt development.

of works that the RMS may encounter include former road infrastructure features and services, culverts, previous historic road formation, historic pavement, buried road retaining walls, tramlines, cisterns and conduits. Although an approval under the *Heritage Act 1977* may not be required, the discovery of works must also be managed in accordance with this procedure.

3.3 Human skeletal remains

Human skeletal remains can be identified as either an Aboriginal object or non-Aboriginal relic depending on ancestry of the individual (Aboriginal or non-Aboriginal) and burial context (archaeological or non-archaeological). Remains are considered to be archaeological when the time elapsed since death is suspected of being 100 years or more. Depending on ancestry and context, different legislation applies.

As a simple example, a pre-contact archaeological Aboriginal burial would be protected under the *National Park and Wildlife Act 1974*, while a historic (non-Aboriginal) archaeological burial within a cemetery would be protected under the *Heritage Act 1977*. For these cases, the relevant heritage approval and notification requirements described in the above sections 3.1 and 3.2 would apply. In addition to the *National Park and Wildlife Act 1974*, finding Aboriginal human remains also triggers notification requirements to the Commonwealth Minister for Sustainability, Environment, Water, Populations and Communities (SEWPC) under s20(1) of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth).

IMPORTANT!

<u>All</u> human skeletal remains are subject to statutory controls and protections.

All bones must be treated as potential human skeletal remains and work around them must stop while they are protected and investigated urgently.

However, where it is suspected that less than 100 years has elapsed since death, the human skeletal remains come under the jurisdiction of the State Coroner and the *Coroners Act 2009* (NSW). Such a case would be considered a 'reportable death' and under legal notification obligations set out in s35(2); a person must report the death to a police officer, a coroner or an assistant coroner as soon as possible. This applies to all human remains less than 100 years old[10] regardless of ancestry (ie both Aboriginal and non-Aboriginal remains). Public health controls may also apply.

Guidance on what to do when suspected human remains are found is provided in Appendix F.

[10] Under s19 of the *Coroners Act 2009*, the coroner has no jurisdiction to conduct an inquest into reportable death unless it appears to the coroner that (or that there is reasonable cause to suspect that) the death or suspected death occurred within the last 100 years.

4. Responsibilities

The following roles and responsibilities are relevant to this procedure.

Role	Definition/responsibility
Aboriginal Cultural Heritage Advisor (ACHA)	Provides Aboriginal cultural heritage advice to project teams. Acts as Aboriginal community liaison for projects on cultural heritage matters. Engages and consults with the Aboriginal community as per the RMS *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*.
Aboriginal Sites Officer	Is an appropriately trained and skilled Aboriginal person whose role is to identify and assess Aboriginal objects and cultural values. For details on engaging Aboriginal sites officers, refer to RMS *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*.
Archaeologist (A)	Professional consultant, contracted on a case-by-case basis to provide heritage and archaeological advice and technical services (such as reports, heritage approval documentation etc).
Project (*on-call*) Archaeologist	Professional consultant contracted for the implementation phase of a construction project to provide heritage and archaeological advice and technical services when required. Major projects with complex heritage issues often have a Project archaeologist.
Project Manager (PM)	Ensuring all aspects of this procedure are implemented. The PM can delegate specific site tasks to a construction environment manager, RMS site representatives or regional environment staff, where appropriate.
Regional Environment Staff (RES)	Providing advice on this procedure to project teams. Ensuring this procedure is implemented consistently by supporting the PM. Supporting project teams during the uncovering of unexpected finds. Reviewing archaeological management plans and liaising with heritage staff and archaeological consultants as needed.
Registered Aboriginal parties (RAPs)	RAPs are Aboriginal people who have registered with the RMS to be consulted about a proposed RMS project or activity in accordance with OEH's Aboriginal cultural heritage consultation requirements for proponents (2010).
RFS Environment Manager	Ensuring RFS field staff are aware of the RFS Escalation Protocol and RFS Unexpected Find Recording Form 418. Supporting the RFS Section Manager, where required, during the implementation of this procedure and ensuring reporting of unexpected finds through environment management systems.
RFS Section Manager	Responding to escalated unexpected finds that have been uncovered during RFS maintenance works.

	Liaising with the RES and RFS Environment Manager and heritage staff, where required, during the uncovering of unexpected finds and the implementation of this procedure.
RFS Team Leader	Ensuring RFS field crew stop works in vicinity of the find. Completing RFS Unexpected Find Recording Form 418 and escalating issues to RFS Section Manager, as per RFS Escalation Protocol.
Senior Environmental Specialist (Heritage) (SES(H))	Provides technical assistance on this procedure and archaeological technical matters, as required. Reviewing the archaeological management plans and facilitating heritage approval applications, where required. Assists with regulator engagement, where required.
Technical Specialist	Professional consultant contracted to provide specific technical advice that relates to the specific type of unexpected find (eg a forensic or physical anthropologist who can identify and analyse human skeletal remains).

5. Acronyms

The following acronyms are relevant to this procedure.

Acronym	**Meaning**
AHIP	Aboriginal Heritage Impact Permit
ASO	Aboriginal Site Officer
CEMP	Construction Environment Management Plan
DSEWPC	Commonwealth Department of Sustainability, Environment, Water, Populations and Communities
EPRG	Environmental Planning and Regulatory Group. *Please note at the time of finalisation EPRG became part of Environment Protection Authority.*
OEH	Office of Environment and Heritage
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
RAP	Registered Aboriginal Party/ies
RFS	Road and Fleet Services
RMCC	Road Maintenance Council Contracts
RMS	Roads and Maritime Services

6. Overview of the procedure

On discovering something that could be an unexpected archaeological find ('the find'), the project manager must implement the following procedure with the assistance of the regional environment staff and RMS heritage staff, where required.

There are eight steps in the procedure. These steps are shown briefly in Figure 1 below and explained in detail in Section 7.

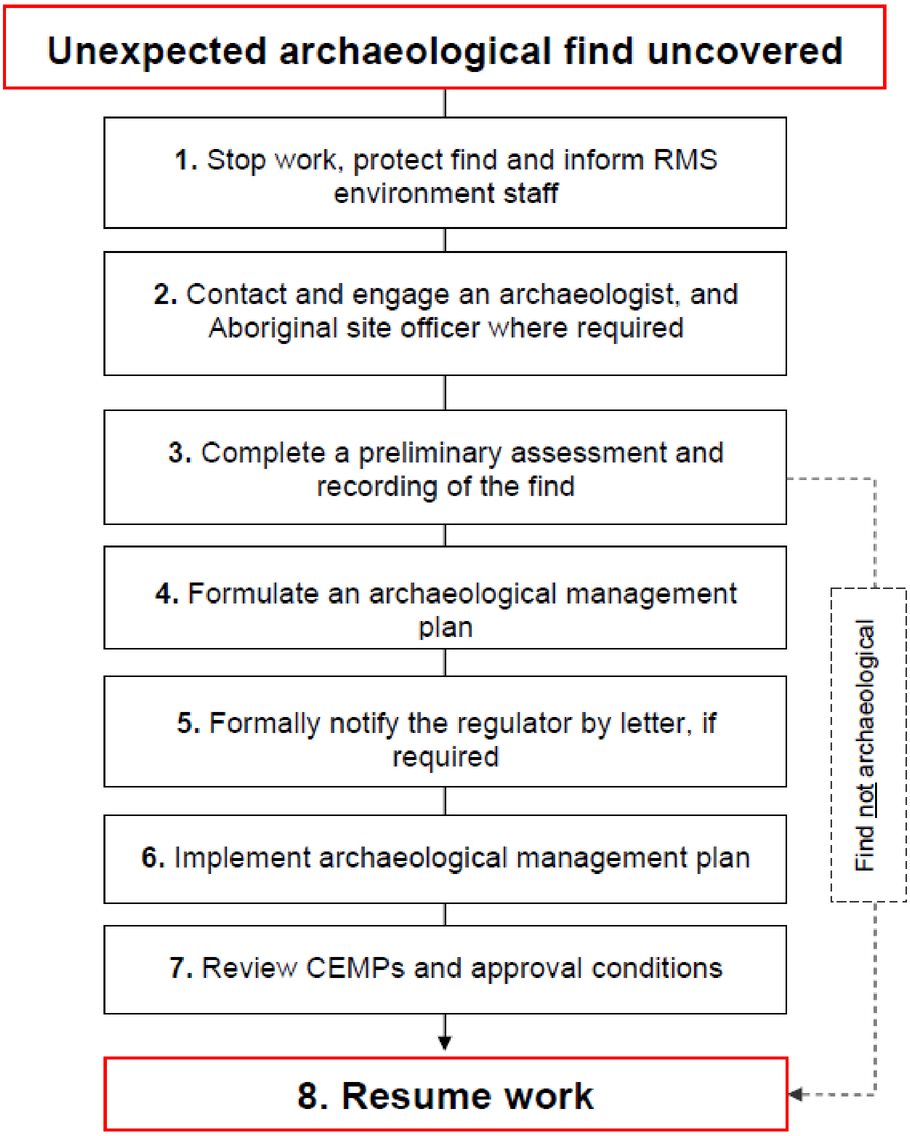


Figure 1: Overview of steps to be undertaken on the discovery of an unexpected archaeological find.

7. Unexpected Archaeological Finds Procedure

Table 1: Specific tasks to be implemented following the discovery of an unexpected find.

Aboriginal Cultural Heritage Advisor (ACHA); Aboriginal Sites Officer (ASO); Archaeologist (A); Project Manager (PM); Regional Environment Staff (RES); Registered Aboriginal Parties (RAPs); Senior Environmental Specialist (Heritage) (SES(H)).

Step	Task	Responsibility	Guidance & Tools
1	**Stop work, protect find and inform RMS environment staff**		
1.1	Stop all work in the immediate area of the find and notify the PM.	All	**Appendix A** (Identifying Unexpected Archaeological Finds)
1.2	RFS routine maintenance crews are required to follow the escalation protocol outlined in Appendix B and return to this procedure when directed by that protocol.	RFS Team Leader	**Appendix B** (RFS Escalation Protocol) **Appendix C** (RFS Find Recording Form 418)
1.3	Take a number of photographs that captures the general context and specific detail of the find.	PM	**Appendix D** (Photographing Unexpected Archaeological Finds)
1.4	Inform relevant RMS regional environment staff, Senior Environmental Specialist (Heritage) and Regional Aboriginal Cultural Heritage Advisor (where the find is thought to be an Aboriginal object).	PM	**Appendix E** (Key Environmental Contacts)
1.5	Delineate and protect the find with appropriate (high visibility) fencing, where practical.	PM	
1.6	No further interference, including works, ground disturbance, touching or moving the find of any kind, must occur to the find or within the protected area.	PM	
1.7	Inform all site personnel of the protected area (a new environmentally sensitive zone).	PM	

Step	Task	Responsibility	Guidance & Tools
1.8	Where, at this stage, the find is reasonably suspected to be human remains proceed directly to notifying the local police who may take command of all or part of the site. Where the find does not involve human remains, continue progressing through this procedure.	PM	**Appendix F** (Uncovering Bones)
1.9	Report the find as a '*Notifiable Event*' in accordance with the RTA *Incident Classification and Reporting Procedure*. Also implement any additional reporting requirements related to the project's approval and CEMP.	PM/RES	**RTA Incident Classification and Reporting Procedure**
2	**Contact and engage an archaeologist, and Aboriginal site officer where required**		
2.1	Contact the project (*on-call*) archaeologist to discuss the location and extent of the find and to arrange a site inspection, if required. The project CEMP contains contact details of the project archaeologist.	PM/RES	Also see **Appendix E** (Key Environmental Contacts)
2.2	Where there is no project archaeologist engaged for the project, engage a suitably qualified and experienced archaeological consultant to undertake a site inspection, conduct a preliminary assessment and prepare an archaeological management plan. Lists of consultants are available from online sources, including the yellow pages. Regional environment staff and RMS heritage staff can also advise on appropriate consultants.	PM/RES	Online lists of heritage consultants: • OEH List • AACAI List
2.3	Where the find is likely to be an Aboriginal object, arrange for an Aboriginal sites officer to inspect the find. Generally, this person would be a sites officer from the relevant local Aboriginal land council. If an alternative contact person (ie a RAP) has been nominated as a result of previous consultation, then that person is to be contacted.	PM/ACHA	
2.4	If requested, provide photographs of the find taken at Step 1.3 to the archaeologist, and Aboriginal sites officer if relevant.	PM/RES	**Appendix D** (Photographing Unexpected Archaeological Finds)
3	**Preliminary assessment and recording of the find**		
3.1	In a minority of cases, the archaeologist (and Aboriginal sites officer, if relevant) may	A/PM/ASO	Proceed to Step 8

Step	Task	Responsibility	Guidance & Tools
	determine from the photographs that no site inspection is required because no archaeological constraint exists for the project (*eg the find is not a 'relic', a heritage 'work' or an 'Aboriginal object'*). Any such advice should be provided in writing by the archaeologist (eg via email) and confirmed by the project manager.		
3.2	Arrange site access for the archaeologist (and Aboriginal sites officer, if relevant) to inspect the find as soon as practicable. In the majority of cases a site inspection is required to conduct a preliminary assessment.	PM	
3.3	Subject to the archaeologist's assessment (and the Aboriginal sites officer's assessment, if relevant), work may recommence at a set distance from the find. This is to protect any other archaeological material that may exist in the vicinity, which has not yet been uncovered. Existing protective fencing established in Step 1.5 may need to be adjusted to reflect the extent of the newly assessed protective area. No works are to take place within this area once established.	A/PM/ASO	
3.4	The archaeologist (and Aboriginal sites officer, if relevant) may provide advice after the site inspection and preliminary assessment that no archaeological constraint exists for the project (*eg the find is not a 'relic', a heritage 'work' or an 'Aboriginal object'*). Any such advice should be provided in writing by the archaeologist, (and Aboriginal sites officer if relevant) (eg via email) and confirmed by the project manager.	A/PM/ASO	Proceed to Step 8
3.5	Where required, seek additional specialist technical advice (such as a forensic or physical anthropologist to identify skeletal remains). Regional environment staff and/or RMS heritage staff can provide contacts for such specialist consultants.	PM/RES	**Appendix E** (Key Environmental Contacts)
3.6	Where the find has been identified as a 'relic', 'work' or an 'Aboriginal object' the archaeologist should record the find on a proforma recording form.	A	• Aboriginal site recording form • Non-Aboriginal site recording form
3.7	The regulator can be notified informally by telephone at this stage by the archaeologist or project manager (or delegate). Any verbal conversations with regulators must be noted on the project file for future reference.	PM/A	

Step	Task	Responsibility	Guidance & Tools
4	**Prepare an archaeological management plan**		
4.1	The archaeologist must prepare an archaeological management plan (with input from the Aboriginal sites officer, where relevant) shortly after the site inspection. This plan is a brief overview of the following: (a) description of the feature, (b) historic context, if data is easily accessible, (c) likely significance, (d) heritage approval and regulatory notification requirements, (e) heritage reporting requirements, (f) stakeholder consultation requirements, (g) relevance to other project approvals and management plans etc.	A/ASO	**Appendix G** (Archaeological Advice Checklist)
4.2	In preparing the plan, the archaeologist with the assistance of regional environment staff must review the CEMP, any heritage sub-plans, any conditions of heritage approvals, any conditions of project approval (and or Minister's Conditions of Approval) and heritage assessment documentation (eg Aboriginal Cultural Heritage Assessment Report). This will outline if the unexpected find is consistent with previous heritage/project approval(s) and/or previously agreed management strategies. The project manager and regional environment staff must provide all relevant documents to the archaeologist to assist with this. Discussions should occur with design engineers to consider if re-design options exist and are appropriate.	A/RES/PM	**Appendix G** (Archaeological Advice Checklist)
4.3	The archaeologist must submit this plan as a letter, brief report or email to the project manager outlining all relevant archaeological issues. This plan should be submitted to the project manager as soon as practicable. Given that the archaeological management plan is an overview of all the necessary requirements (and the urgency of the situation), it should take no longer than two working days to submit to the project manager.	A	
4.4	The project manager must review the archaeological management plan to ensure all requirements can reasonably be implemented. Seek additional advice from regional environment staff and RMS heritage staff, if required.	PM/RES/SES (H)	
5	**Notify the regulator, if required.**		
5.1	Review the archaeological management plan to confirm if regulator notification is required. It may state notification is not required.	PM/RES/SES (H)	Proceed to Step 6

Step	Task	Responsibility	Guidance & Tools
5.2	If notification is required, complete the template notification letter.	PM	**Appendix H** (Template Notification Letter)
5.3	Forward the draft notification letter, archaeological management plan and the site recording form to regional environment staff and Senior Environmental Specialist (Heritage) for review, and consider any suggested amendments.	PM/RES/SES (H)	
5.4	Forward the signed notification letter to the relevant regulator (ie notification of non-Aboriginal relics must be given to the Heritage Branch of OEH, while notification for Aboriginal objects must be given to the Environmental Protection and Regulation Group of OEH). Informal notification (via a phone call or email) to the regulator prior to sending the letter is appropriate. The archaeological management plan and the completed site recording form must be submitted with the notification letter. For Part 3A and Part 5.1 projects, the Department of Planning and Infrastructure must also be notified.	PM	**Appendix E** (Key Environmental Contacts)
5.5	A copy of the final signed notification letter, archaeological management plan and the site recording form should be kept on file by the project manager and a copy sent to the Senior Environmental Specialist (Heritage).	PM	
5.6	If requested by the regulator, arrange a site inspection of the find for them.	PM	
6	**Implement archaeological management plan**		
6.1	Modify the archaeological management plan to take into account any additional advice resulting from notification and discussions with the regulator.	A/PM	
6.2	Implement the archaeological management plan. Where impact is expected, this would include such things as a formal assessment of significance and heritage impact assessment, preparation of excavation or recording methodologies, consultation with registered Aboriginal parties, obtaining heritage approvals etc, if required.	PM/RAPs	PACHCI Stage 3
6.3	Where heritage approval is required contact regional environment staff for further advice and support material. Please note time constraints associated with heritage approval preparation and processing. Project scheduling may need to be revised where extensive delays are expected.	PM/RES	

Step	Task	Responsibility	Guidance & Tools
6.4	For Part 3A/Part 5.1 projects, assess whether heritage impact is consistent with the project approval or if project approval modification is required from the Department of Planning and Infrastructure. Seek advice from regional environment staff and Environment Branch specialist staff if unsure.	PM/RES	
6.5	Where statutory approvals (or project approval modification) are required, impact upon relics and/or Aboriginal objects must not occur until heritage approvals are issued by the appropriate regulator.	PM	
6.6	Where statutory approval (or Part 3A/Part 5.1 project modification) is not required and where archaeological recording is recommended by the archaeologist, sufficient time must be allowed for this to occur.	PM	
6.7	Ensure short term and permanent storage locations are identified for archaeological material removed from site, where required. Interested third parties (eg museums or local councils) should be consulted on this issue. Contact regional environment staff and Senior Environmental Specialist (Heritage) for advice on this matter, if required.	PM	
6.8	Ensure all archaeological excavation and heritage recording are completed prior to RMS project work resuming.	PM	
7	**Review CEMPs and approval conditions**		
7.1	Clarify regulator expectations around written authorisation to commence project work. This may relate to situations where human remains are found or when they request to review preliminary archaeological excavation reports or assessments prior to the resumption of RMS project work. Where this is not explicit in heritage approval conditions, expectations should be clarified directly with the regulator.	PM	
7.2	Update the CEMP, site mapping and project delivery program as appropriate with any project changes resulting from final heritage management (eg retention of heritage item, salvage of item). Updated CEMPs must incorporate additional conditions arising from any heritage approvals, and Aboriginal community consultation if relevant. Include any changes to CEMP in site induction material and update site workers during toolbox talks.	PM	

Step	Task	Responsibility	Guidance & Tools
8	**Resume work**		
8.1	Seek written clearance to resume project work from regional environment staff and the archaeologist (and regulator, if required). Clearance would only be given once all archaeological excavation and heritage recording (where required) are complete. Resumption of project work must be in accordance with the all relevant project/heritage approvals/determinations.	RES/A/PM	
8.2	If required, ensure archaeological excavation reporting and other heritage approval conditions are completed in the required timeframes. This includes artefact retention repositories and/or disposal strategies.	PM/A	
8.3	Forward all heritage/archaeological assessments, heritage location data and its RMS ownership status to the Senior Environmental Specialist (Heritage). They will ensure all heritage items in RMS ownership and/or control are considered for the RMS S170 Heritage Register.	PM/SES(H)	
8.4	If additional unexpected finds are uncovered this procedure must begin again from Step 1.	PM	

8. Seeking advice

Advice regarding this procedure should be directed to regional environment staff in the first instance, and then RMS heritage staff, where required. RMS staff can contact RMS regional environment staff for advice on this procedure at any time. Contractors and alliance partners should ensure their own project environment managers are aware of and understand this procedure. Regional environment staff can assist non-RMS project environment managers with enquires concerning this procedure.

IMPORTANT!

RMS staff and contractors are not to seek advice on this procedure directly from OEH without first seeking advice from regional environment and heritage staff.

Technical archaeological advice regarding the unexpected find should be sought from the contracted archaeologist. Technical specialist advice can also be sought from heritage staff within Environment Branch to assist with the preliminary archaeological identification and technical reviews of heritage/archaeological reports.

9. Related information

Contact details: Manager, Environmental Policy, Environment Branch, 02 8588 5740

Effective date: 1 November 2011

Review date: Final + 12 months

This procedure should be read in conjunction with:

- RTA *Incident Classification and Reporting Procedure*.
- RMS *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*.
- RTA *Heritage Guidelines 2004*.
- RTA *Environmental Impact Assessment Guidelines*.

This procedure replaces:

- Procedure 5.5 ("*unexpected discovery of an archaeological relic or Aboriginal object*") outlined in the RTA's *Heritage Guidelines* 2004.

Other relevant reading material:

- NSW Heritage Office (1998), *Skeletal remains: guidelines for the management of human skeletal remains*.
- Department of Environment and Conservation NSW (2006), *Manual for the identification of Aboriginal remains*.
- Department of Health (April 2008), *Policy Directive: Burials - exhumation of human remains*[11].

[11] http://www.health.nsw.gov.au/policies/pd/2008/pdf/PD2008_022.pdf

10. List of appendices

The following appendices are included to support this procedure.

Appendix A	Identifying Unexpected Archaeological Finds
Appendix B	Road and Fleet Services Escalation Protocol
Appendix C	RFS Unexpected Find Recording Form 418
Appendix D	Photographing Unexpected Archaeological Finds
Appendix E	Key Environment Contacts
Appendix F	Uncovering Bones
Appendix G	Archaeological Advice Checklist
Appendix H	Template Notification Letter

Appendix A

Identifying Unexpected Archaeological Finds

The following images can be used to assist in the preliminary identification of a potential unexpected find (both Aboriginal and non-Aboriginal) during construction and maintenance works. Please note this is not a comprehensive typology.

Top left hand picture continuing clockwise: Stock camp remnants (Hume Highway Bypass at Tarcutta); Linear archaeological feature with post holes (Hume Highway Duplication), Animal bones (Hume Highway Bypass at Woomargama); Cut wooden stake; Glass jars, bottles, spoon and fork recovered from refuse pit associated with a Newcastle Hotel (Pacific Highway, Adamstown Heights, Newcastle area).

Top left hand picture continuing clockwise: Woodstave water pipe with tar and wire sealing (Horsley Drive); Tram tracks (Sydney); Brick lined cistern (Clyde); Retaining wall (Great Western Highway, Leura).

Top left hand picture continuing clockwise: Road pavement (Great Western Highway, Lawson); Sandstone kerbing and guttering (Parramatta Road, Mays Hill); Telford road (sandstone road base, Great Western Highway, Leura); Ceramic conduit and sandstone culvert headwall (Blue Mountains, NSW); Corduroy road (timber road base, Entrance Road, Wamberai).

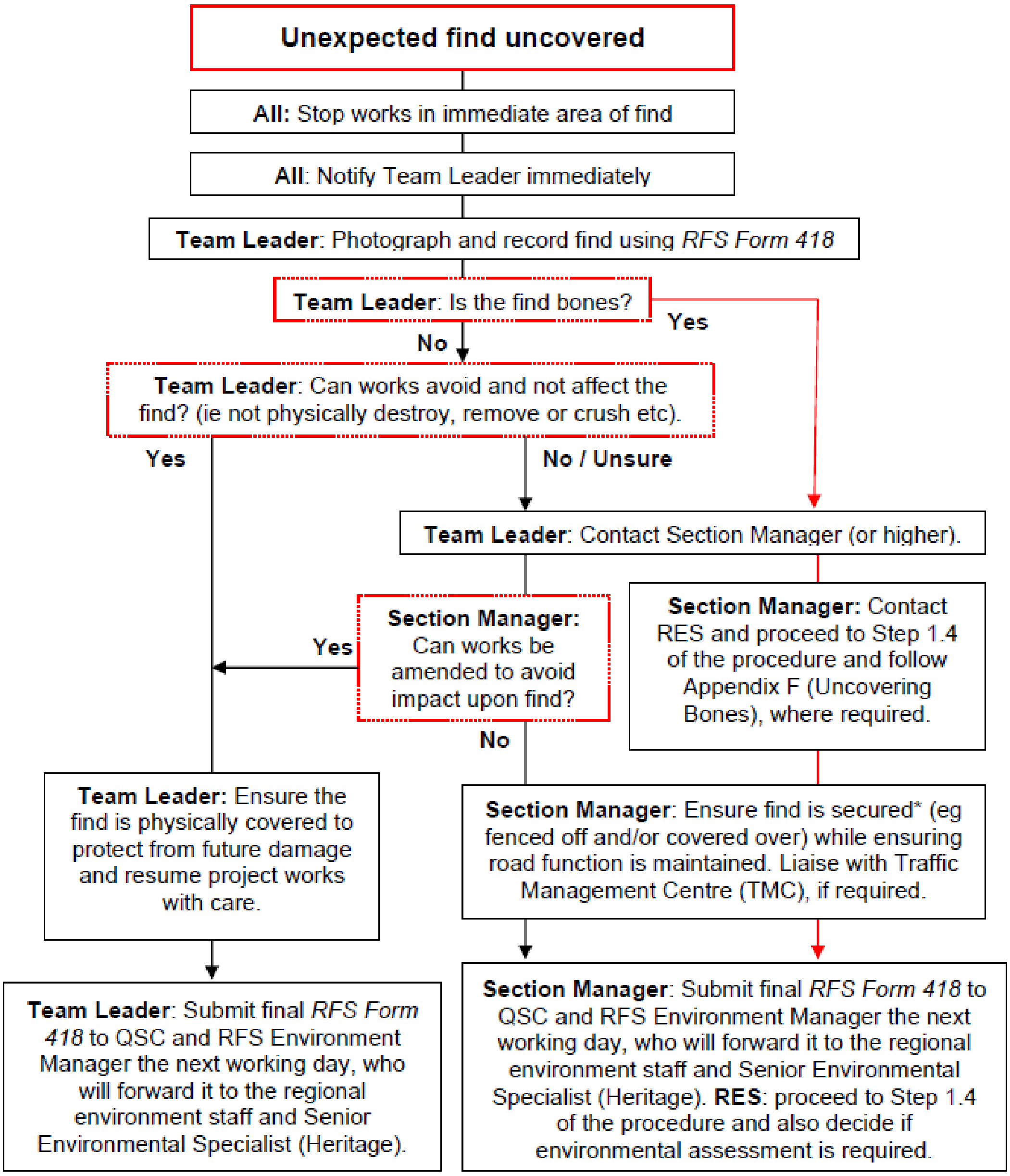
Top left hand corner continuing clockwise: Alignment Pin (Great Western Highway, Wentworth Falls); Survey tree (MR7, Albury); Survey tree (Kidman Way, Darlington Point, Murrumbidgee); Survey tree (Cobb Highway, Deniliquin); Milestone (Great Western Highway, Kingswood, Penrith); Alignment Stone (near Guntawong Road, Riverstone). Please note survey marks may have additional statutory protection under the *Surveying and Spatial Information Act 2002*.

Top left hand corner: Culturally modified stone discovered on Main Road 92, about two kilometres west of Sassafras. The rest of the images show a selection of stone artefacts retrieved from test and salvage archaeological excavations during the Hume Highway Duplication and Bypass projects from 2006-2010.

Appendix B

Road and Fleet Services Escalation Protocol

Road crews in RMS Road and Fleet Services (RFS) undertake routine maintenance works such as patching, cleaning, line marking and milling within the road reserve. In addition, these works are often undertaken at night on urban thoroughfares. A specific escalation protocol has been developed to ensure that disruption to traffic is minimised if an unexpected find is encountered when carrying out such maintenance works.



*Appropriate temporary covering of the find is something that protects it from further damage and that can be removed quickly the next day without damage from re-excavation. For example geofabric and loose, dry asphalt, or a metal plate. Certain unexpected finds (such as human remains) should not be covered with loose material as the re-excavation process is likely to cause further damage to the find. Fencing and immediate action is appropriate in these rare cases.

Appendix C

RFS Unexpected Find Recording Form 418

Transport Roads & Maritime Services	**RFS Unexpected Find Recording Form**	**418**

Date:		**Recorded by**	
Project Name:			

Description of works being undertaken (eg Removal of failed pavement by excavation and pouring concrete slabs in 1m x 1m replacement sections).	
Description of exact location of find (eg Within the road formation on Parramatta Road, east bound lane, at the corner of Johnston Street, Annandale, Sydney).	
Description of item found (eg Metal tram tracks running parallel to road alignment. Good condition. Tracks set in concrete, approximately 10cms (100 mm) below the current ground surface).	

Sketch
(Provide a sketch of the find's general location in relation to other road features so its approximate location can be mapped without having to re-excavate it. Also annotate this sketch with the location and direction of any photographs of the item taken).

Action Taken (Tick either A *or* B)

A.	Unexpected find **will not** be affected by maintenance works	☐	B.	Unexpected find **will be** affected by maintenance works	☐

A. Describe if and how works were amended to avoid impact to the find and the action taken to cover the item.

B. Describe how works will affect the find. (eg Milling is required to be continued to 200 mm depth to ensure road pavement requirements are met. Milling to required depth would affect the top 50 mm of potential heritage pavement).

Attach Photographs. (Take a number of close up and general photographs so anyone off site can understand the location of the find, the material it is made from and any distinguishing features).

Team Leader Signature	

Action: Refer issue to Section Manager (or higher) immediately where 'B' has been ticked.

To be completed by Section Manager

Describe any further considerations to amend project works to avoid unexpected find and if impact is still anticipated.	
Describe action taken to secure site temporarily	
Section Manager Signature	

Action: Escalate to environment and heritage staff where impact to item cannot be avoided.

Appendix D

Photographing Unexpected Archaeological Finds

Removal of the find from its context (eg excavating from the ground) for photographic purposes is not permitted.

Photographs of unexpected finds, in their original placement (*in situ*), assists heritage staff and archaeologists to identify 'finds' soon after being uncovered. Emailing good quality photographs to specialists can allow for better quality and faster heritage advice. The key elements that must be captured in photographs of the find include its position, the general find itself and any distinguishing features. All photographs must have a scale (ruler, scale bar, mobile phone, coin) and a note describing the direction of the photograph.

Context and detailed photographs

It is important to take a general photograph (Figure 1) to convey the location and setting of the find. This will add much value to the subsequent detailed photographs also required (Figure 2).

Figure 2: Close up detail of the sandstone surface showing material type, formation and construction detail. This is essential for establishing date of the feature.

Figure 1: Telford road uncovered on the Great Western Highway (Leura) in 2008.

Photographing distinguishing features

Where unexpected finds (eg artefacts) have a distinguishing feature, close up detailed photographs must be taken of this, where practicable. See Figures 3 and 4 for examples.

Figure 3: Ceramic bottle artefact with stamp.

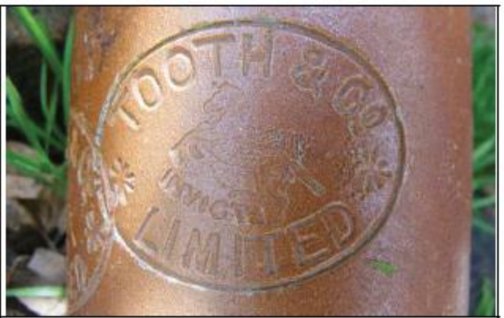


Figure 4: Detail of the stamp allows '*Tooth & Co Limited*' to be made out. This is helpful to a specialist in gauging the artefact's origin, manufacturing date and likely significance.

Photographing bones

The majority of bones found on site will those of be recently deceased animal bones often requiring no further assessment (unless they are in archaeological context). However, if bones are human RMS must contact the police immediately (see Appendix F for detailed guidance). Taking quality photographs of the bones can often resolve this issue quickly. Heritage staff in Environment Branch can confirm if bones are human or non-human if provided with appropriate photographs. Ensure that photographs of bones are not concealed by foliage (Figure 5) as this makes it difficult to identify. Minor hand removal of foliage can be undertaken as long as disturbance of the bone does not occur. Excavation of the ground to remove bone(s) should not occur, nor should they be pulled out of the ground if partially exposed. Where sediment (adhering to a bone found on the ground surface) conceals portions of a bone (Figure 6) ensure the photograph is taken of the bone (if any) that is not concealed by sediment.

Figure 5: Bone concealed by foliage.

Figure 6: Bone covered in sediment

Ensure that all close up photographs include the whole bone and then specific details of the bone (especially the ends of long bones, the *epiphysis*, which is critical for species identification). Figures 7 and 8 are examples of good photographs of bones that can easily be identified from the photograph alone. They show sufficient detail of the complete bone and the epiphysis.

Figure 7: Photograph showing complete bone.

Figure 8: Close up of a long bone's epiphysis.

Appendix E

Key Environmental Contacts

Hunter region	Senior Environmental Officer	4924 0281
	Aboriginal Cultural Heritage Advisor	4924 0383
Northern region	Senior Environmental Officer	6640 1072
	Aboriginal Cultural Heritage Advisor	6604 9305
Southern region	Senior Environmental Officer	4221 2765
	Aboriginal Cultural Heritage Advisor	4221 2767
South West region	Senior Environmental Officer	6938 1143
	Aboriginal Cultural Heritage Advisor	6937 1647
Sydney region	Senior Environmental Officer	8814 2516
	Aboriginal Cultural Heritage Advisor	8849 2006
Western region	Senior Environmental Officer	6861 1628
	Aboriginal Cultural Heritage Advisor	6861 1658
Pacific Highway Office	Environmental Services Manager	6640 1375
Hume Highway Office	Senior Environmental Officer	6923 3419
Road and Fleet Services	Environment Manager	9598 7721
Environment Branch	Senior Environmental Specialist, Heritage	8588 5754

Heritage Regulators

Heritage Branch Office of Environment and Heritage Locked Bag 5020 Parramatta NSW 2124 Phone: (02) 9873 8500	Minister for Sustainability, Environment, Water, Populations and Communities GPO Box 787 Canberra ACT 2601 Phone: (02) 6274 1111
Planning and Aboriginal Heritage Section Environment Protection and Regulation Group* (Metropolitan) Office of Environment and Heritage PO Box 668 Parramatta NSW 2124 Phone: (02) 9995 5000	Planning and Aboriginal Heritage Section Environment Protection and Regulation Group* (North East) Office of Environment and Heritage Locked Bag 914 Coffs Harbour NSW 2450 Phone: (02) 6651 5946
Environment and Conservation Programs Environment Protection and Regulation Group* (North West) Office of Environment and Heritage PO Box 2111 Dubbo NSW 2830 Phone: (02) 6883 5330	Aboriginal Heritage Protection Section Environment Protection and Regulation Group* (South) Office of Environment and Heritage PO Box 733 Queanbeyan NSW 2620 Phone: (02) 6229 7000

Project-Specific Contacts (*complete as needed*)

Position	**Name**	**Phone Number**
Project Manager		
Site/Alliance Environment Manager		
Regional Environmental Officer		
Aboriginal Cultural Heritage Advisor		
Consultant Archaeologist		
Local Police Station		
OEH: Environment Line		131 555

* **Please note:** at the time of finalising this procedure EPRG became part to the Environment Protection Authority (EPA); full title block was yet to be finalised.

Appendix F

Uncovering Bones

All matters relating to uncovering bones and RMS' human remains notification obligations should involve RMS regional environment and heritage staff. They will guide project managers through occurrences of uncovering bones.

This appendix provides project managers with advice (1) on what to do on first uncovering bones (2) the range of human skeletal notification pathways and (3) additional considerations and requirements when managing the discovery of human remains.

1. First uncovering bones

Stop all work in the vicinity of the find. All bones uncovered during project works should be **treated with care and urgency** as they have the potential to be human remains. Therefore they must be identified as either human or non-human as soon as possible by a qualified forensic or physical anthropologist. These specialist consultants can be sought by contacting regional environment staff and/or heritage staff at Environment Branch.

On the very rare occasion where it is *instantly obvious* from the remains that they are human, the project manager (or a delegate) should **inform the police by telephone** prior to seeking specialist advice. It will be '*obvious*' that it is human skeletal remains where there is *no doubt*, as demonstrated by the example in Figure 1. Often skeletal elements in isolation (such as a skull) can also clearly be identified as human. Note it may also be obvious that human remains have been uncovered when soft tissue and clothing are present.

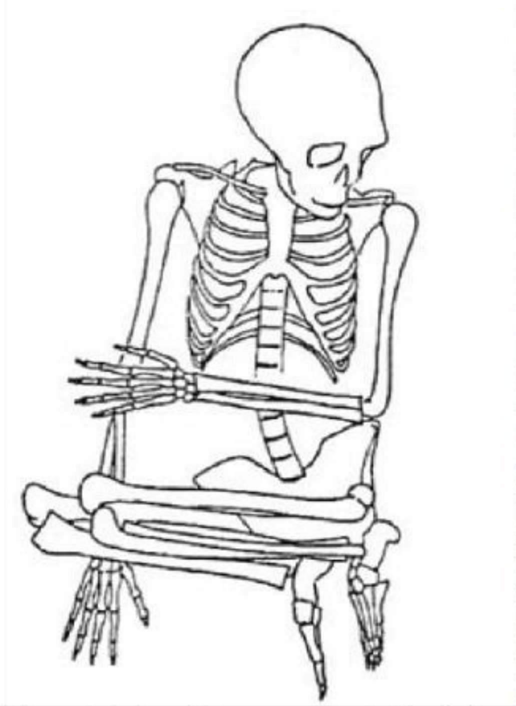


Figure 1: Schematic of a complete skeleton that is 'obviously' human[12].

Figure 2: Disarticulated bones that require assessment to determine species.

[12] After Department of Environment and Conservation NSW (2006), *Manual for the identification of Aboriginal Remains*: 17.

This preliminary phone call is to let the police know that the RMS is undertaking a specialist skeletal assessment to determine the approximate date of death which will inform legal jurisdiction. The police may wish to take control of the site at this stage. If not, a forensic or physical anthropologist must be requested to make an on-site assessment of the skeletal remains.

Where it is not 'obvious' that the bones are human (in the majority of cases, illustrated by Figure 2), specialist assessment is required to establish the species of the bones. Photographs of the bones can assist this assessment if they are clear and taken in accordance with guidance provided in Appendix D. Good photographs often result in the bones being identified by a specialist without requiring a site visit; noting they are nearly always non-human. In these cases, non-human skeletal remains must be treated like any other unexpected archaeological find.

If the bones are identified as human (either by photographs or an on-site inspection) a technical specialist must determine the likely ancestry (Aboriginal or non-Aboriginal) and burial context (archaeological or forensic). This assessment is required to identify the legal regulator of the human remains so **urgent notification** (as below) can occur. Preliminary telephone or verbal notification by the project manager or regional environment staff is considered appropriate. This must be followed up later by RMS formal letter notification as per Appendix H when a management plan has been developed and agreed to by the relevant parties.

2. Range of human skeletal notification pathways

The following is a summary of the different notification pathways required for human skeletal remains depending on the preliminary skeletal assessment of ancestry and burial context.

A. Human bones are from a recently deceased person (*less than* 100 years old).

> **☑ Action**
> A police officer must be notified immediately as per the obligations to report a death or suspected death under s35 of the *Coroners Act 2009* (NSW). It should be assumed the police will then take command of the site until otherwise directed.

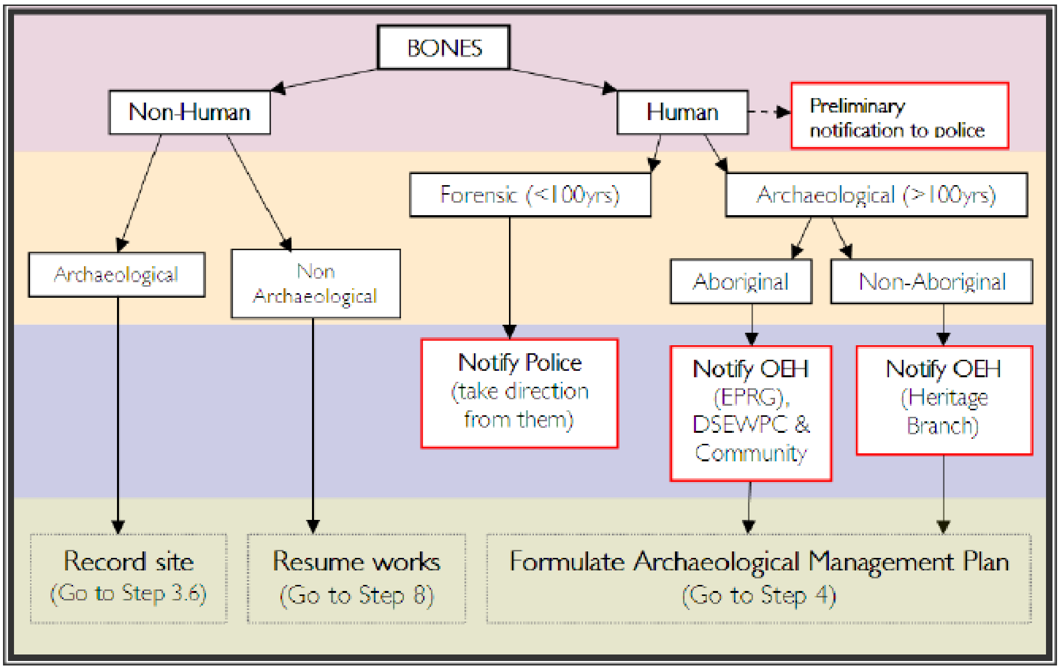
B. Human bones are archaeological in nature (*more than* 100 years old) and are likely to be *Aboriginal* remains.

> **☑ Action**
> The OEH (*EPRG*) and the RMS Aboriginal Cultural Heritage Advisor (ACHA) must be notified immediately. The ACHA must contact and inform the relevant Aboriginal community stakeholders who may request to be present on site. Relevant stakeholders are determined by the RTA's *Procedure for Aboriginal Cultural Heritage Consultation and Investigation*.

C. Human bones are archaeological in nature (*more than* 100 years old) and likely to be *non-Aboriginal* remains.

> **☑ Action**
> The OEH (Heritage Branch, Conservation Team) must be notified immediately.

The simple diagram below summarises the notification pathways on finding bones.



After the appropriate verbal notifications (as described in B and C), the project manager must proceed through the *Unexpected Archaeological Finds Procedure* to formulate an archaeological management plan (Step 4). Note *no* archaeological management plan is required for forensic cases (A), as all future management is a police matter. Non-human skeletal remains must be treated like any other unexpected archaeological find and so must proceed to recording the find as per Step 3.6.

3. Additional considerations and requirements

Uncovering archaeological human remains must be managed intensively and needs to consider a number of additional specific issues. These issues might include facilitating culturally appropriate processes when dealing with Aboriginal remains (such as repatriation and cultural ceremonies). RMS ACHA can provide advice on this and how to engage with the relevant Aboriginal community. Project managers, more generally, may also need to consider overnight site security of any exposed remains and may need to manage the onsite attendance of a number of different external stakeholders during assessment and/or investigation of remains. Project managers may also be advised to liaise with local church/religious groups and the media to manage community issues arising from the find. Additional investigations may be required to identify living descendants, particularly if the remains are to be removed and relocated.

If exhumation of the remains (from a formal burial or a vault) is required, project managers should also be aware of additional approval requirements under the *Public Health Act 1991* (NSW). Specifically, RMS is required to apply to the Director General of NSW Department of Health for approval to exhume human remains as per Clause 26 of the *Public Health (Disposal of Bodies) Regulation 2002* (NSW)[13]. Further, the exhumation of such remains needs to consider health risks such as infectious disease control, exhumation procedures and reburial approval and registration. Further guidance on this matter can be found at the NSW Department of Health website.

In addition, due to the potential significant statutory and common law controls and prohibitions associated with interfering with a public cemetery, project teams are advised, when works uncover human remains adjacent to cemeteries, to confirm the cemetery's exact boundaries.

[13] This requirement is in addition to heritage approvals under the *Heritage Act 1977*.

Appendix G

Archaeological Advice Checklist

The archaeologist must advise the project manager of an appropriate archaeological management plan as soon as possible after site inspection (see Step 4). An archaeological management plan can include a range of activities and processes, which differ depending on the find and its significance. In discussions with the archaeologist the following checklist can be used by the project manager and the archaeologist as a prompt to ensure all relevant archaeological issues are considered when developing this plan. This will allow the project team to receive clear and full advice to move forward quickly and in the right direction. Archaeological advice on how to proceed can be received in a letter or email outlining all relevant archaeological issues.

	Required	Outcome/notes
Assessment and investigation		
• Assessment of significance	Yes/No	
• Assessment of heritage impact	Yes/No	
• Archaeological excavation	Yes/No	
• Archival photographic recording	Yes/No	
Heritage approvals and notifications		
• AHIPs, Section 140, S139 exceptions etc	Yes/No	
• Regulator relics/objects notification	Yes/No	
• RMS' S170 Heritage Register listing requirements	Yes/No	
• Compliance with CEMP or other project heritage approvals	Yes/No	
Stakeholder consultation		
• Aboriginal stakeholder consultation requirements and how it relates to RTA *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI).	Yes/No	
• Advice from regional environmental staff, Aboriginal Cultural Heritage Advisor, RMS heritage team.	Yes/No	
Artefact management		
• Disposal strategy for non-Aboriginal relics or heritage material (eg former road pavement): short term and permanent storage locations (interested third parties should be consulted on this issue).	Yes/No	
• Control Agreement for Aboriginal objects.	Yes/No	
Program and budget		
• Time estimate associated with archaeological work.		
• Total cost of archaeological work.		

Appendix H

Template Notification Letter

[Select and type date]

[Select and type reference number]

[Select and type file number]

[Insert recipient's name and address, see **Appendix E**]

[Select and type salutation and name],

Re: Unexpected archaeological find uncovered during Roads and Maritime Services project works.

I write to inform you of an unexpected archaeological [select: relic and/or Aboriginal object] found during Roads and Maritime Services construction works at [insert location] on [insert date]. [Where the regulator has been informally notified at an earlier date by telephone, this should be referred to here].

This letter is in accordance with the notification requirement under [select: Section 146 of the *Heritage Act 1977* (NSW) or Section 89(A) of the *National Parks and Wildlife Act 1974* (NSW)].

NB: On finding Aboriginal human skeletal remains this letter must also be sent to the Commonwealth Minister for Sustainability, Environment, Water, Populations and Communities (SEWPC) in accordance with notification requirements under Section 20(1) of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth).

[Provide a brief overview of the project background and project area. Provide a summary of the description and location of the find, including a map and image where possible. Also include how the project was assessed under the *Environmental Planning and Assessment Act 1979* (NSW) (eg Part 5). Also include any project approval number, if available].

Roads and Maritime Services [*or contractor*] has sought professional archaeological advice regarding the find. A preliminary assessment indicates [provide a summary description and likely significance of the find]. Please find additional information on the site recording form attached.

Resulting from these preliminary findings, Roads and Maritime Services *[or contractor]* is proposing [provide a summary of the proposed archaeological approach (eg develop archaeological research design, seek heritage approvals and undertake archaeological investigation). Also include preliminary justification of such archaeological impact with regard to project design constraints and delivery program].

The proposed archaeological approach will be further developed in consultation with a nominated Office of Environment and Heritage [select either EPRG/Heritage Branch, Conservation Team] staff member.

Please contact me if you have any input on this approach or if you require any further information.

Yours sincerely

[Sender name and position]

[Attach the archaeological management plan and site recording form].