Proposed Extension to an Existing Sand Quarry, Moama Aboriginal Cultural Heritage Assessment

Name of Proponent: EMM Group Pty. Ltd.

Name of Cultural Heritage Advisor: Joanne Bell

Name of Authors: Joanne Bell & Ashley Edwards

Date of Completion: 21 June 2016

Local Government Area: Murray Shire Council

Jo Bell Heritage Services Pty. Ltd.
PO Box 248 Euroa VIC 3666
T: +61 3 5798 1341 M: 0427 505 335
ACN: 135 659 915 ABN: 18 135 659 915

Proposed Extension to an Existing Sand Quarry, Moama Aboriginal Cultural Heritage Assessment

Name of Proponent: EMM Group Pty. Ltd.

Name of Cultural Heritage Advisor: Joanne Bell

Name of Authors: Joanne Bell & Ashley Edwards

Date of Completion: 21 June 2016

Local Government Area: Murray Shire Council

Jo Bell Heritage Services Pty. Ltd.
PO Box 248 Euroa VIC 3666
T: +61 3 5798 1341 M: 0427 505 335
ACN: 135 659 915 ABN: 18 135 659 915

EXECUTIVE SUMMARY

This report documents the assessment of the Aboriginal cultural heritage values of a proposed sand quarry extension at Moama, New South Wales (see Map 1).

An Environmental Impact Statement (EIS) is being prepared for the activity area in accordance with the provisions of Part 4 of the *Environmental Planning & Assessment Act* 1979. An assessment of the Aboriginal cultural heritage values of the activity area must be undertaken as a part of the EIS.

The cultural heritage advisor commissioned to carry out the assessment is Jo Bell, Director, Jo Bell Heritage Services Pty. Ltd. The archaeological fieldwork was carried out by Joanne Bell and Bridget Grinter.

The activity area comprises a proposed development area of approximately 49ha with a buffer of 25.8ha within Lot 97 DP751140, Parish of Bama (see Map 2). It is bounded by the Murray Valley National Park in the east, Rushy Road in the west and agricultural land to the north and south. The local government area is Murray Shire.

The proponent is EMM Group Pty. Ltd., 26-42 Old Aerodrome Road, Echuca, Victoria 3564. Kane Henson (General Manager) is the Project Manager for EMM Group. The EIS is being prepared by Steve Hamilton Environmental Consulting. Steve Hamilton is project managing the EIS.

The activity area is owned by the proponent.

The activity includes the extraction, processing and transportation of quarry products.

Moama Local Aboriginal Land Council (MLALC), Bangerang Aboriginal Corporation (BAC) and Yorta Yorta Nation Aboriginal Corporation (YYNAC) identified as Registered Aboriginal Parties (RAPs) for the project.

A desktop assessment and a field survey were carried out during the assessment.

Desktop Assessment

The results of the desktop assessment indicate that the activity area comprises undulating dune formations associated with the Barmah Sand Hills, a formation resulting directly from the uplift of the Cadell Fault and the down-throwing of the Echuca Depression (Palaeo Lake Kanyapella) some 30,000 years ago. Previous archaeological investigations in the vicinity of the activity area indicate that stone artefact scatters, mounds, scarred trees and burials are likely to be found in association with such landforms. The area has been generally used for agricultural purposes with quarrying activities commencing at two locations within the property from 2006.

Survey

The field survey was carried out over two days on 6-7 December 2015 by Jo Bell and Bridget Grinter (Archaeologists, Jo Bell Heritage Services Pty Ltd) with Brett Hamilton (Bangerang), Mick Bourke (Yorta Yorta), John B. Kerr and John Kerr (Moama LALC) also in attendance.

The activity area for survey was divided into survey units 1 to 4. These areas were defined by internal farm tracks, laid out across the undulating sand dune (see Map 3). The activity

area was surveyed on foot by the field team, focusing on exposed areas with good visibility (see Map 4). The buffer zones were not assessed.

Three scatters of stone artefacts were identified during the survey (*Moama Sand Quarry Artefacts 1-3*).

The activity area comprises a sector of sand dunes associated with the Cadell Fault to the west, overlooking a wetland area to the east. Similar dune landforms in the area, both to the west and east, have been shown to contain ancestral remains, shell midden, mound and hearth material, artefact scatters and scarred trees. Dating of shell and charcoal indicate an age of approximately 1100 BP. The activity area, comprising sand sheet and sand dune landforms, was identified as a potential archaeological deposit (PAD).

Whilst the existing extraction pits exhibit obvious disturbance, these lie outside the proposed future development areas. The activity area appears to have sustained impacts only from agriculture and only in the upper 250mm of deposit (K.Henson pers.comm: 2016). Further investigation will be necessary to determine the potential for Aboriginal cultural heritage to be located in a buried context.

Recommendations

Recommendation 1 - Moama Sand Quarry Artefacts 1 (AHIMS No 59-2-0017)

1. Extraction activities will not impact on this Aboriginal site. The site will not be harmed by the activity.
2. However, should any ancillary works or other activities including cropping or grazing be undertaken by the proponent within 50m of this site, then the site must be fenced prior to the commencement of works to protect the Aboriginal cultural heritage from harm.
3. Should any ancillary works or other activities including cropping or grazing be undertaken by the proponent within 50m of this site and there is potential for harm, then no works must commence in the area until further assessment and an Aboriginal Heritage Impact Permit (AHIP) is obtained from OEH.

Recommendation 2 - Moama Sand Quarry Artefacts 2 (AHIMS No 59-2-0018)

1. Extraction activities will not impact on this Aboriginal site. The site will not be harmed by the activity.
2. However, should any ancillary works or other activities including cropping or grazing be undertaken by the proponent within 50m of this site, then the site must be fenced prior to the commencement of works to protect the Aboriginal cultural heritage from harm.
3. Should any ancillary works or other activities including cropping or grazing be undertaken by the proponent within 50m of this site and there is potential for harm, then no works must commence in the area until further assessment and an AHIP is obtained from OEH.

Recommendation 3 - Extraction Activities Cannot Commence near Moama Sand Quarry Artefacts 3 (AHIMS No 59-2-0019)

1. Proposed extraction activities will no longer impact on this Aboriginal site. The site will not be harmed by the proposed activity.
2. However, should any ancillary works or other activities including cropping or grazing be undertaken by the proponent within 50m of this site (including the

spoil from initial scalping of the area), then the site must be fenced prior to the commencement of works to protect the Aboriginal cultural heritage from harm.

3. Should any ancillary works or other activities including cropping or grazing be undertaken by the proponent within 50m of this site (including the spoil from initial scalping of the area), an AHIP must be obtained from OEH before any works can commence.

Recommendation 4 - Further Assessment is Required in PAD areas

1. The entire sand sheet within the property has been identified as an area of cultural heritage sensitivity (potential archaeological deposit). However, the proponent has reduced the extent of potential harm by limiting the extraction footprint to approximately 1ha in both the southern and the northern areas (see Figure 12). As harm cannot be totally avoided in the identified PAD, ***further assessment is required*** to investigate the actual potential for Aboriginal cultural heritage to be located within the proposed activity footprint. This work must be undertaken prior to commencement of works.

Further investigation must include a program of sub-surface testing but may also include the use of ground penetrating radar (GPR) as suggested by John Kerr (Moama LALC) on-site and discussed during the recommendations meeting held on 18 March 2016. The further investigation options and proposed sampling methodology must be discussed with representatives from the RAPs, OEH and the proponent

TABLE OF CONTENTS

LIST OF MAPS

LIST OF FIGURES

LIST OF TABLES

LIST OF PLATES

Acknowledgments

Jo Bell Heritage Services would like to thank the following people who provided invaluable support through participation, consultation and discussion during the preparation of the project:

Kane Henson	EMM Group Pty. Ltd.
Andrew	EMM Group Pty. Ltd.
Steve Hamilton	Hamilton Environmental Services
Joe Day	Moama Local Aboriginal Land Council
John Kerr	Moama Local Aboriginal Land Council
John B. Kerr	Moama Local Aboriginal Land Council
Wade Morgan	Yorta Yorta Nation Aboriginal Corporation
Tyrone Miller	Yorta Yorta Nation Aboriginal Corporation
Michael Bourke	Yorta Yorta Nation Aboriginal Corporation
Vicki Atkinson	Bangerang Aboriginal Corporation
Brett Hamilton	Bangerang Aboriginal Corporation
Peter Ewin	OEH, Albury
Jo Bell	Jo Bell Heritage Services, Meetings, GIS mapping, Fieldwork, Reporting
Ashley Edwards	Jo Bell Heritage Services, Background research, GIS mapping, Reporting
Bridget Grinter	Jo Bell Heritage Services, Meetings, Fieldwork, Editing

1.0 INTRODUCTION

This report documents the assessment of Aboriginal cultural heritage values for the proposed extension of an existing sand quarry at 79 Rushy Road, north of Moama, New South Wales (Map 1). The works are being undertaken as part of an Environmental Impact Statement (EIS).

Objectives

The objective (and brief) for the assessment was to identify the Aboriginal cultural heritage values in the activity area for the purposes of assessing the impact of the development on those values and to develop recommendations for the management and/or mitigation of harm to those values.

1.1 Statutory Context

Aboriginal cultural heritage in New South Wales is protected by several acts:

National Parks and Wildlife Act 1974 (NPW Act)

The NPW Act is administered by the Office of Environment and Heritage (OEH) (NSW Department of Premier and Cabinet). It is the primary legislation for the protection of Aboriginal cultural heritage in NSW. One of the objectives of the NPW Act is:

> "…the conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including but not limited to: (i) places, objects and features of significance to Aboriginal people…"

Section 2A(1)(b)) Part 6 of the NPW Act provides specific protection for Aboriginal objects and places by making it an offence to harm them.

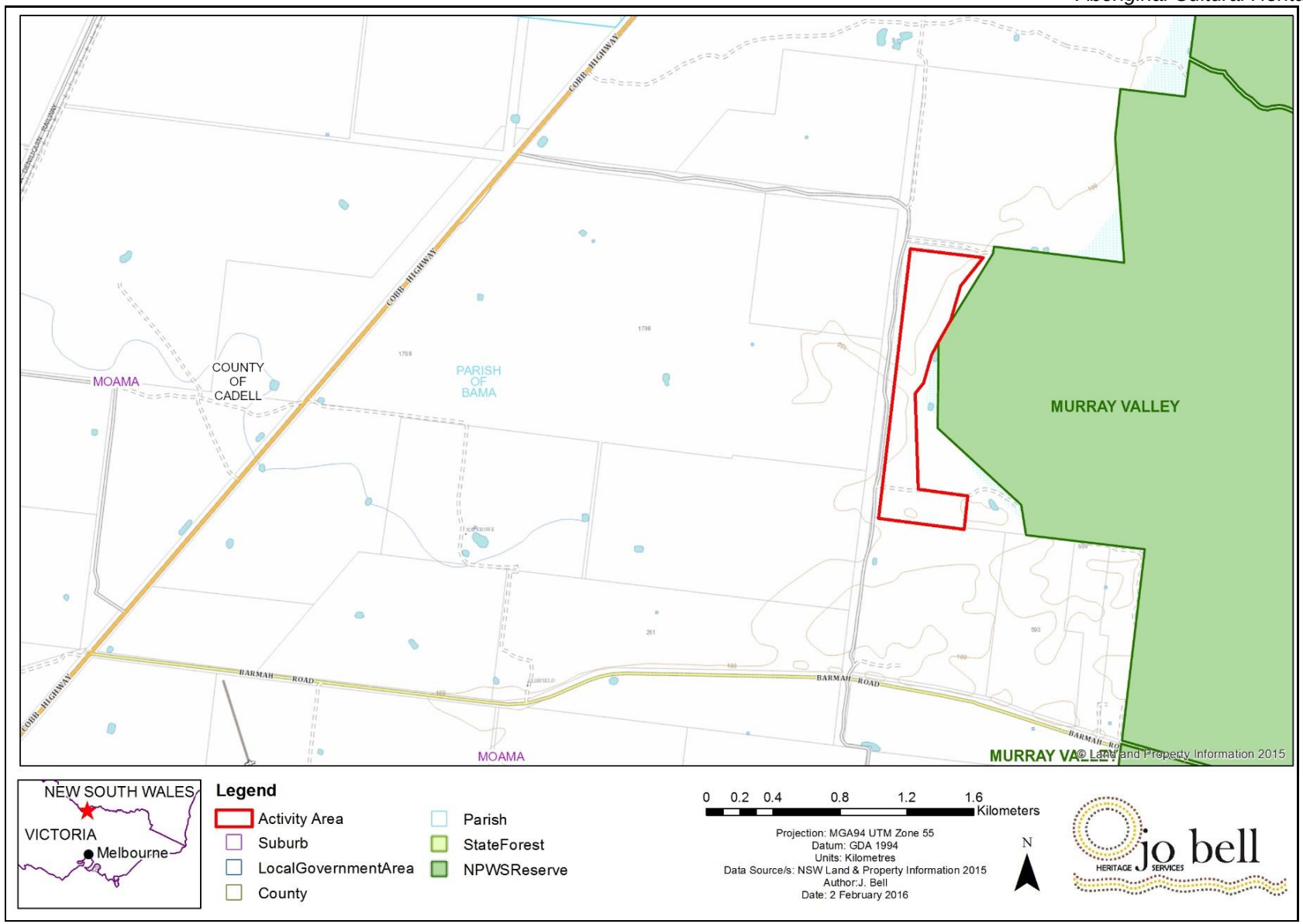
Consent from the Director-General of the OEH is required under Section 87 for the investigation of Aboriginal sites, or under Section 90 for the destruction of an Aboriginal object or Aboriginal place (Aboriginal Heritage Impact Permit (AHIP)).

Environmental Planning and Assessment Act 1979 (EP&A Act)

The EP&A Act is administered by the NSW Department of Planning and Infrastructure (DPI). It provides planning controls and requirements for environmental assessment in the development approval process. The EP&A Act establishes the framework for Aboriginal cultural heritage values to be formally assessed in the land-use planning and development consent processes.

Heritage Act 1977

The Heritage Act is also administered by the NSW Office of Environment and Heritage. This act protects the state's natural and cultural heritage. While Aboriginal heritage is primarily protected under the NPW Act, it may be subject to the provisions of the Heritage Act if the item is listed on the State Heritage Register or subject to an interim heritage order (IHO). The Heritage Act established the NSW Heritage Council, which provides advice and recommendations to the Minister for Heritage. The Minister approves the listing of items and places on the State Heritage Register and can also prevent the destruction, demolition or alteration of items.



Map 1: General Location of the Activity Area

Aboriginal Land Rights Act 1983 (ALR Act)

The NSW Aboriginal Land Rights Act (ALR Act) is administered by NSW Department of Education and Communities. It establishes the NSW Aboriginal Land Council (NSWALC) and Local Aboriginal Land Councils (LALCs). The Act requires these bodies to:

- Take action to protect the culture and heritage of Aboriginal persons in the council's area, subject to any other law; and
- Promote awareness in the community of the culture and heritage of Aboriginal persons in the council's area.

These requirements recognise and acknowledge the statutory role and responsibilities of NSWALC and LALCs.

The ALR Act also establishes the registrar whose functions include, but are not limited to, maintaining the Register of Aboriginal Land Claims and the Register of Aboriginal Owners. Under the NSW *Aboriginal Lands Right Act* 1983, the registrar is to give priority to the entry in the register of the names of Aboriginal persons who have a cultural association with:

- Lands listed in Schedule 14 to the NPW Act; and
- Lands to which section 36A of the ALR Act applies.

Native Title Act 1993 (Cth) (NTA)

The Commonwealth NTA provides the legislative framework to:

- Recognise and protect native title;
- Establish ways in which future dealings affecting native title may proceed and to set standards for those dealings, including providing certain procedural rights for registered native title claimants and native title holders in relation to acts which affect native title;
- Establish a mechanism for determining claims to native title; and
- Provide for, or permit, the validation of past acts invalidated because of the existence of native title.

Native Title Act 1994 (NSW)

The NSW *Native Title Act* 1994 was introduced to make sure the laws of NSW are consistent with the Commonwealth's NTA on future dealings. It validates past and intermediate acts that may have been invalidated because of the existence of native title.

The National Native Title Tribunal has a number of functions under the NTA, including maintaining the Register of Native Title Claims, the National Native Title Register and the Register of Indigenous Land Use Agreements, and mediating native title claims.

Other Acts

The Australian Government *Aboriginal and Torres Strait Islander Heritage Protection Act* 1984 (Cth) may be relevant if any item of Aboriginal heritage significance to an Aboriginal community is under threat of injury or desecration and state-based processes are unable to protect it. The *Environment Protection and Biodiversity Conservation Act* 1999 (Cth) may also be relevant to some proposals, particularly where there are heritage values of national significance present.

1.2 Proponent

The proponent is EMM Group Pty. Ltd., 26-42 Old Aerodrome Road, Echuca, Victoria 3564. Kane Henson (General Manager) is the Project Manager for EMM Group.

The EIS is being prepared by Steve Hamilton Environmental Consulting. Steve Hamilton is project managing the EIS.

1.3 Cultural Heritage Advisor

The cultural heritage advisor commissioned to carry out the assessment is Joanne (Jo) Bell, Director, Jo Bell Heritage Services Pty. Ltd. The authors of the assessment report are Jo Bell and Ashley Edwards. The field survey was carried out by Jo Bell and Bridget Grinter. Jo has a BA (Hons) in Archaeology and over fifteen years' professional experience in the cultural heritage industry, including the preparation of cultural heritage management plans and assessment reports. Ashley has a BArch (Hons), an MA in Archaeology and over nine years of experience in the cultural heritage industry (see Appendix 1). Bridget has a BA (Hons) in Archaeology and more than six years of experience in the industry.

1.4 Activity Area

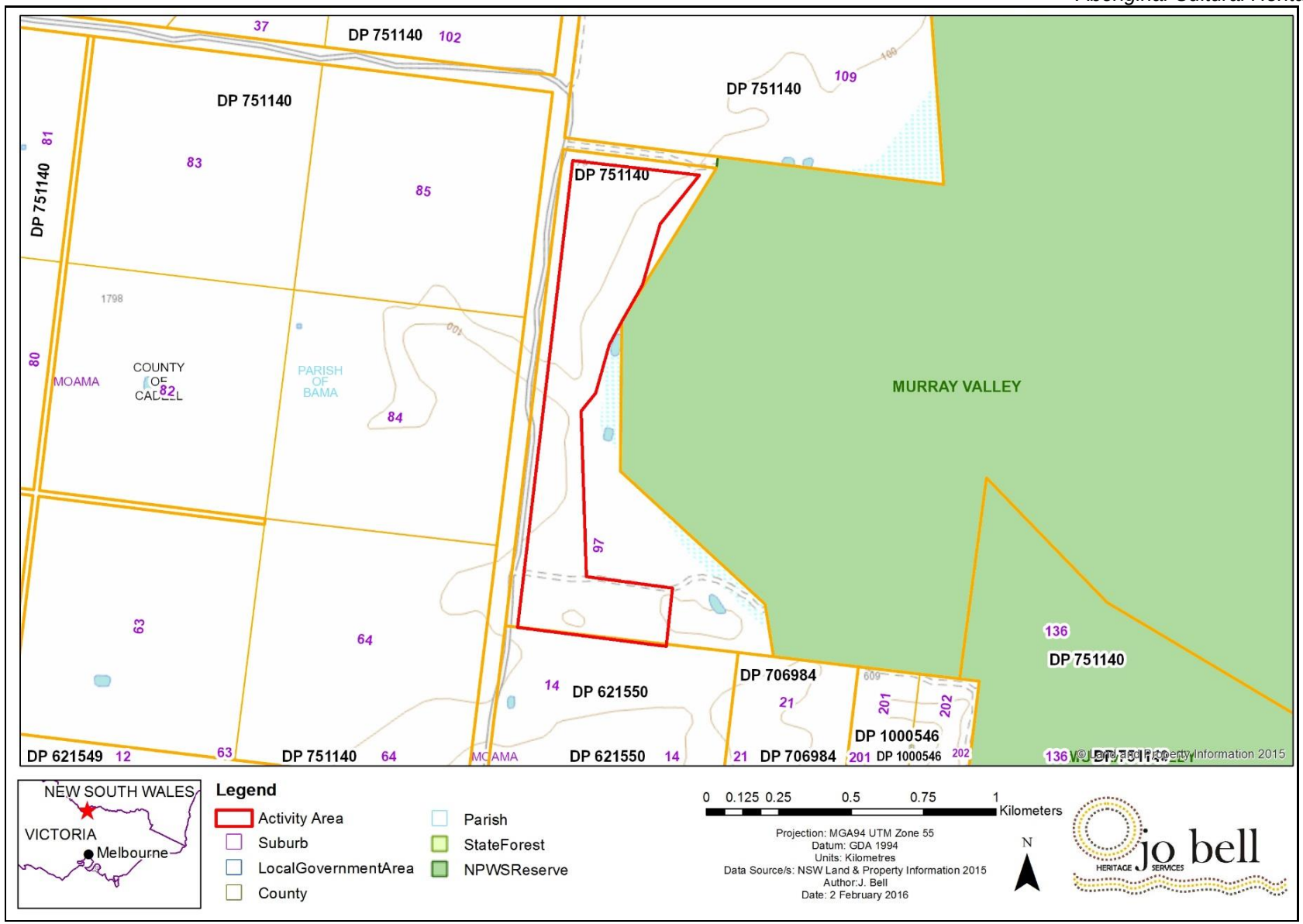
1.4.1 Activity Area Description

The activity area (or subject area) is located approximately 16km northeast of Moama and 8km west of Barmah (both as the crow flies) (see Map 1). It comprises a proposed development area of approximately 49ha within Lot 97 DP751140 (Map 2). The quarry buffer varies in dimensions but covers approximately 25.8ha in area. The existing quarry pits make up approximately 8ha in total.

The property is situated on Rushy Road (also known as 11 Mile Road), Moama. It is bounded by the Murray Valley National Park in the east, Rushy Road in the west and agricultural land to the north and south.

The property comprises undulating dune formations associated with the Barmah Sand Hills (Figure 1), a formation resulting directly from the uplift of the Cadell Fault and the down-throwing of the Echuca Depression (Palaeo Lake Kanyapella) some 30,000 years ago (Cochrane *et al* 1995:77; McPherson *et al* 2012).

The activity area is owned by the proponent.



Map 2: Parcel Plan showing the Activity Area

1.4.2 Existing Conditions

The proposed development areas are currently undeveloped and used for agricultural purposes, including cropping and cattle grazing. Recent NSW LPI aerial imagery shows a number of dams in the central part of the activity area. An existing sand quarry is shown in the south west corner of the activity area.

The development plan for the project, which uses a more recent aerial, shows a second existing sand quarry north east of the house in the activity area.

Isolated trees exist within the activity area, although these are mostly confined to the buffer zones.

Figure 1 is an aerial photograph that shows recent conditions in the activity area.

1.5 Nature of the Proposed Activity

The proponent is proposing to extend the existing sand extraction pits into the as yet undeveloped land (excluding the buffer zones) (Figure 2).

The proposed activity will include the following:

- Excavation of sand from the proposed development areas down to a depth of approximately 3m in the south and approximately 6m in the north ;
- On-site screening of excavated material;
- On-site storage and stockpiling of excavated material ready for supply;
- Formalisation of internal farm access tracks;
- Protection of buffer areas; and
- Rehabilitation of extraction areas following extraction completion.

A variety of different sand types is available from the site, from very fine sand through to coarse sand, with different extraction areas targeting particular grades of sand.

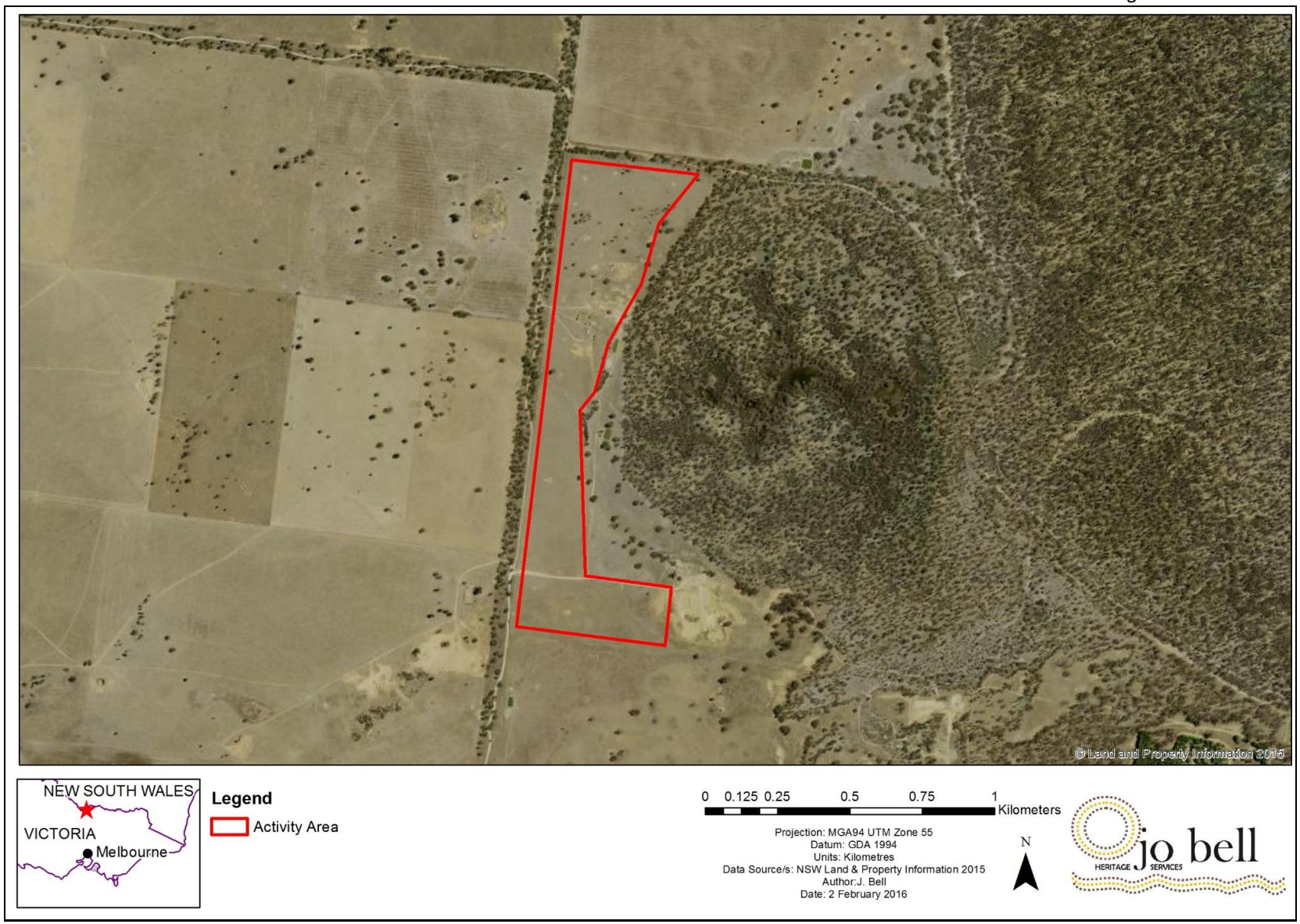


Figure 1: Existing conditions in the Activity Area (2015 Imagery)

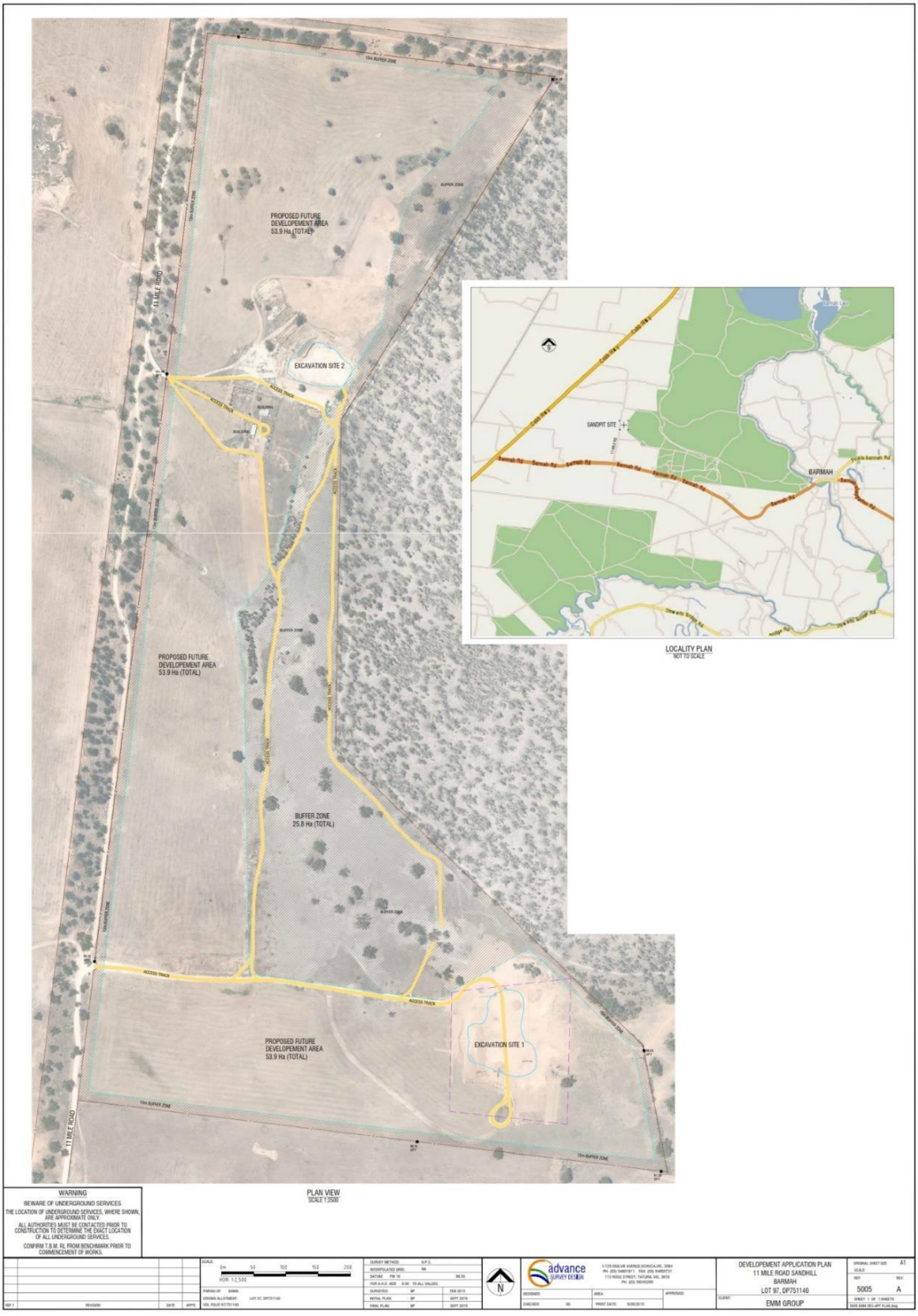


Figure 2: Concept Plan (source: Advance Survey Design 2015)

2.0 CONSULTATION

Consultation with Aboriginal people is necessary to understand their views and concerns about the proposed activity but also to understand the cultural values present in the area that may be harmed.

Aboriginal community consultation for the assessment followed the requirements as specified in clause 80c *National Parks and Wildlife Regulations* 2009 as set out in the Department of Environment, Climate Change and Water's *(*DECCW) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (2010a). This consultation was carried out in a number of stages.

2.1 Stage 1 - Notification of Project Proposal and Registration of Interest

Stage 1 of the consultation process involves ascertaining, from reasonable sources of information, the names of Aboriginal people who may have an interest and/or hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places in the activity area. Letters requesting the contact details of people who may have an interest and/or hold cultural knowledge relevant to the activity area, were sent on 22 October 2015 to the following agencies and groups (see Appendix 2 for a sample letter):

- Moama Local Aboriginal Land Council;
- Murray Shire Council;
- Murray CMA;
- OEH EPRG;
- The Registrar, Aboriginal Land Rights Act 1983 for a list of Aboriginal owners;
- The National Native Title Tribunal for a list of registered native title claimants, native title holders and registered Indigenous Land Use Agreements; and
- Native Title Services Corporation Limited (NTSCORP Limited).

The letters sent to the above agencies and groups notified recipients that an Aboriginal Heritage Assessment was being prepared for the activity. These letters outlined the name and contact details of the proponent and provided a brief overview of the proposed activity that is the subject of the assessment (and an AHIP where necessary), including the location of the proposed activity.

As a result of the letters, a number of groups were identified who may hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places that may exist within the activity area (see Table 1).

The groups identified in Table 1 were sent a letter providing them with a brief overview of the proposed activity, the location of the activity area and an invitation to register as an Aboriginal stakeholder or Registered Aboriginal Party.

A notice was also placed in the local newspaper (The Riverine Herald) on 11 November 2015 inviting expressions of interest (EOI) by relevant Aboriginal persons or organisations that may hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or place(s) in the area of the proposed activity (a copy of the EOI is provided in Appendix 2). The notice also outlined the name and contact details of the proponent and a provided brief overview of the proposed activity that will be the subject of the assessment, including the location of the proposed activity.

Aboriginal Person/Organisation	Date Sent	Method
Moama Local Aboriginal Land Council	11 November 2015	Post
Bangerang Aboriginal Corporation	11 November 2015	Post
Cummeragunga Local Aboriginal Land Council	11 November 2015	Post
Deniliquin Local Aboriginal Land Council	11 November 2015	Post
Wakool Aboriginal Corporation	11 November 2015	Post
Yarkuwa Indigenous Knowledge Centre	11 November 2015	Post
Yorta Yorta Nation Aboriginal Corporation	11 November 2015	Post

Table 1: List of Aboriginal people or organisations identified as potential stakeholders and invited to register as an Aboriginal stakeholder or Registered Aboriginal Party

Both the EOI notices required Aboriginal persons or organisations to register an interest in the process of community consultation with the proponent regarding the proposed activity no later than COB 27 November 2015.

Joe Day from Moama Local Aboriginal Land Council (MLALC) responded via phone on 27 October 2015, registering their interest as an Aboriginal party.

Vicki Atkinson from Bangerang Aboriginal Corporation (BAC) responded via phone on 19 November 2015 and later by email (24 November 2015), registering their interest as an Aboriginal Party.

Wade Morgan from Yorta Yorta Nation Aboriginal Corporation (YYNAC) responded via email on 27 November 2015, registering YYNAC's interest as an Aboriginal party.

No other EOI were received. A list of the Aboriginal people/organisations who responded to the letter of invitation or the public newspaper notice and registered for involvement in the consultation process is presented in Table 2. These Aboriginal people/organisations will be referred to as Registered Aboriginal Parties (RAPs).

Aboriginal Person/Organisation	Contact	Date Registration Received	Method
Joe Day Moama Local Aboriginal Land Council	03 5482 6071	27/10/2015	Phone
Vicki Atkinson Bangerang Aboriginal Corporation	0417 789 393	24/11/2015	Email
Wade Morgan Yorta Yorta Nation Aboriginal Corporation	03 5832 0222	27/11/2015	Email

Table 2: List of Aboriginal people or organisations identified as potential stakeholders and invited to register as an Aboriginal stakeholder or Registered Aboriginal Party

A list of the RAPs for the project was sent to the Moama LALC and OEH via email on 30 November 2015.

Appendix 2 also contains copies of any submissions from the RAP throughout the consultation process.

2.2 Stage 2 - Presentation of Information About the Proposed Activity

Stage 2 of the consultation process aims to provide registered Aboriginal parties with information about the scope of the proposed project and the proposed cultural heritage assessment process.

An inception meeting was arranged for 16 December 2015 at EMM Group offices in Echuca to present the proposed project information. In attendance were Steve Hamilton (Project Manager), Kane Henson (EMM Group), Brett Hamilton (BAC), John Kerr (MLALC), Wade Morgan and Tyrone Miller (YYNAC), and Bridget Grinter (JBHS).

The presentation of the information presented during the meeting included:

- A description of the activity (including the nature, scope, methodology, and environmental and other impacts);
- A description of the activity area;
- A summary of the geology, geomorphology, climate and flora and fauna of the activity area;
- A summary of the Aboriginal sites in the area;
- A summary of the land use history of the activity;
- A brief site prediction model based on the desktop assessment;
- An outline of the impact assessment process including the input points into the investigation and assessment activities;
- The proposed survey methodology for the field survey; and
- Specification of timelines and milestones for the completion of the assessment activities and delivery of reports.

The proposed methodology for the field survey was discussed as a group and it was agreed that the activity area should be systematically assessed as a group, walking transects across the entire activity area, where possible (see Section 4.1). This survey methodology was to include the inspection of all mature Eucalypts and landforms known to be sensitive for Aboriginal cultural heritage, such as dunes, terraces and high ground overlooking watercourses. In addition to systematic survey, opportunistic areas of exposure would be targeted for detailed examination.

It was proposed to record any Aboriginal cultural heritage places directly onto AHIMS site recording forms. Areas of potential Aboriginal cultural heritage sensitivity identified during the surface assessment were to be noted for further investigation (as necessary).

The RAPs did not identify any cultural concerns during the field assessment other than stating that burials were likely to be found given the landforms existing in the activity area.

2.3 Stage 3 - Gathering Information about Cultural Significance

On 19 January 2016, a map showing the location of the recorded Aboriginal cultural heritage and information about cultural significance was emailed to all RAPs with a request for information in relation to cultural significance of the heritage values and the landscape. No information was received as a result.

Additionally, a meeting with RAP representatives was held on 18 March 2016 to discuss the results of the assessment, the cultural significance of the Aboriginal cultural heritage identified and to develop cultural heritage management options.

As a result of the group discussion, the significance assessment is provided in Section 5 of this report; the impact assessment is detailed in Section 6 of this report; and the management recommendations are set out in Section 7 of this report. It should be stated that each Aboriginal site and PAD was discussed separately and all RAP representatives had input into the development of the management recommendations.

2.4 Stage 4 - Review of Draft Cultural Heritage Assessment Report

The cultural heritage advisor provided each RAP with a copy of the draft cultural heritage assessment report via email on 9 May 2016 for their review and comment.

The RAPs were given a minimum of 28 days to make a submission. No response was had from any of the RAPs.

A copy of the final Aboriginal cultural heritage assessment report will be sent to each RAP and the LALC for their records.

2.5 Consultation Outcomes

The consultation process has been undertaken in accordance with the guidelines published by DECCW, *Aboriginal cultural heritage consultation requirements for proponents 2010*, under Part 6 of the *National Parks and Wildlife Act 1974*.

Moama Local Aboriginal Land Council, Bangerang Aboriginal Corporation and Yorta Yorta Nation Aboriginal Corporation all submitted an EOI in relation to the project. Each RAP has

been consulted throughout the project and representatives from each RAP have been instrumental in developing the recommendations of this report.

3.0 DESKTOP ASSESSMENT

As outlined in the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011:5), a background assessment should 'compile, analyse and synthesise previous information and relevant contextual information to gain an initial understanding of the cultural landscape'.

This section of the report sets out the methodology and results of the desktop assessment.

3.1 Methodology

The desktop assessment was carried out according to the previously mentioned guide and *The Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b).

The aim of a desktop assessment is to produce an archaeological site prediction model. Site prediction models are then used to assist:

- The design of fieldwork strategies;
- The interpretation of fieldwork results;
- The assessment of Aboriginal cultural heritage significance; and
- The design of management recommendations.

In order to produce an archaeological site prediction model, the cultural heritage advisor must review relevant background information.

As part of the desktop assessment, the following tasks were undertaken:

- Search of AHIMS register to identify any previously recorded Aboriginal objects/places recorded within or near the activity area;
- Review of archaeological reports previously undertaken in the geographic region of the activity area including existing site prediction models;
- Review of local histories of the region, including any documentation of written or oral history regarding Aboriginal people in the region;
- Review of relevant reference texts on the local geology and geomorphology, and flora and fauna studies to identify the resources that would have been available to Aboriginal people in the past;
- Field ethnographic sources to identify the likely traditional owners;
- Historic archival plans;
- Aerial photography; and
- The land-use history of the area, particularly evidence for the extent and nature of past land disturbance.

The background research was undertaken by Ashley Edwards.

3.2 Landscape Context & Regional Character

3.2.1 Geology and Geomorphology

The activity area is situated on Shepparton Formation (Nws) geology, which is characterised by 'unconsolidated to poorly consolidated, mottled, variegated clay, silty clay with lenses of coarse to fine sand and gravel, including interlayered red-brown palaeosols' (Deniliquin 1:250 000 Geological Map, NSW DPI 2000; Figure 3).

The area to the east of the activity area is comprised of Coonambidgal Formation geology and other alluvial deposits characterised by 'unconsolidated, grey, brown, micaceous silty clay, silt, sand and gravel'.

The area to the south of the activity area is comprised of poorly consolidated brown, red, yellow and grey siliceous sand, silty clay, clay pellet aggregates, gypseous clay pellets, pale grey gypseous clay pellets, pale grey gypsite and older components increasingly modified by soil formation and development processes.

The activity area is located in the Riverina bioregion of New South Wales.

> 'This bioregion is dominated by river channels, floodplains, backplains, swamps, lakes and lunettes that are all of Quaternary age. The region comprises three overlapping alluvial fans centred on the eastern half of the Murray Basin. Features of each fan differ slightly because of differences in the discharge of the streams. The Lachlan fan is mainly clay as this smaller stream does not have the competence to carry sand. The other two fans are similar except that the Murray is more confined and has more active anabranch channels where it is forced to flow around the obstacle of the Cadell fault near Echuca. At times of extreme flood flow, water from the different streams can cross the fan surfaces and enter channels of another system'. (NSW NPWS 2003:92)

More specifically however, the uplift of the Cadell Fault resulted in river diversion of both the Murray and the Goulburn Rivers to the north and south respectively, creating the swamps and wetlands of the Moira, Barmah and Kanyapella lakes system (Pels 1966; Bonhomme 1990). The Barmah Sand Hills, of which the activity area forms a part, comprise a large continuous ridge rising 18m above the plain (Bonhomme 1990). According to Bowler (1978), 'this lunette formed during lake full conditions and the absence of characteristic clay layers in the lunette profile indicates that the lake was an open system where fine sediments were flushed out of the system' (Bonhomme 1990, after Bowler 1978).

The activity area is located at the transition from Murray Channels and Floodplains landforms to Murray Scaled Plains Landforms (NSW NPWS 2003).

Geotechnical testing has also been carried out on the property (Bell Cochrane & Associates 2015). This testing defined the amount of overburden (silts, clays and silty-clayey sands) overlying the sand resource (ranging from very fine sands through medium and coarse sands to gravels).

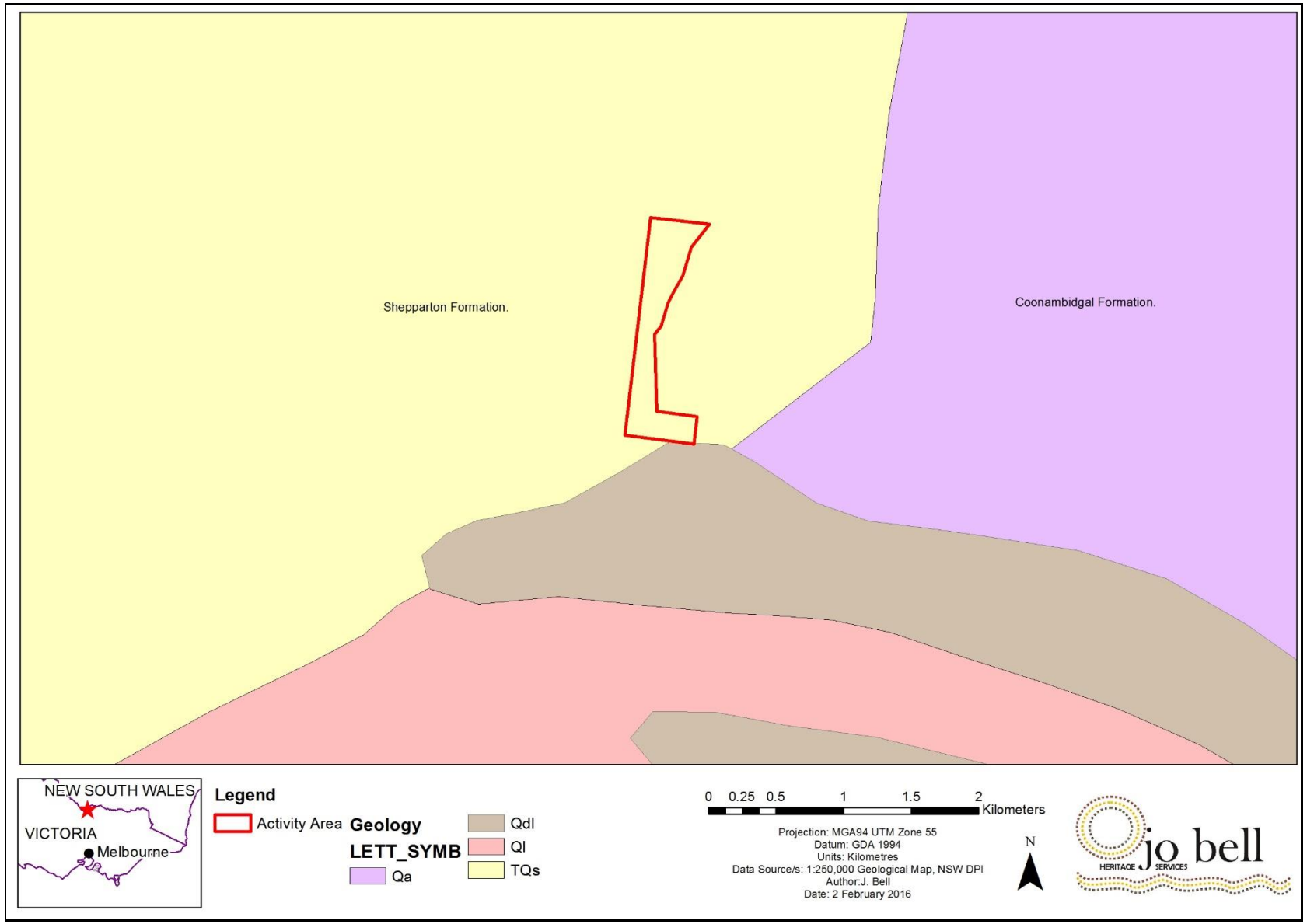


Figure 3: Geology of the Activity Area

The results of the geotechnical testing found that that the northern area (Area 3) contained an average overburden of 3m overlying the sand resource layer of 7m. The Middle Area (Area 2) showed an average overburden of 2m overlying the sand resource layer of 10m. The Southern Area (Area 1) contained an average overburden of 1.7m overlying the sand resource layer of 10.3m. The Dune Sand Area was also located in the south of the property and was differentiated from other sand deposits based on particle size amongst other things. This area showed an average overburden of 0.2m overlying the sand resource layer of 2.6m (Bell Cochrane & Associates 2015).

3.2.2 Climate and Hydrology

The activity area is situated on the sand dunes surrounding a low-lying wetland or swamp that is a part of the Murray River floodplain.

The Riverina Bioregion 'is dominated by a persistently dry semi-arid climate and characterised by hot summers and cool winters' (Stern *et al* 2000, cited in NSW NPWS 2003:91). Mean Annual rainfall ranges from 238 – 617mm with summer rainfall tending to occur mainly from localised thunderstorms with more consistent rainfall occurring in the winter months (NSW NPWS 2003:91)

3.2.3 Flora and Fauna

Mapping of the pre 1750 vegetation in the area indicates that the area was dominated by Eucalypt Woodlands (MVG 5). This vegetation

> 'includes a series of communities which have come to typify inland Australia (e.g. the box and ironbark woodlands of eastern Australia). Understoreys may vary from grasses to shrubs and in some cases have attained a parkland appearance due to frequent fire and grazing. The parkland appearance is reflected in early landscape paintings providing a strong sense of place for many Australians' (DEWR 2007:18).

The activity area is further mapped as '*Eucalyptus woodlands with a tussock grass understorey'*.

- Estimated Pre 1750 Major Vegetation Group - Eucalypt Woodlands
- Estimated Pre 1750 Major Vegetation Sub Group - Eucalyptus woodlands with a tussock grass understorey
- Present Major Vegetation Group - Eucalypt Woodlands
- Present Major Vegetation Sub Group - Eucalyptus woodlands with a tussock grass understorey.

Current mapping shows the vegetation unchanged in the activity area.

A recent assessment of the current flora and fauna in the activity area has been conducted by Steve Hamilton Environmental Consulting (*in prep*). The assessment describes the current vegetation as follows:

> *Notwithstanding the direct impact of the extraction areas, the vegetation of the remainder of the property does reflect the inferred historic land use:*
> - *Substantial tree clearing, with only scattered mature trees across the northern and central areas of the property in particular;*
> - *No tree recruit for several decades;*
> - *No shrub layer or shrub recruitment;*
> - *A ground layer that is predominantly opportunistic annual introduced species-based due to the recurrent cultivation and cropping disturbance over much of the property, with indigenous ground layer vegetation only evident around the base of clumps of trees or along some of the boundary areas along the perimeter fences;*
> - *No fallen timber.*
>
> Hamilton (*in prep*:3).

3.2.4 Land Use History

Pastoral History

> 'John Oxley first explored the Riverina in 1817, following the Lachlan River downstream southwest of Booligal in the centre of the bioregion (Eardley 1999). Oxley was followed almost 20 years later by Thomas Mitchell, who arrived at the junction of the Lachlan and the Murrumbidgee Rivers in 1836, and by Charles Sturt, who explored the Murrumbidgee and lower Murray in the years between 1828 and 1831 (Eardley 1999)' (NSW NPWS 2003).
>
> 'Graziers followed soon after, establishing pastoral runs near Yanco and on the Murrumbidgee and Murray Rivers as far west as Hay between 1835 and 1839 (Eardley 1999). In the 1840s, cattle were the primary industry but by the 1860s sheep were the predominant stock (Eardley 1999)' (NSW NPWS 2003).

Aerial Photography

1961

The activity area appears to be mostly cleared farmland (grazing) with a number of remnant mature trees in the northern part of the activity area and around the edge of the swamp which appears to be dry (Figure 4).

1996

The activity area appears relatively unchanged apart from the addition of a house and sheds. The swamp appears to be wet and green when the photograph was taken (Figure 5).

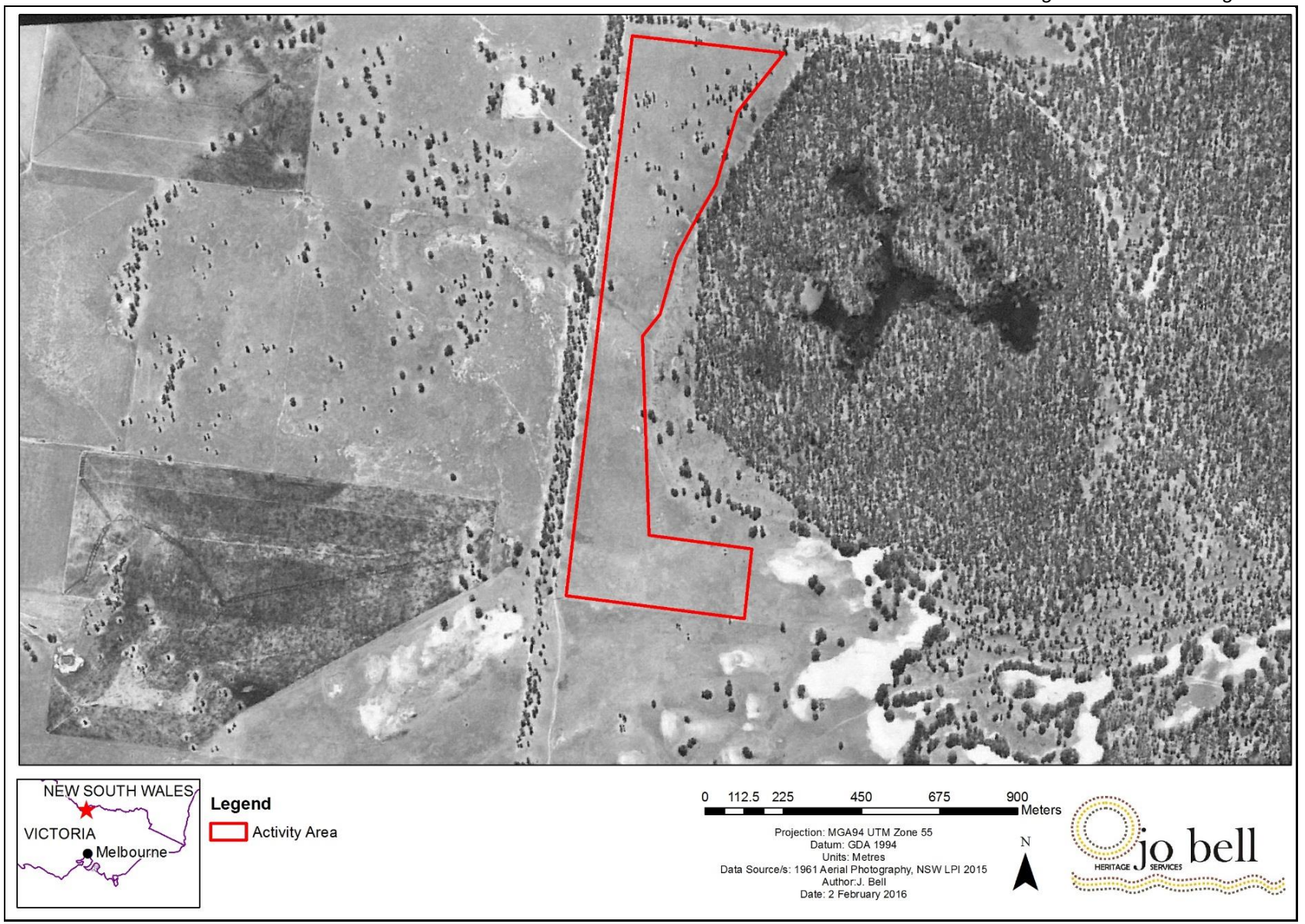


Figure 4: Historic Aerial Photography, 1961 (source: NSW Land and Property Information)

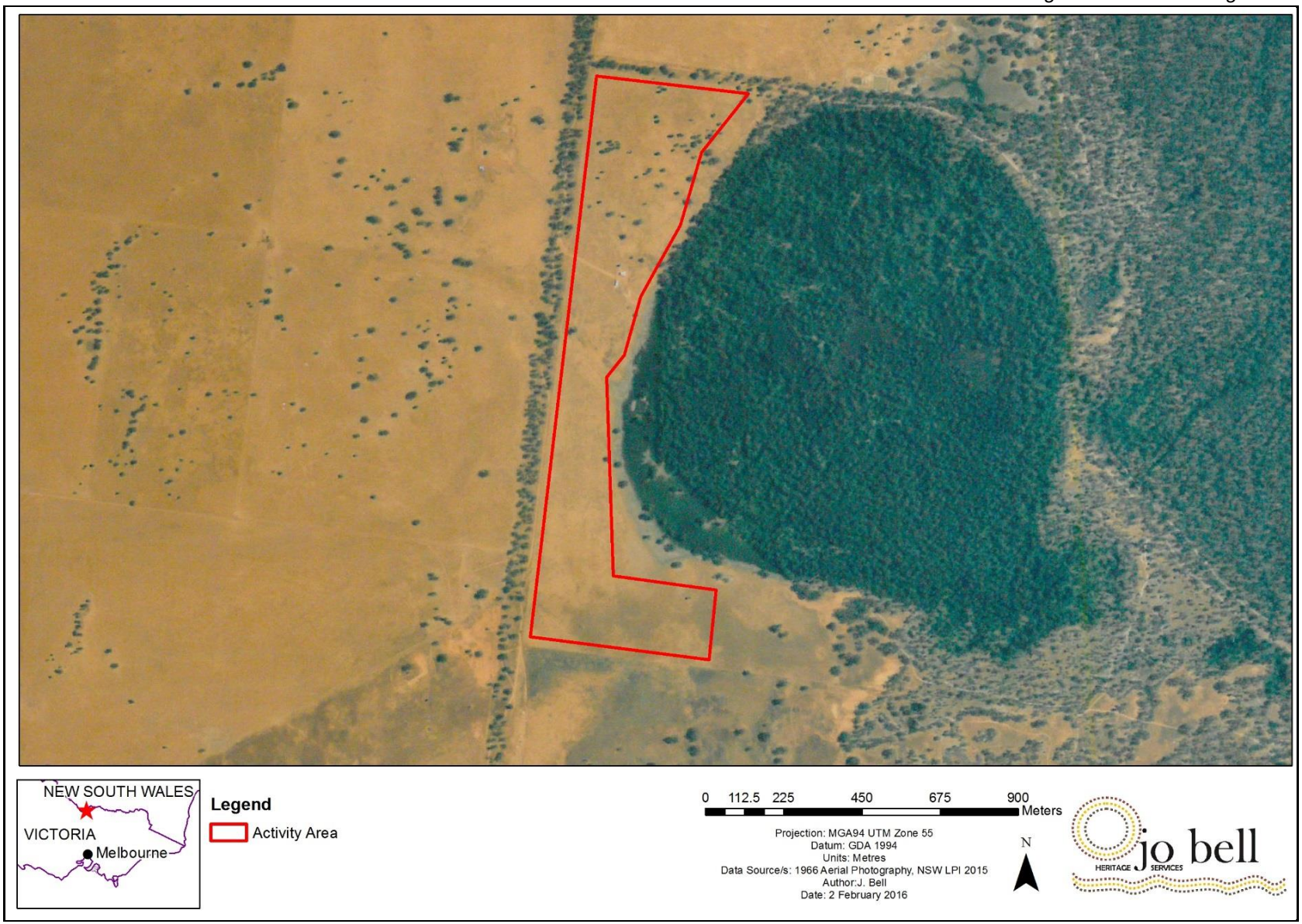


Figure 5: Aerial Photography, 1996 (source: NSW Land and Property Information)

Historic Plans

Parish of Bama

1914

The activity area is marked as leased to Thomas Light Hamling on August 18th (197 acres). The plan states that the property was gazetted on 11 July 1900. The activity area is shown as situated on the western edge of a swamp (Figure 6).

No Date

The activity area is still marked as leased to Thomas L. Hamling from August 18th (197 acres). The activity area is still shown as situated on the western edge of a swamp.

1928

The activity area is marked as leased to T. A. Hamling on November 4th (197 acres) which has been crossed out and replaced with A. J. Eddy. The swamp is not shown in this plan (Figure 7).

3.3 Previous Archaeological Work

3.3.1 Previous Archaeological Assessments

A review was made of the Aboriginal Heritage Information Management System (AHIMS) Register as part of the desktop assessment. A number of archaeological investigations have been carried out in the wider region in which the activity area is located (Table 3). Of most relevance to the activity area itself, is a site survey undertaken by Cummeragunga LALC on 29 May 2006.

According to a letter from Cummeragunja LALC Sites Officer Neville Atkinson (provided by the proponent), Mr Atkinson conducted a site survey of the 'Rushi Farm' property in 2006. In conclusion, Mr Atkinson states

> 'The proposed quarry sites [are] in the general area where land has been cultivated over a long period of time for cereal cropping…There were no visible signs of any Aboriginal heritage listings suggesting the possibility of finding any on the surface in the near future is very remote taking into consideration all the previous land disturbance that has taken place in the past'.

Presumably, the survey took place only for the two quarry sites that are currently in existence and not the rest of the property that is currently being investigated. It should be noted that whilst the statement considers surface material, it does not make any consideration of the potential for *buried* Aboriginal cultural heritage to be identified during works.

Figure 6: Historic plan of Parish of Bama, County of Cadell, 1914 (source: NSW Land and Property Information)

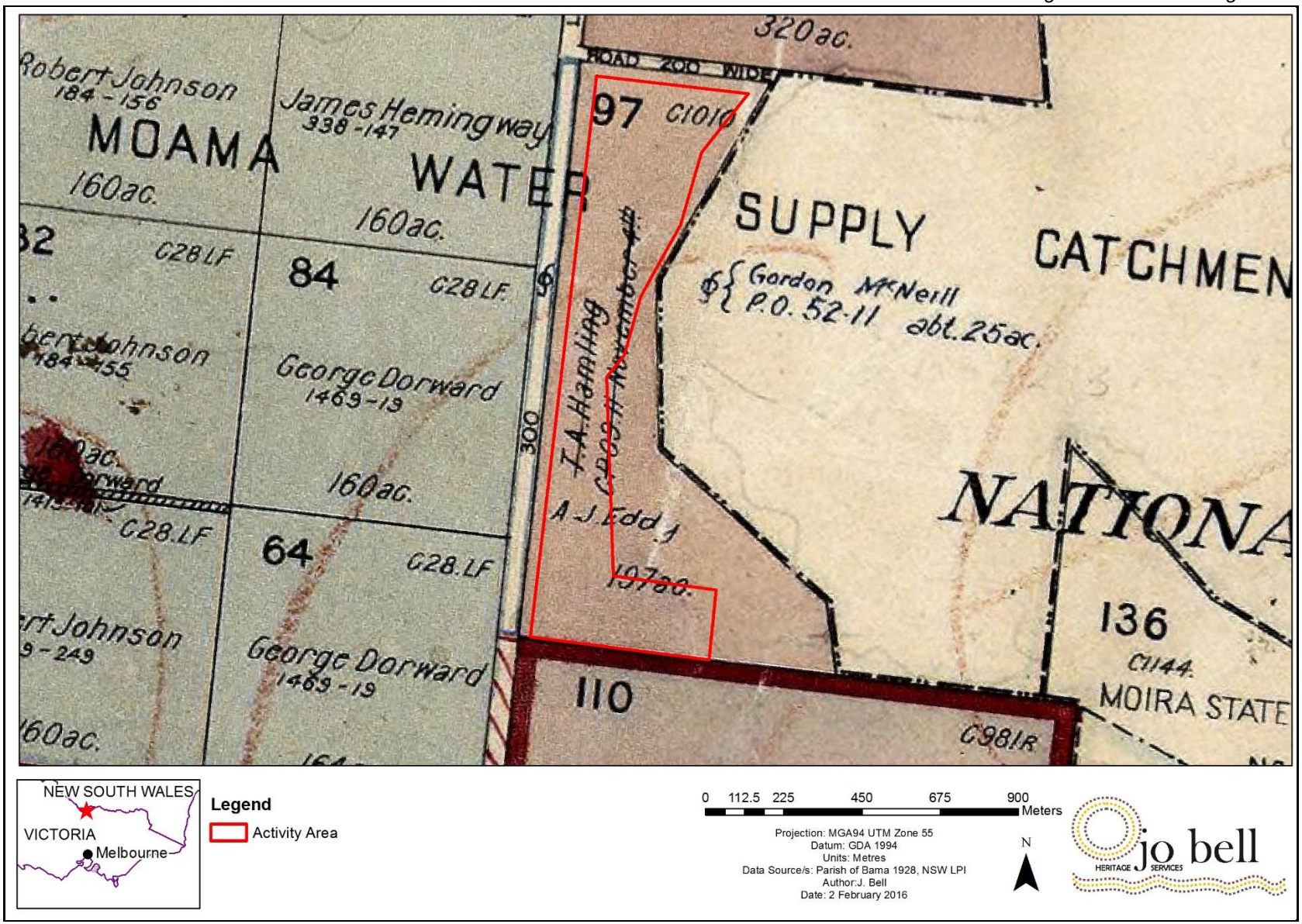


Figure 7: Historic plan of Parish of Bama, County of Cadell, 1928 (source: NSW Land and Property Information)

In terms of archaeological investigations undertaken of similar landforms as exist within the current activity area, the most relevant are summarised below.

Lance, A. & Webb, S. G. 1985
An Archaeological Investigation of a Sand Dune on the Murray River at Moama, NSW. Report to the NPWS, NSW. ANU Archaeological Consultancies: Canberra.

This study reports on an investigation of a sand quarry 2km east of Moama, which was prompted by reports of human remains at the property (up to 15 individuals). An inspection of the site resulted in the identification of the skeletal remains of a child at the site. A number of 1x1m pits and auger holes were excavated on the property. No human remains were identified during the excavation however the remains of a further two individuals were identified in some spoil dumps. The report assesses the site as of relatively low scientific significance and claims that the reports of 15 individuals being removed from the site as 'exaggerated'. The report considered it unlikely that additional remains would be found at the property.

Lance, A. 1985
An Archaeological Investigation of the Algeboia Shell Midden in the Moira State Forest, Murray Valley, NSW. Report to the Forestry Commission of NSW. ACT Archaeological Consultancies: Higgins.

This report details the results of an investigation into a shell midden situated on a low sandy rise bordering the Murray River floodplain that was disturbed by quarrying. The site is located only 3km northeast of the activity area. The site contained freshwater mussel shell, fish and mammal bones, one stone flake, one hammerstone and scarred trees. An excavation of the site was carried out revealing a deposit of shell, bone, charcoal, stone artefacts and clay. The site was dated to 1,100 BP.

Edmonds, V. 1990
An Archaeological Survey of the Proposed Echuca-Moama RSL and Citizen's Club Site, Moama, New South Wales. Report prepared for Echuca-Moama RSL and Citizen's Club Ltd.

Edmonds conducted a survey of the 4ha site, located 1km northwest of Moama. No Aboriginal sites were identified during the survey.

Lloyd, A. 1993
Archaeological Survey of Proposed Moama Sewerage Treatment Works, Moama, New South Wales. Report to Moama Shire Council.

Lloyd surveyed an area of 431ha north of Moama (11.5km southwest of the activity area). A total of 18 scarred trees and one mound were recorded during the survey. Lloyd suggests that scarred trees and mounds are likely to occur across all landform types 'rather than being landform specific'.

Craib, J. L. 1991
Archaeological Survey of the Moira-Millewa State Forests. Report for National Parks and Wildlife Service.

Craib surveyed an area of the Moira-Millewa forest, 20km north of Moama. A total of 146 sites including burials, mounds, middens, scarred trees and artefact scatters were identified during the survey across a variety of landforms. Based on the results of the survey, together with Bonhomme's 1990 survey results from the Barmah Forest, Craib developed a prediction model for the Moira-Millewa forest area. The current activity area contains sand dunes which,

according to Craib's prediction, could contain open artefact scatters and burials in low densities and mounds in higher densities.

Stone, T. 1999

An Archaeological Survey of the Corridor of a Proposed Levee Bank near Moama, NSW. A report to Sinclair Knight Merz.

Stone surveyed a 5km corridor north of Moama. No Aboriginal sites were identified during the survey.

Navin Officer Heritage Consultants 2009

Deniliquin to Moama 132kV Transmission Line Route: Aboriginal and Historical Archaeological Assessment. A report to Sinclair Knight Merz.

Navin Officer Heritage Consultants conducted a survey of a 69km alignment between Moama and Deniliquin. Nine scarred trees were identified during the survey of the alignment, none of these were close to the activity area.

Table 3: Summary of Previous Archaeological Investigations in the Region

Investigation	Location / Survey Type	Landform	Results
Lance, A. & Webb, S. G. 1985 *An Archaeological Investigation of a Sand Dune on the Murray River at Moama, NSW*. Report to the NPWS, NSW. ANU Archaeological Consultancies: Canberra.	Sand quarry 2km east of Moama Foot survey and test excavations	Sand dune, 300m from Murray River main channel	Ancestral remains of 3 individuals identified in spoil. No remains identified during test excavations. Excavations and augering to a depth of 2.7m. Unit A - humic-rich soil horizon overlying Unit B - red sand horizon (some charcoal associated with carbonized tree roots), overlying Unit C - mottled red sand (leached from Unit B), overlying Unit D – yellow sand (horizontal bedding planes), overlying Unit E – riverine clays
Lance, A. 1985 *An Archaeological Investigation of the Algeboia Shell Midden in the Moira State Forest, Murray Valley, NSW*. Report to the Forestry Commission of NSW. ACT Archaeological Consultancies: Higgins.	Moira State Forest Foot survey and excavation	Low sandy rise bordering Murray River floodplain	Shell midden disturbed through quarrying. Site contained freshwater mussel shell, fish and mammal bones, charcoal, stone flake, a hammerstone and scarred trees. Dated to 1,100 years BP
Edmonds, V. 1990 *An Archaeological Survey of the Proposed Echuca-Moama RSL and Citizen's Club Site, Moama, New South Wales*. Report prepared for Echuca-Moama RSL and Citizen's Club Ltd.	4ha area for the Echuca –Moama RSL site, 1km northwest of Moama Foot survey	Floodplain – 500m from northern bank of Murray River	No cultural heritage identified

Investigation	Location / Survey Type	Landform	Results
Bonhomme, T. 1990 *An Archaeological Survey of the Barmah Forest*. Report prepared for Victoria Archaeological Survey and Department of Conservation and Environment.	Barmah Forest, Victoria 9km north of Barmah township Foot Survey of linear transects for sampling	Varied – River and creek margins, floodplain, sand dunes and plains	182 Aboriginal sites recorded, including scarred trees, mounds, burials and stone artefact scatters
Craib, J. L. 1991 *Archaeological Survey of the Moira-Millewa State Forests*. Report for National Parks and Wildlife Service.	Moira-Millewa State Forests, 20km north of Moama Area foot survey	Varied – River and creek margins, floodplain, sand dunes and plains	146 Aboriginal sites recorded, including burials, mounds, middens, scarred trees and artefact scatters
Lloyd, A. 1993 *Archaeological Survey of Proposed Moama Sewerage Treatment Works, Moama, New South Wales*. Report to Moama Shire Council.	431ha north of Moama Foot survey	Plain	18 Scarred trees and one mound identified
Stone, T. 1999 *An Archaeological Survey of the Corridor of a Proposed Levee Bank near Moama, NSW*. A report to Sinclair Knight Merz.	5km linear alignment, north of Moama Foot survey	Plain, terrace edge of Murray River	No cultural heritage identified
Navin Officer Heritage Consultants 2009 *Deniliquin to Moama 132kV Transmission Line Route: Aboriginal and Historical Archaeological Assessment*. A report to Sinclair Knight Merz.	69km linear alignment between Moama and Deniliquin Field Inspection	Varied	9 scarred trees were identified

3.3.2 Aboriginal Heritage Information Management System (AHIMS) Register Search

A Basic Search of the AHIMS was conducted on 22 October 2015 (Client Service ID: 196232). The results indicated that one Aboriginal site had been recorded in the vicinity of the activity area.

An extensive search of AHIMS has indicated that there are 59 sites within a 10km radius of the activity area. These sites include an Aboriginal place, burials, an ochre quarry, fish traps, ovens, mounds, scarred trees, mythological sites, and mixed sites located primarily on river bank and flood plain landforms.

There is one Aboriginal site located east of the activity area, in the swamp. The site is *Many Waters Scar Tree 4* (Site ID 54-5-0248). The environmental context of the scarred tree is given as 'Lagoon', 'Stream bank' and 'Open forest' (Figure 8).

The tree is a healthy standing Red Gum with a single scar. The condition of the tree is given as 'Good'. The scar measures 0.85m in length and 0.14m in width. It is 1.2m above the ground surface level. The orientation of the scar is south east. The presence of axe marks is 'indeterminate'. There are no recommendations for protecting the tree as it was not seen as being under any threat at the time of recording.

3.3.3 Aboriginal History and Ethnography

There is evidence that Aboriginal people have been present in the Murray-Darling Basin for at least 40,000 years (NSW NPWS 2003:95). However there appears to be little agreement about the location of the boundaries of the Aboriginal groups to the north of the Murray River in the vicinity of the study area for this investigation.

The Riverina bioregion of NSW was occupied by various traditional Aboriginal groups that lived on the Hay Plain and around the rivers. These included the Wiradjuri, Nari-Nari, Mudi-Mudi, Gurendji, Yida-Yida, Bangerang, Yorta-Yorta, Baraba-Baraba, Wamba-Wamba, Wadi-Wadi and Dadi-Dadi communities (*Ibid.*). The rivers of the region were integral to the traditional Aboriginal economy, especially as a source of food (*Ibid*.). According to Pardoe (1988) access to the resources of major river systems in the region was a privilege inherited by generation upon generation of the local indigenous groups.

According to the NSW NPWS (2003:95) the Bangerang people were located around the Moama region. The Bangerang used the Murray River extensively, travelling the river in bark canoes (*Ibid*.). Evidence of Aboriginal presence commonly found along the river systems include human burial sites, camping sites, scarred trees and middens (*Ibid*.).

The Murray supplied the Bangerang with Murray cod and shellfish, while nuts, fruit and tubers were found in the river's surrounds (NSW NPWS 2003:95). The Bangerang may have joined the Wiradjuri and Monaro groups to participate in the summer feasts of Bogong moths in the alpine country (*Ibid.*).

Howitt, on the other hand believed that the Baraba-baraba language group was located within the country extending "from Mathoura between Deniliquin and Moama on the south to Jerilderie or Narandera on the east, to Moulemein on the south east and Dry Lake on the north east" (1996:52-3).

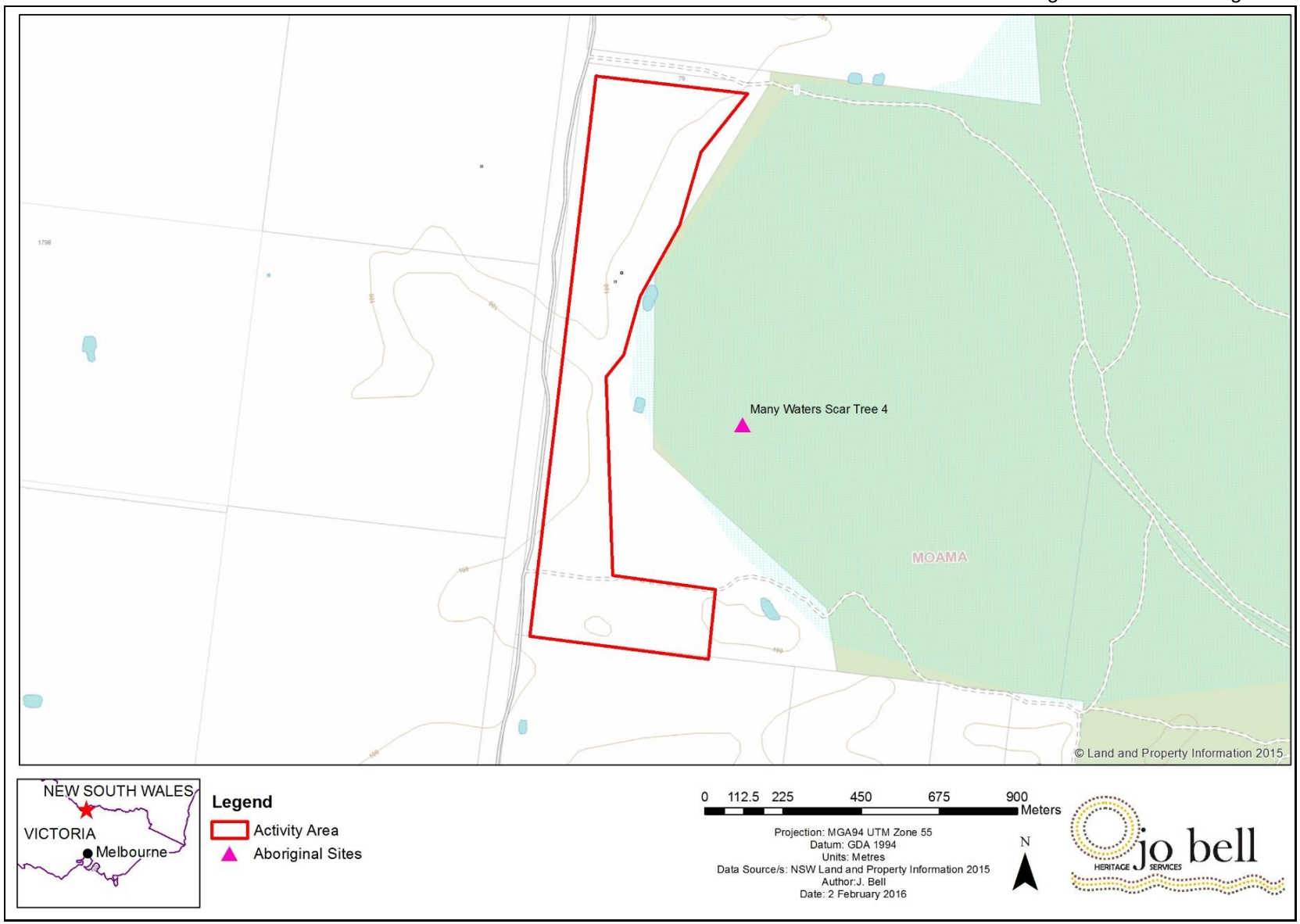


Figure 8: Location of registered Aboriginal sites within 1km of the Activity Area

Tindale's reconstruction of language groups in the area names Jotijota as occurring on the Murray 'from east of Cohuna to Echuca and a point 30km by river west of Tocumwal, along Tullah Creek to Yielima, at Tuppal, Conargo and Deniliquin in NSW' (1974:194). The group was reported in 1842 as visiting the Murrumbidgee River (*Ibid*.). Tindale believes that Curr mistakenly included two of Jotijota's hordes in his Pangerang horde list (Ngarrimowro and Woolithiga) (*Ibid*.).

Contact

By the 1830s, the effects of European settlement could be seen when diseases such as influenza, smallpox and syphilis ravaged the Bangerang community (NSW NPWS 2003:95). A census of Aboriginal people in 1845 estimated there were about 2,000 living in the Murrumbidgee Pastoral District, including 100 at Thomas Mitchell's station near what is now Albury, 300 near Deniliquin, and 200 at Urana on the eastern boundary of the Riverina Bioregion (*Ibid*.). Middens, which are often thought to have reflected the high population of the eighteenth century, became deserted, with midden material used in place of gravel by the Europeans (*Ibid*.). Some aspects of traditional Aboriginal life continued through the 1840s and 1850s but by the 1870s important ceremonies such as corroborees began to attract the interest of settlers who encouraged them as a form of entertainment by paying surviving group members to perform them (*Ibid*.).

The 1870s also saw Aboriginal people forced off their traditional lands with the men coerced into employment on local stations or encouraged to live in towns (NSW NPWS 2003:96). The women were forced to work as domestic servants and often bore settlers' children (*Ibid*.).

While the authors have attempted to provide an account of the available historical literature, this may not necessarily be accepted by descendants of traditional custodians or RAPs.

3.3.4 Summary of Previous Site Prediction Models

Previous site prediction models for sand sheet and dune landforms in particular have suggested that open artefact scatters and burials will occur in low densities, whilst mounds would be identified in higher densities. Scarred trees and mounds are likely to occur across all landform types. Shell middens are most likely to be found associated with low sandy rises overlooking the Murray River. The one cultural deposit that has been dated indicates a date of 1,100 years BP.

3.4 Summary

The results of the desktop assessment indicates that the activity area comprises undulating sand dune and sand sheet landforms, associated with the Cadell Fault and the Echuca Depression. Previous archaeological investigations in the vicinity of the activity area indicate that stone artefact scatters, mounds, scarred trees and burials are likely to be found in association with these landforms.

3.5 Site Prediction Model

Based on the results of the desktop assessment, it is predicted that scatters of stone artefacts and mounds or hearth material are the most likely site types to be found in the activity area, and usually occur relatively close to the surface. These site types are likely to represent campsites and stone working areas as the undulating sand hills of the activity area overlook a low-lying wetland that would have provided both food and water resources. The sand hills themselves would have provided dry ground for habitation and high ground for a long-range view of the surrounding area.

It is also possible that ancestral remains could be identified at some depth within the sand deposits on the property. The likelihood of the survival of skeletal remains would depend on the amount of erosion and re-deposition of sediment, which is linked to land-use practices including clearing of vegetation and subsequent dune instability.

4.0 SURVEY

The results of the desktop assessment indicated that a survey was required to further investigate the Aboriginal cultural heritage values (if any) located within the activity area.

4.1 Survey Methodology

The field team was to consist of two archaeologists and a representative from each of the RAPs. The proposed field methodology included a systemic survey of the entire activity area as a group, walking transects where possible across the survey units, Areas 1 to 4 (after Burke & Smith 2004). This survey methodology was to include the inspection of all mature Eucalypts and exposed ground as the entire area is a landform known to be sensitive for Aboriginal cultural heritage (sand dune).

It was proposed to record any Aboriginal cultural heritage places directly onto AHIMS site recording forms. Areas of potential Aboriginal cultural heritage sensitivity identified during the surface assessment were to be noted for further investigation during subsurface testing (as necessary).

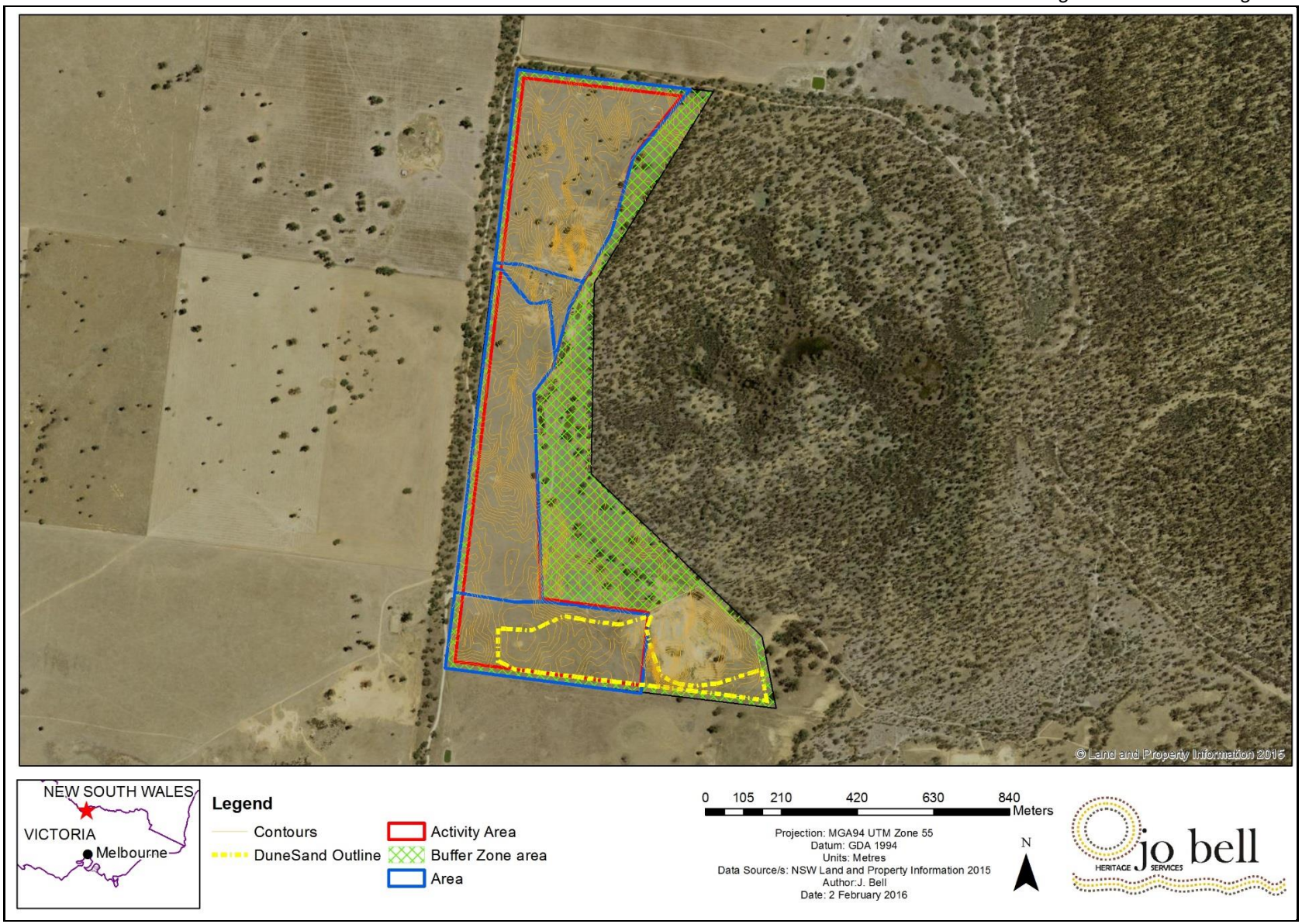
4.2 Results

The field survey was carried out over two days on 6-7 December 2015 Jo Bell and Bridget Grinter (Archaeologists, Jo Bell Heritage Services Pty. Ltd.) with Brett Hamilton (Bangerang), Mick Bourke (Yorta Yorta), John B. Kerr and John Kerr (Moama LALC) also in attendance.

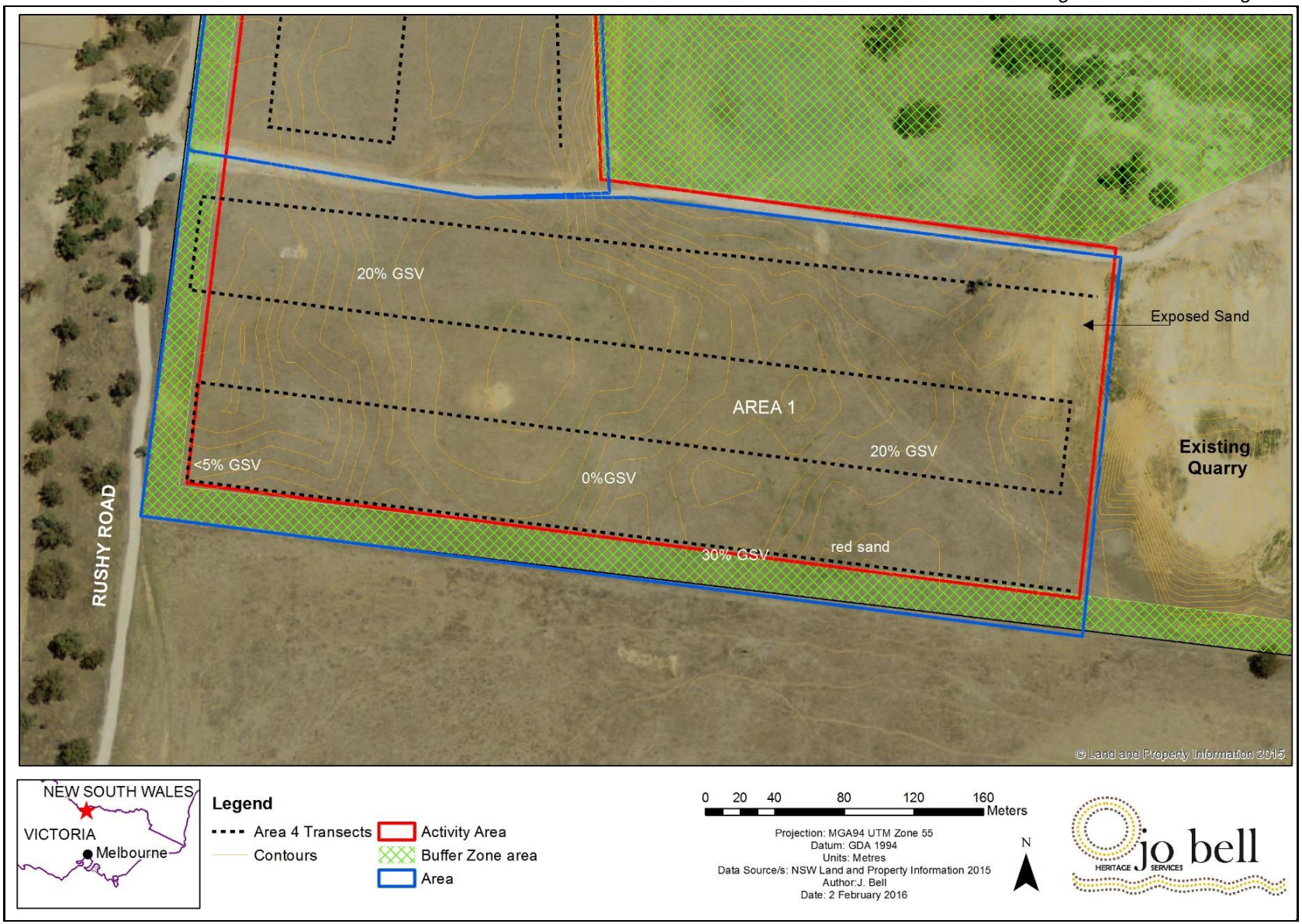
The activity area for survey was divided into survey units 1 to 4. These areas were defined by internal farm tracks, laid out across the undulating sand dune (Map 3). The activity area was surveyed on foot by the field team, focusing on exposed areas with good visibility (Map 4 series; Plates 1-2). The buffer zones, which will not be subject to ground disturbance, were not assessed.

Visibility and exposure in the activity area was quite variable, ranging between 0% where weed and grass growth was high to 100% where crop stubble had not yet given way to new growth, or the A-horizon had been completed eroded (Tables 4-5; Plates 3-4).

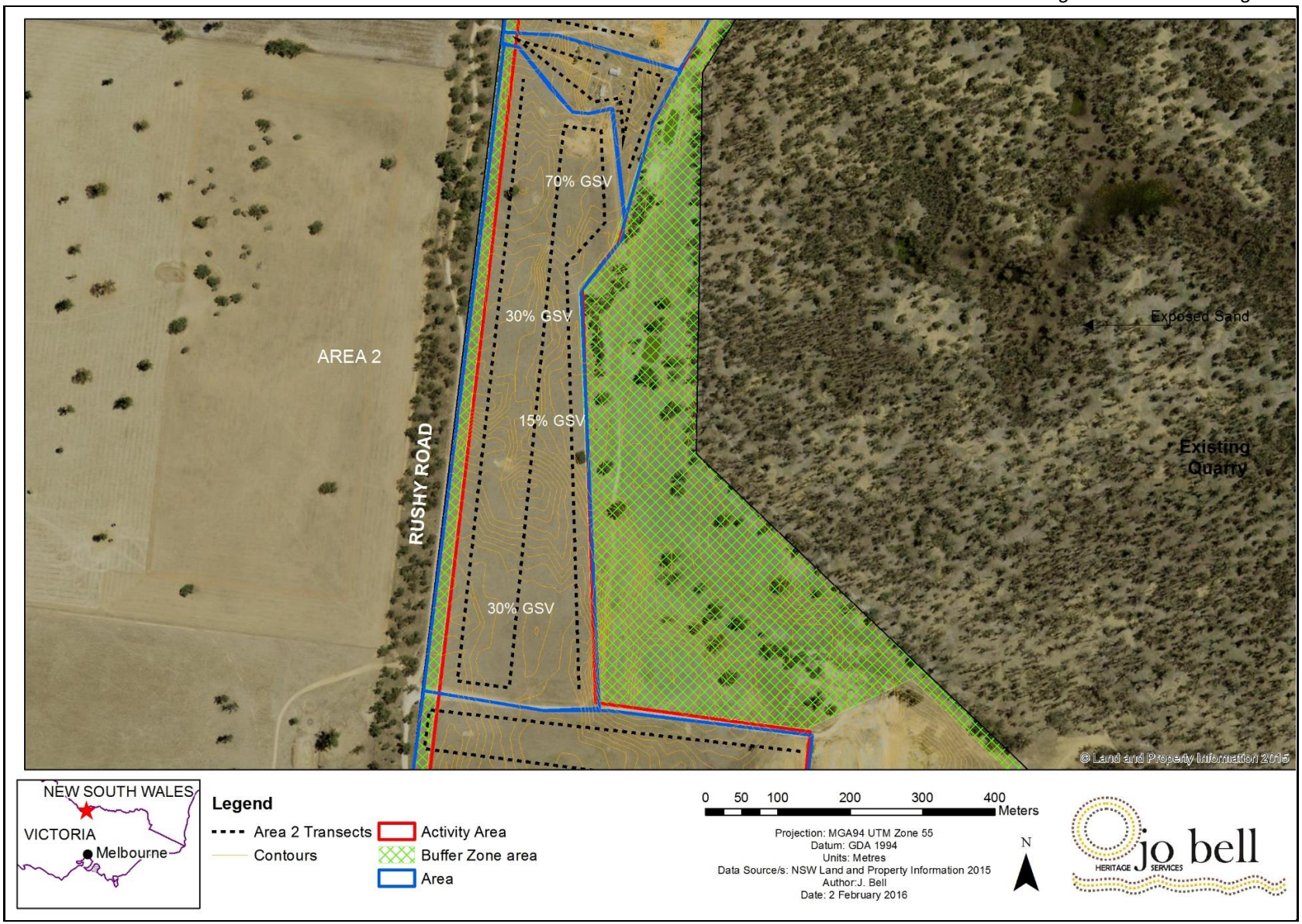
The activity area as a whole, contained very few trees. Isolated mature Eucalypts were mostly confined to Area 3 (see Plate 4). These were all examined in detail, however none showed evidence of cultural scarring. A small stand of young regrowth Eucalypts were identified in Area 2 within the buffer zone. A shallow saddle between two rises in Area 2 was also noted, acting as an ephemeral drainage line (see Plate 2). A house site, sheds, garden and slope down to a nearby dam comprised Area 4. Areas 1-3 had been planted (and harvested) to either oats or vetch. Geotechnical test pit and bore locations were also observed throughout the activity area (see Plate 1).



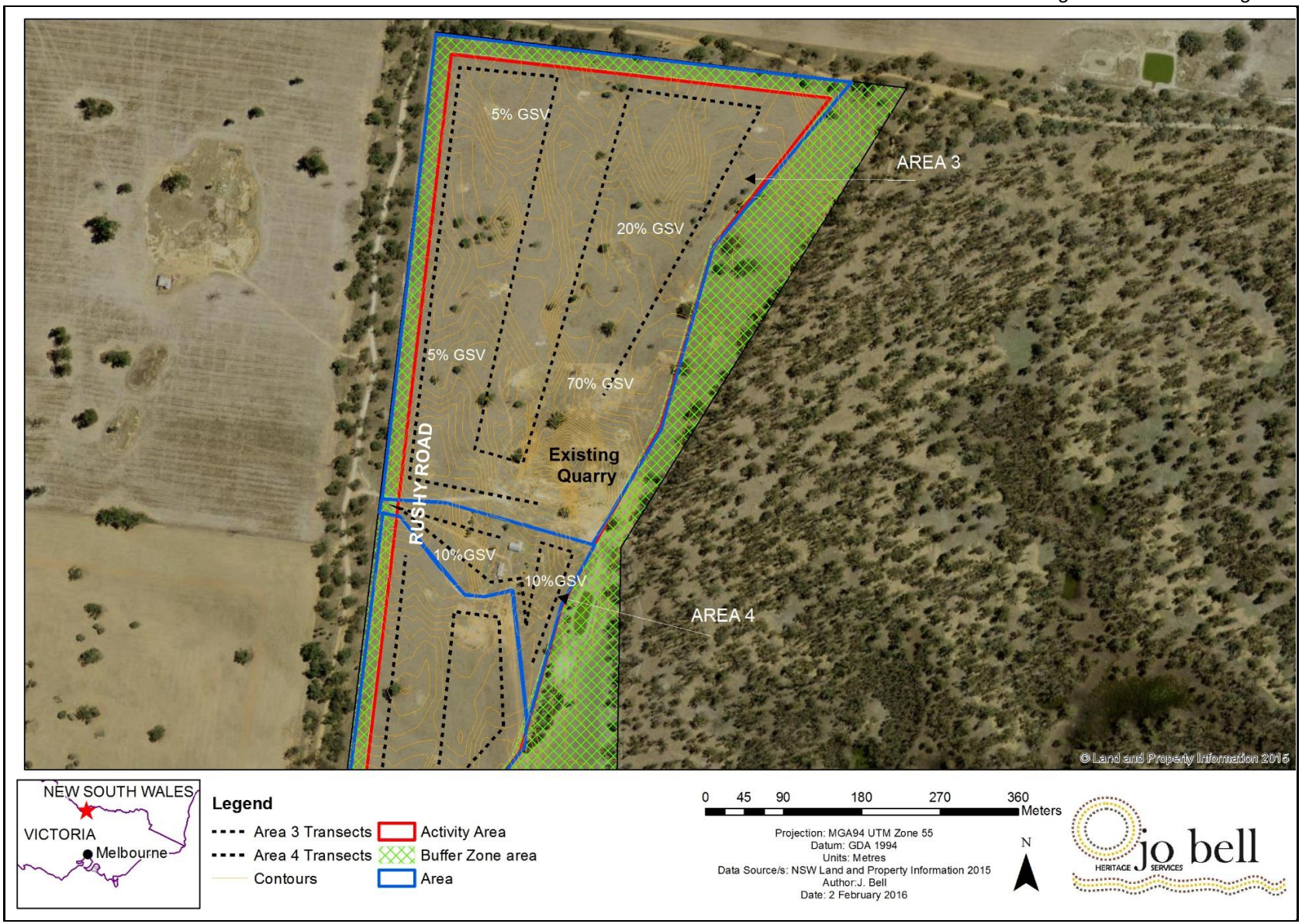
Map 3: Survey Units and Landforms in the activity area



Map 4a: Survey Results – Area 1



Map 4b: Survey Results – Area 2



Map 4c: Survey Results – Areas 3 &4

Table 4: Estimated Survey Coverage

Survey Unit	*Landform*	*Survey Unit Area (square metres)*	*Visibility (%)*	*Exposure (%)*	*Effective Coverage Area (square metres)*	*Effective Coverage (%)*
Area 1	Sand dune / sheet	117,000	20	60	14,040	0.12
Area 2	Sand dune / sheet	164,000	40	50	32,800	0.2
Area 3	Sand dune / sheet	190,000	50	40	38,000	0.2
Area 4	Sand dune / sheet	21,000	10	10	210	0.01

Table 5: Estimated Landform Coverage

Landform	*Landform Area (square metres)*	*Area of Landform Effectively Surveyed (square metres)*	*% of Landform Effectively Surveyed*	*Number of Sites*	*Number of Artefacts or Features*
Sand sheet / dune	492,000	85,050	0.172	3	60+

Plate 1: Area of excellent ground surface visibility in Area 1. Note backfilled geotechnical testing trench, facing 80º (Photo: J.Bell 6/1/2016)

Plate 2: Looking down at Area 2 from top of hill and good ground surface visibility, facing 190º (Photo: J.Bell 6/1/2016)

Plate 3: Area 1 showing limited ground surface visibility, looking towards existing quarry, facing 90º (Photo: J.Bell 6/1/2016)

Plate 4: Area 3 showing plough furrows and isolated trees, facing 190º (Photo: J.Bell 6/1/2016)

4.2.1 Aboriginal Cultural Heritage

No Aboriginal cultural heritage was identified in Areas 3 or 4.

Two isolated artefact occurrences were identified in Area 2: one in the northern sector of the survey unit, south of the shed in the cropped paddock (***Moama Sand Quarry Artefacts 1***); and another in the southern sector of the survey unit, close to the access track in the cropped paddock (***Moama Sand Quarry Artefacts 2***). A dense artefact scatter was identified close to the current extent of the southern extraction pit (Excavation Site 1) (***Moama Sand Quarry Artefacts 3***) (Map 5). These are described further below. AHIMS registrations are detailed in Table 6.

Moama Sand Quarry Artefacts 1 (AHIMS 59-2-0017)

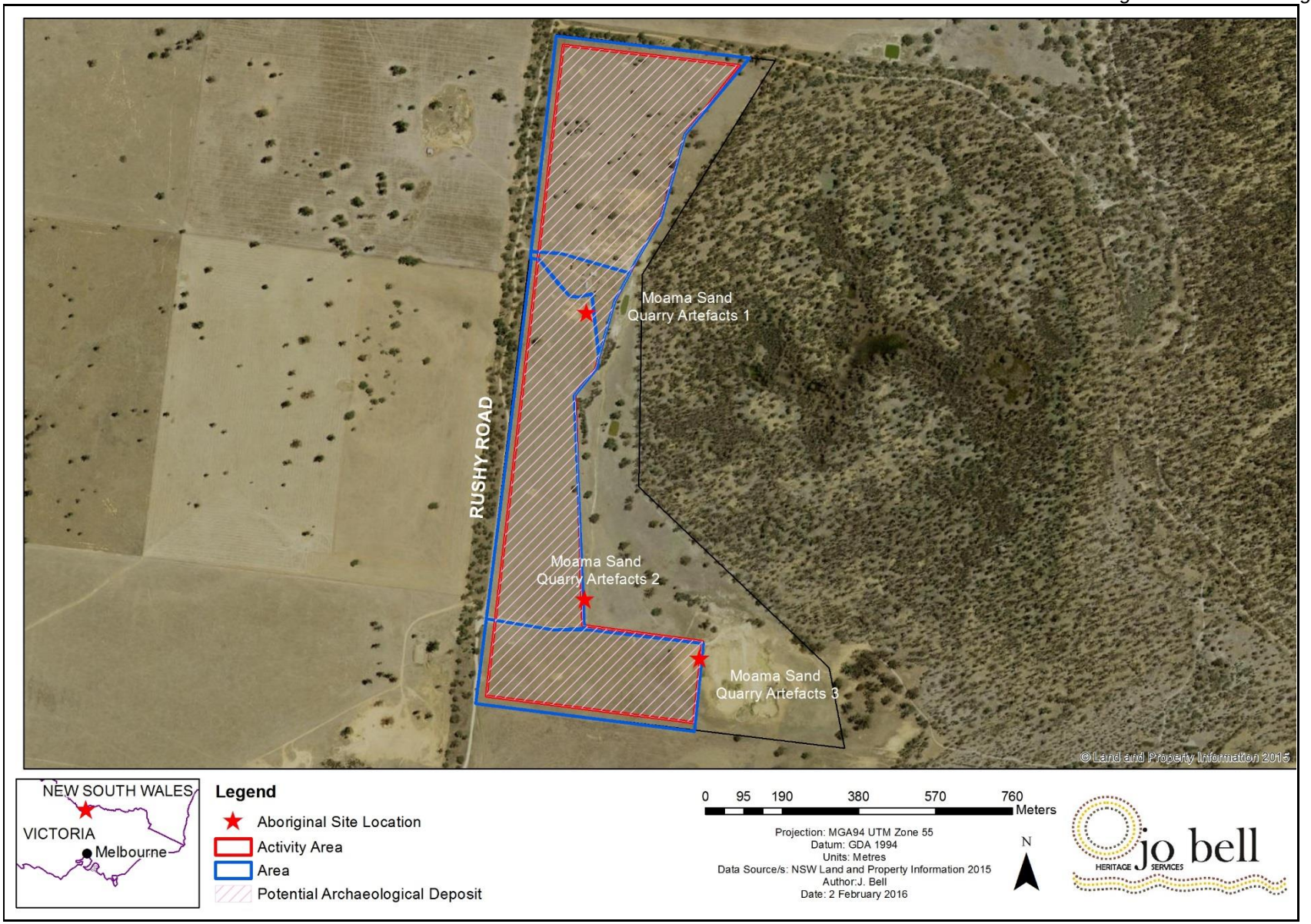
This Aboriginal place is represented by two flaked quartz artefacts; a flake and a core, situated approximately 18m apart in a ploughed paddock. The artefacts were found towards the top of a dune at an elevation of 106.826m (AHD). The place does not represent an *in situ* deposit (Figure 9; Plate 5). Artefact analysis is provided in Appendix 3.

Plate 5: Context of *Moama Sand Quarry Artefacts 1* in Area 2 (Photo: J.Bell 7/1/16)

Moama Sand Quarry Artefacts 2 (AHIMS 59-2-0018)

This Aboriginal place is represented by a single mudstone axe blank, identified exposed in a ploughed paddock near an access track at an elevation of 106.275m (AHD). The artefact does not represent an *in situ* deposit (Figure 10; Plate 6). Artefact analysis is provided in Appendix 3.

Plate 6: *Moama Sand Quarry Artefacts 2* (Photo: J.Bell 7/1/16)



Map 5: Location of sites and PADs in the Activity Area

Table 6: Results – Sites Identified during the Survey

Site Number	***Feature(s)***	***Survey Unit***	***Landform***
Moama Sand Quarry Artefacts 1 (AHIMS 59-2-0017)	Artefact Scatter	Area 2	Sand sheet
Moama Sand Quarry Artefacts 2 (AHIMS 59-2-0018)	Artefact Scatter	Area 2	Sand sheet
Moama Sand Quarry Artefacts 3 (AHIMS 59-2-0019)	Artefact Scatter	Area 1	Sand dune

Figure 9: Context of Moama Sand Quarry Artefacts 1 (AHIMS 59-2-0017)

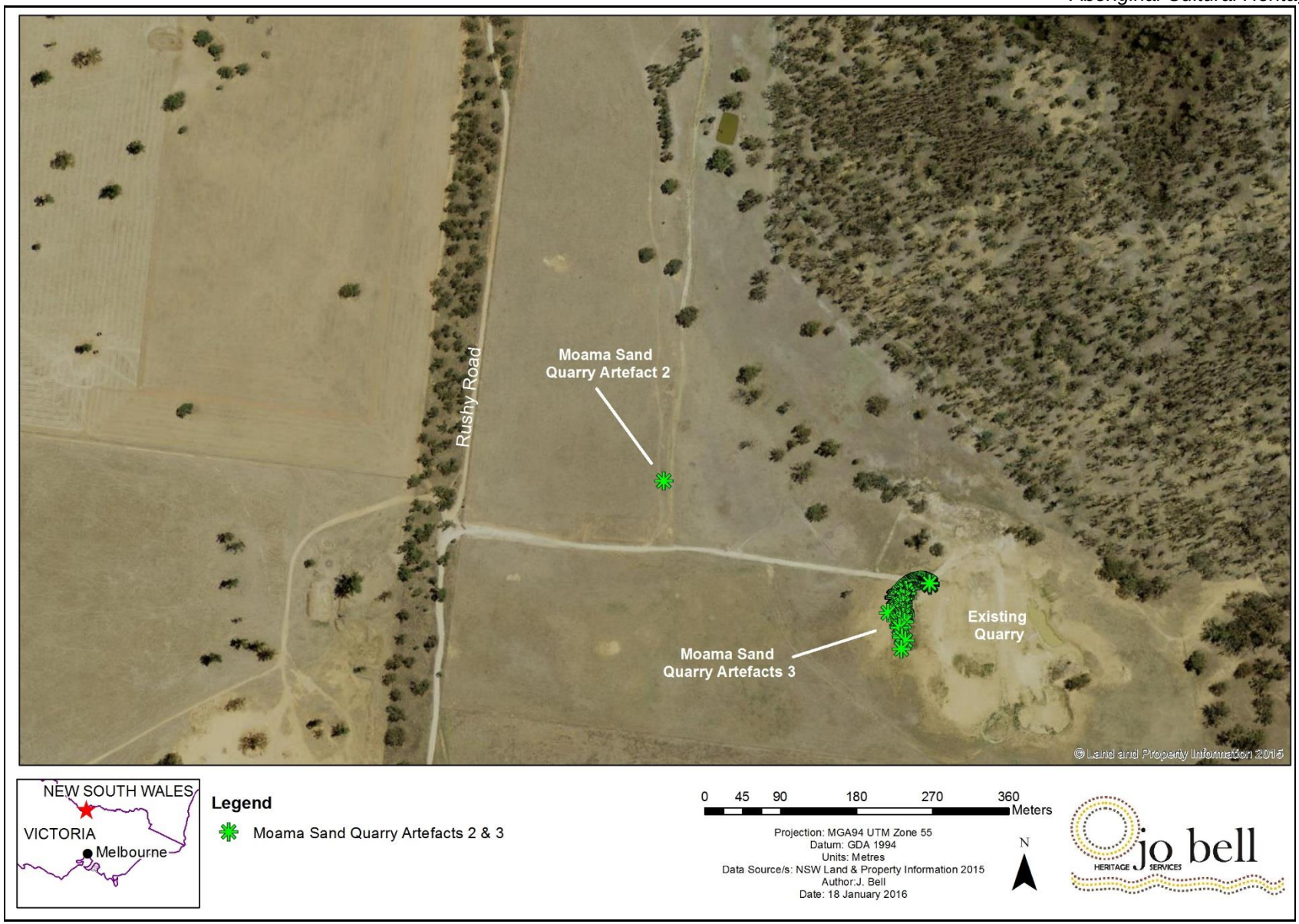


Figure 10: Context of Moama Sand Quarry Artefacts 2 (AHIMS 59-2-0018) and 3 (AHIMS 59-2-0019)

Moama Sand Quarry Artefacts 3 (AHIMS 59-2-0019)

This Aboriginal place is represented by a scatter of stone artefacts exposed in disturbed sand on the edge of the existing extraction pit in the southern sector of the property (see Figure 10; Plates 7-8). The topsoil has been scalped and stockpiled as part of the extraction process. The exposed cultural heritage lies at an elevation of between 99.5m and 100.6m (AHD). Artefacts were identified exposed in the wall of the extraction pit as well as on top of the as yet unexcavated portion. A sample of the artefactual material was analysed (see Appendix 3), and included smoky quartz, crystal quartz, rose quartz, milky quartz, quartzite and silcrete. Artefact types included complete flakes, broken flakes, angular fragments and cores. Charcoal was also identified embedded in the exposed and crusted B-horizon. Its origin or significance could not be determined without excavation.

Plate 7: Context of surface exposure associated with *Moama Sand Quarry Artefacts 3* in Area 1, facing 170º (Photo: J.Bell 7/1/16)

Plate 5: Sample of stone artefacts from *Moama Sand Quarry Artefacts 3* (Photo: J.Bell 7/1/16)

Potential Archaeological Deposits (PADs)

The activity area comprises a sector of sand dunes associated with the Cadell Fault to the west, overlooking a wetland area to the east. Similar dune landforms in the area, both to the west and east, have been shown to contain ancestral remains, shell midden, mound and hearth material, artefact scatters and scarred trees. Dating of shell and charcoal indicate an age of approximately 1,100 years BP.

Geotechnical testing has identified 'dune sand' in the south of the activity area (Area 1) and other sand deposits within Areas 1-3. On this basis, the entire activity area must be identified as a PAD as these areas are likely to contain Aboriginal cultural heritage (see Map 5).

4.3 Oral History

No oral history about the activity area was provided during the field assessment or meetings.

4.4 Analysis & Discussion

In accordance with the site prediction model for the region, three stone artefact scatters were identified within the activity area. Additionally, the sand deposits of the activity area were also considered by all team members as representing potential archaeological deposits. Despite ploughing and cropping, the geomorphology of the area suggests that these landforms most likely have not been significantly disturbed.

During the meeting on 18 March 2016, John Kerr stated that he believed it was likely that the artefacts from the two northern-most sites (Moama Sand Quarry Artefacts 1-2) originated from the southern-most site (Moama Sand Quarry Artefacts 3), which is the large *in situ* deposit, located between the sandy rise and the wetland. He also indicated that he felt that the southern area was much more sensitive than the northern area, a point of view which was reiterated by both Brett Hamilton and Wade Morgan.

4.5 Summary

In summary, the entire activity area was walked by the survey team in linear transects. The activity area comprises an extensive sand sheet associated with the Barmah Sand hills. Ground surface visibility was variable across the study area. Three Aboriginal sites were identified during the assessment, all artefact scatters. The activity area as a whole has been identified as a potential archaeological deposit.

5.0 SIGNIFICANCE ASSESSMENT

Cultural significance is a concept which assists in estimating the value of places. Places that are likely to be of significance are those which aid in the understanding of the past or enrich the present, and which will be of value to future generations.

In the Burra Charter (Australia ICOMOS 1999), cultural significance means "aesthetic, historic, scientific or social value for past, present or future generations".

Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria may include consideration of the form, scale, colour, texture and material of the fabric; the smells and sounds associated with the place and its use.

Historic value encompasses the history of aesthetics, science and society, and therefore to a large extent underlies all of the terms set out in this section.

A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives *in situ*, or where the settings are substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of subsequent treatment.

Social value embraces the qualities for which a place has become a focus of spiritual, political, national or other cultural sentiment to a majority or minority group.

The scientific or research value of a place will depend upon the importance of the data involved, on its rarity, quality or representativeness, and on the degree to which the place may contribute further substantial information.

Scientific value assesses research potential and representativeness which has been developed by Bowdler (1984) and complements the assessment of scientific value as described by Australia ICOMOS (1999). Research potential is defined by the *contents* and *condition* of an archaeological site. Representativeness is defined by the frequency with which a particular site type occurs within a particular region or group of related landforms. The methodology developed by Bowdler (1984) assesses whether a site is of common, occasional or rare occurrence within a region.

In 2001, Australia ICOMOS adopted a Statement on Indigenous Cultural Heritage which recognises among other things that

- Indigenous cultural perspectives require an integrated view of heritage which includes social significance and natural features and landscapes, which are given meaning through culture; and that
- The Indigenous cultural heritage significance of places can only be determined by the Indigenous communities themselves.

An assessment of the social, aesthetic, historic and scientific significance of the sites identified in the activity area is presented below. Further investigation (sub surface testing) may identify additional sites, which will also require significance assessment prior to the preparation of an AHIP application (if required).

The significance assessment of each Aboriginal site was discussed in depth at the meeting held on 18 March 2016. The results are as follows.

5.1 Moama Sand Quarry Artefacts 1 (AHIMS 59-2-0017)

This Aboriginal site is represented by two flaked quartz artefacts, identified in a disturbed context (see Section 4.2.1).

In terms of aesthetic, social and historic significance, John Kerr stated that the Aboriginal site was of low cultural significance because the paddock had essentially been cleared and ploughed, only two artefacts were identified and neither were *in situ*. Brett Hamilton and Wade Morgan concurred that the site was of low significance.

In terms of scientific significance, the site is represented by a limited number and range of cultural materials, which are not in their original context. The site type is also known to commonly occur within the landscape units being assessed. It is assessed as having low scientific significance.

5.2 Moama Sand Quarry Artefacts 2 (AHIMS 59-2-0018)

This Aboriginal site is represented by a single mudstone axe blank, identified exposed in a ploughed paddock near an access track and is not *in situ* (see Section 4.2.1).

Similarly, John Kerr, Brett Hamilton and Wade Morgan all indicated that this Aboriginal site was of low cultural significance in terms of aesthetic, social and historic values given its location.

In terms of scientific significance, the site is represented by a limited number and range of cultural materials, which are not in their original context. However, the axe blank does provide evidence of the manufacturing process of ground-edge axes. The site type is known to commonly occur within the landscape units being assessed. It is assessed as having low scientific significance.

5.3 Moama Sand Quarry Artefacts 3 (AHIMS 59-2-0019)

This Aboriginal site is represented by a scatter of stone artefacts exposed in disturbed sand on the edge of the existing extraction pit in the southern sector of the property (see Section 4.2.1).

Following discussion, John Kerr stated that since charcoal and artefacts were found embedded in the deposit, the landscape below the scalped area was in fact relatively intact. It was also a relatively sheltered area and likely to be a campsite due to the artefact density. Brett Hamilton agreed that it was more likely to be *in situ* given its location between the hill and the wetland area. John Kerr added that the campsite was probably directly related to the use of the wetland, a point which was reiterated by Wade Morgan. All RAP representatives agreed that this site was of high cultural significance in relation to aesthetic, social and historic values.

In terms of scientific significance, the site is represented by a large and diverse range of cultural materials and artefacts. It is also largely intact with material still embedded in the deposit although slumping of sand in the excavated wall made an assessment of any potential stratification impossible. Whilst further investigation is needed to investigate and interpret the site fully, intact deposits such as this are not common in the area, having been either destroyed through extraction activities or not yet uncovered. It is assessed as having high scientific significance.

6.0 IMPACT ASSESSMENT

In terms of the proposed activity, sand extraction will require the removal or disturbance (in the case of the stockpiling of overburden material) of all deposit within the identified sand extraction areas on the property. The depth to which the activity will impact the underlying sub-strata will depend on the depth at which the underlying sand resources are found, and the depth to which the sand deposit will be extracted.

The activity therefore is likely to impact on any Aboriginal cultural heritage that may be identified within the activity area. Based on geomorphological studies, it appears that the Cadell Fault uplift, which resulted in the creation of the palaeo Lake Kanyapella, occurred at around 25-30,000 years ago, with the lunette associated with Little Kanyapella on the dry Kanyapella lake floor dating to 18.9+/-1.1Kya (Stone 2006, cited in McPherson 2012:9). Aboriginal occupation of this newly modified landscape that we know today as the Barmah Sand Hills, is likely to contain Aboriginal cultural heritage that may date to beyond the last glacial maximum. However previous investigations suggest that evidence of occupation prior to the last glacial maximum may be sporadic and/or comprise low density distributions.

The impact of the activity on known sites and areas of archaeological potential in the activity area is summarised in Table 7.

The proponent has determined that harm to the artefact scatters (*Moama Sand Quarry Artefacts 1-3*) located within the activity area can be avoided by amending the location of the extraction footprint accordingly. Stage 1 (fine sand extraction) has now been reduced to approximately 1ha, situated in the southwest corner of the property. Stage 2 (coarse sand extraction) has now been reduced to approximately 1ha, situated in the northern area, north of and adjacent to, the existing pit.

The proponent has determined that harm to the entire PAD in the activity area cannot be avoided since the nature of the extraction activity is to remove sand.

Moama Sand Quarry Artefacts 1 is not situated within an area that has been identified for sand extraction and will not be harmed by proposed extraction activities.

Moama Sand Quarry Artefacts 2 is not situated within an area that has been identified for sand extraction and will not be harmed by proposed extraction activities.

Moama Sand Quarry Artefacts 3 is no longer situated within an area that has been identified for sand extraction. Once the Aboriginal site was identified, the proponents fenced it off to prevent any further and undue harm to the site. It will not be harmed by proposed extraction activities.

The site extents of Aboriginal places, Moama Sand Quarry Artefacts 1-3, and the location of the PAD in relation to the preliminary concept plan are shown in Figure 11.

The site extents of the identified Aboriginal sites and the location of the PAD in relation to the updated proposed extraction areas are shown in Figure 12.

Table 7: Impact Assessment

Site Number	***Type of Harm***	***Degree of Harm***	***Consequence of Harm***
Moama Sand Quarry Artefacts 1	None	None	No loss of value
Moama Sand Quarry Artefacts 2	None	None	No loss of value
Moama Sand Quarry Artefacts 3	None	None	No loss of value
PAD	Direct	Partial	Total loss of value within extraction footprint

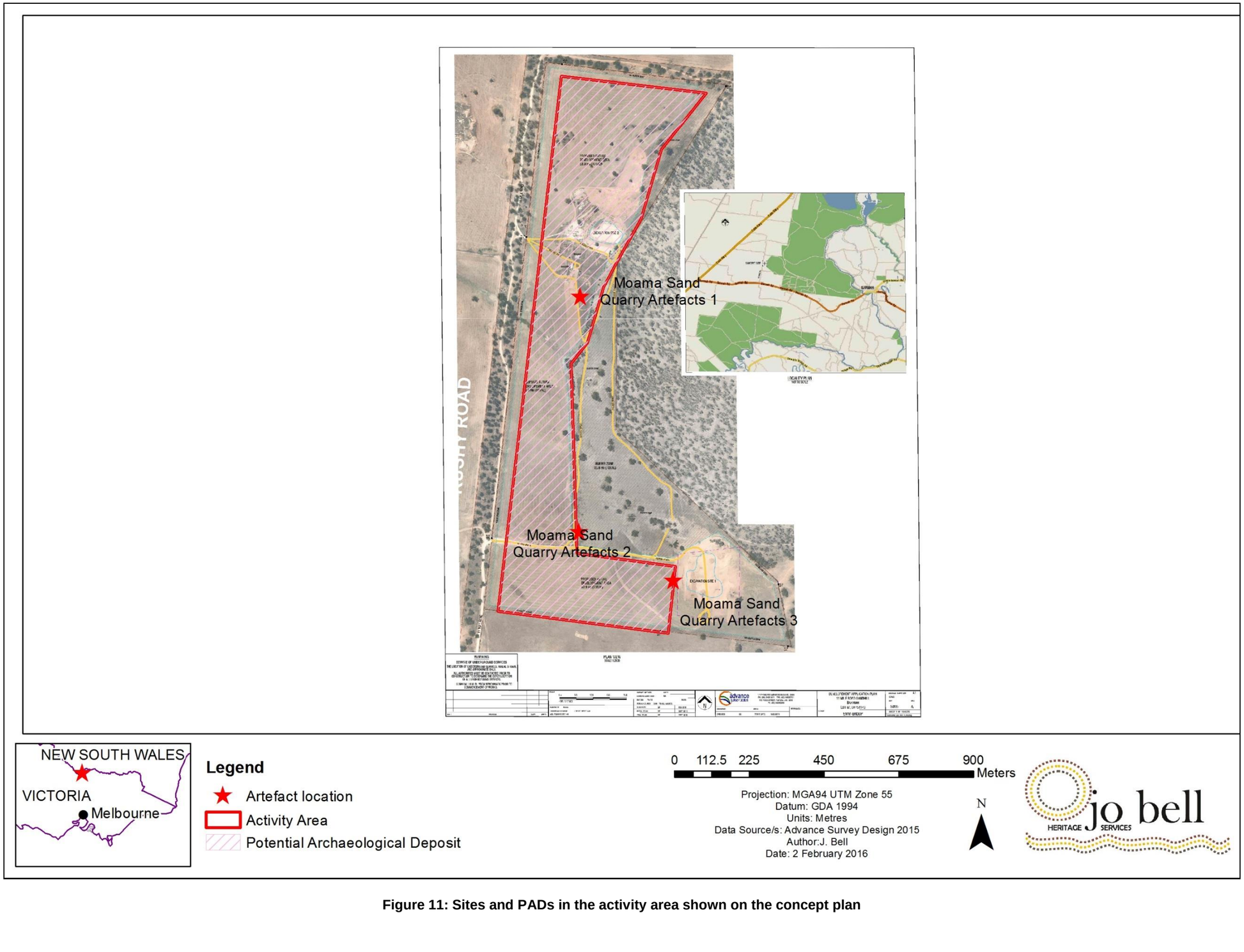


Figure 11: Sites and PADs in the activity area shown on the concept plan

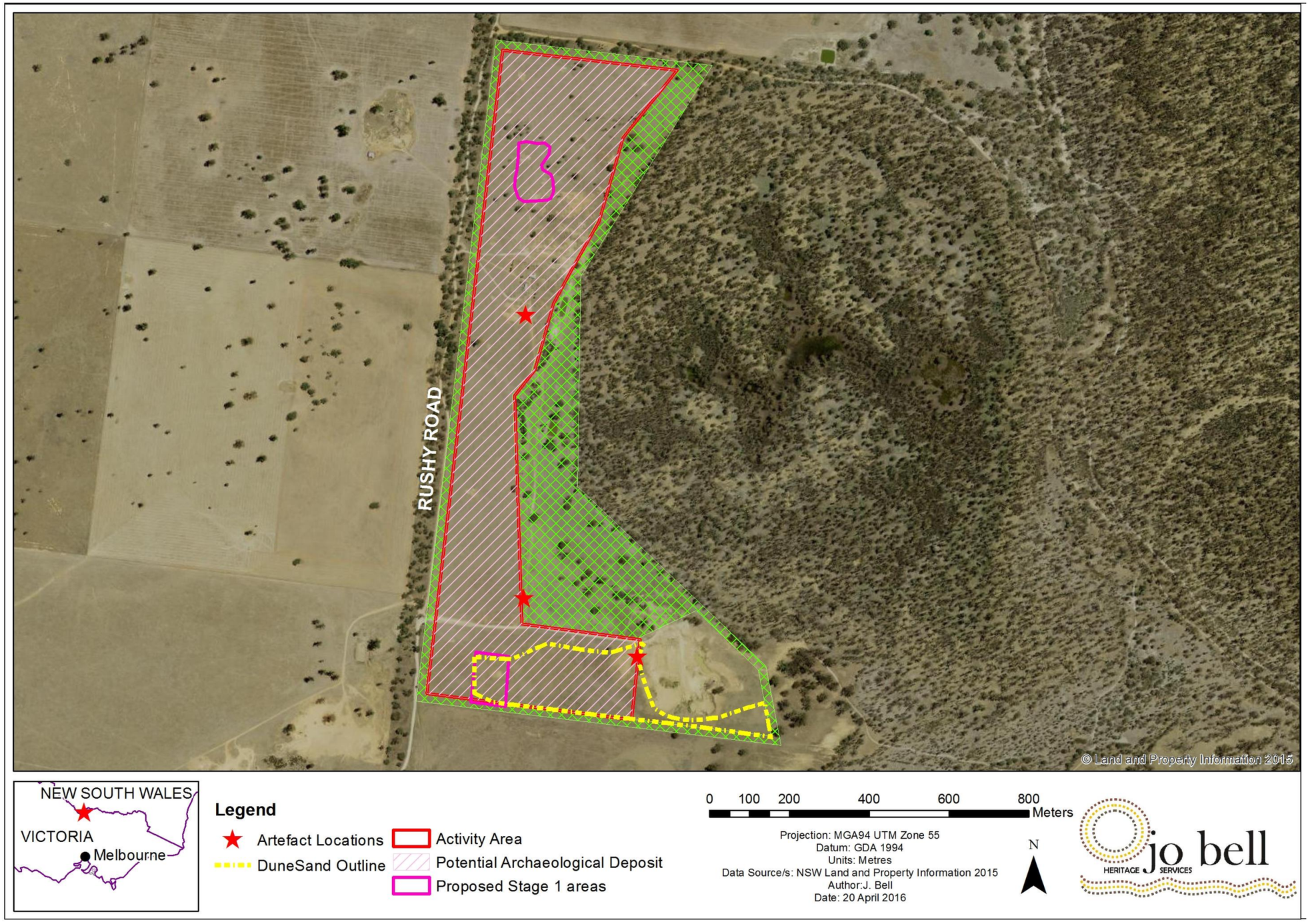


Figure 12: Sites and PADs in the activity area shown in relation to the updated proposed extraction area to avoid harm

7.0 MANAGEMENT & MITIGATION MEASURES

The artefact scatters (*Moama Sand Quarry Artefacts 1-3*) identified during the site inspection are no longer located within the impact zone of the activity. Whilst Moama Sand Quarry Artefacts 1-2 are isolated and not *in situ*, the nature and extent of Moama Sand Quarry Artefacts 3 is as yet unknown. However, the exposed portion has been fenced for protection and the proposed extraction area has been moved to avoid the area entirely.

A portion of the PAD identified during the site inspection is located within the impact zone of the activity, therefore further investigation (sub surface testing) is required so that these areas may be properly managed. Recommendations for these areas are set out in Section 8.

Aboriginal sites in NSW are primarily protected under the *National Parks and Wildlife Act* 1974. To prevent accidental harm to the artefact scatters (*Moama Sand Quarry Artefacts 1-3*) and the PAD in the activity area during the activity, recommendations to prevent harm are set out in Section 8.

In the event that Aboriginal objects are found during the conduct of the activity outside of the site extents and within the PAD areas, contingency measures are set out in Section 9. The contingency measures set out the proponent's requirements in the event that Aboriginal objects are identified during the conduct of the activity.

8.0 RECOMMENDATIONS

Following the desktop and field assessment, the following recommendations are made:

8.1 Moama Sand Quarry Artefacts 1 (AHIMS No 59-2-0017)

1. Extraction activities will not impact on this Aboriginal site. The site will not be harmed by the activity.
2. However, should any ancillary works or other activities including cropping or grazing be undertaken by the proponent within 50m of this site, then the site must be fenced prior to the commencement of works to protect the Aboriginal cultural heritage from harm.
3. Should any ancillary works or other activities including cropping or grazing be undertaken by the proponent within 50m of this site and there is potential for harm, then no works must commence in the area until further assessment and an Aboriginal Heritage Impact Permit (AHIP) is obtained from OEH.

8.2 Moama Sand Quarry Artefacts 2 (AHIMS No 59-2-0018)

1. Extraction activities will not impact on this Aboriginal site. The site will not be harmed by the activity.
2. However, should any ancillary works or other activities including cropping or grazing be undertaken by the proponent within 50m of this site, then the site must be fenced prior to the commencement of works to protect the Aboriginal cultural heritage from harm.
3. Should any ancillary works or other activities including cropping or grazing be undertaken by the proponent within 50m of this site and there is potential for

harm, then no works must commence in the area until further assessment and an AHIP is obtained from OEH.

8.3 Extraction Activities Cannot Commence near Moama Sand Quarry Artefacts 3 (AHIMS No 59-2-0019)

1. Proposed extraction activities will no longer impact on this Aboriginal site. The site will not be harmed by the proposed activity.
2. However, should any ancillary works or other activities including cropping or grazing be undertaken by the proponent within 50m of this site (including the spoil from initial scalping of the area), then the site must be fenced prior to the commencement of works to protect the Aboriginal cultural heritage from harm.
3. Should any ancillary works or other activities including cropping or grazing be undertaken by the proponent within 50m of this site (including the spoil from initial scalping of the area), an AHIP must be obtained from OEH before any works can commence.

8.4 Further Assessment is Required in PAD areas

1. The entire sand sheet within the property has been identified as an area of cultural heritage sensitivity (potential archaeological deposit). However, the proponent has reduced the extent of potential harm by limiting the extraction footprint to approximately 1ha both in the southern and in the northern areas (see Figure 12). As harm cannot be totally avoided in the identified PAD, ***further assessment is required*** to investigate the actual potential for Aboriginal cultural heritage to be located within the proposed activity footprint. This work must be undertaken prior to commencement of works.

2. Further investigation must include a program of sub-surface testing but may also include the use of ground penetrating radar (GPR) as suggested by John Kerr (Moama LALC) on-site and discussed during the recommendations meeting held on 18 March 2016. The further investigation options and proposed sampling methodology must be discussed with representatives from the RAPs, OEH and the proponent.

9.0 CONTINGENCY PLANS

Aboriginal sites in NSW are primarily protected under the *National Parks and Wildlife Act* 1974*.* In the event that Aboriginal objects are found during the conduct of the activity, contingency measures are set out below. The contingency measures set out the proponent's requirements in the event that Aboriginal objects are identified during the conduct of the activity.

9.1 Management and Notification of Aboriginal Objects found during the Activity

The NPW Act requires that, if a person finds an Aboriginal object on land and the object is not already recorded on AHIMS, they are legally bound under s.89A of the NPW Act to notify DECCW of the object's location, as soon as possible.

In the event that new Aboriginal objects are found during the conduct of the activity, then the following must occur:

- The person who discovers Aboriginal object/s during the activity will immediately notify the person in charge of the activity;
- The person in charge of the activity must then suspend any relevant works at the location of the discovery and within 5m of the relevant site boundary;
- In order to prevent any further disturbance, the location will be isolated by safety webbing or an equivalent barrier and works may recommence outside the area of exclusion;
- The person in charge of the activity must contact a cultural heritage advisor/ archaeologist within 48hrs;
- The cultural heritage advisor/ archaeologist must contact the OEH Regional Aboriginal Heritage Division (Southern Region);
- Within a reasonable period, a decision/ recommendation will be made by the cultural heritage advisor/ archaeologist in consultation with the relevant Aboriginal stakeholder group(s) and OEH as to the process to be followed to manage the Aboriginal object/s in a culturally appropriate manner, and how to proceed with the works;
- Options for management may include:
    - Recording the site and submitting the relevant forms to the AHIMS Registrar;
    - Developing a strategy to avoid harm to the site; and/ or
    - If avoiding harm is not possible, further investigation, an impact assessment and an AHIP may be required.
- A separate contingency plan has been developed in the event that suspected human remains are discovered during the conduct of the activity.

9.1.1 Protocols for handling sensitive information

Aboriginal cultural heritage encompasses all aspects of Aboriginal culture, including tangible evidence such as stone artefacts, shell middens and ancestral remains, intangible evidence such as oral histories and song lines as well as living culture. While not all aspects of Aboriginal culture is considered sensitive, especially evidence of activities of daily living, there are some aspects that may relate to ceremony, ritual or ancestral remains that are of a particularly sensitive nature. Culturally-sensitive information is inherently bound up with cultural significance. 'If we accept that cultural significance is not an inherent quality of a place, but a social outcome resulting from people's interactions with a place, then the community itself must be the most important source of significance' (Burke & Smith 2004:245).

In the event that further Aboriginal cultural material is identified *during the conduct of the activity*, the cultural heritage advisor must ensure that any investigations undertaken in relation to the Aboriginal objects are carried out in a culturally-sensitive manner, which may include limiting access to the objects during investigations and further advising the proponent/ contractors/ employees of their obligations in relation to the culturally-sensitive nature of the heritage and their obligations in relation to the relevant legislation.

9.2 Notification of the Discovery of Skeletal Remains during the carrying out of the Activity

1. Discovery:
   - If suspected human remains are discovered, all activity in the vicinity must ***stop*** to ensure minimal damage is caused to the remains, and,
   - The remains must be left in place, and protected from unauthorised access and harm or damage.

2. Notification:
   - Once suspected human skeletal remains have been found, New South Wales Police (use the local number) must be notified immediately;
   - If there is reasonable grounds to believe that the remains could be Aboriginal, the NPWS Head Office must be immediately notified on (02) 9585 6444 or contact the Aboriginal Heritage Officer at the Heritage Branch on (02) 9873 8500 for further advice;
   - All details of the location and nature of the human remains must be provided to the relevant authorities; and
   - The remains should also be reported to the relevant Traditional Owners.

10.0 REFERENCES

Texts and Reports

Australia ICOMOS 1999
The Burra Charter.

Australia ICOMOS 2001
Statement on Indigenous Cultural Heritage.

Bell Cochrane & Associates 2015
Construction Sand Investigations and Resource Estimates, EMM Group Pty. Barmah Sand Pit. Report to EMM Group P/L.

Bonhomme, T. 1990
An Archaeological Survey of the Barmah Forest. Report to the Victoria Archaeological Survey (VAS) and Department of Conservation and Environment (Victoria).

Bowdler, S.
'Archaeological significance as a mutable quality' In Sullivan, S & S. Bowdler (eds) *Site Survey and Significance Assessment in Australian Archaeology*. ANU: Canberra.

Bowler, J.M. 1978
Quaternary climate and tectonics in the evolution of the Riverine Plain, South-Eastern Australia. In J.L. Davies and M.A.J. Williams (eds) *Landform evolution in Australia* 1978:70-112. ANU Press: Canberra.

Burke, H. & C. Smith 2004
The Archaeologist's Field Handbook. Allen & Unwin: Crows Nest.

Cochrane, G.W.; G.W. Quick & D. Spencer-Jones (eds) 1995
Introducing Victorian Geology. Geological Society of Australia (Victorian Division): Melbourne.

Craib, J. 1991
Archaeological Survey in the Moira-Millewa State Forests. Report for NPWS.

Department of Environment, Climate Change and Water (DECCW) 2010a
Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010. NSW Department of Environment, Climate Change and Water: Sydney.

Department of Environment, Climate Change and Water (DECCW) 2010b
The Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales. NSW Department of Environment, Climate Change and Water: Sydney.

Department of the Environment and Water Resources (DEWR) 2007
Australia's Native Vegetation: A Summary of Australia's Major Vegetation Groups, 2007. Australian Government: Canberra.

Eardley, K.A. 1999
A Foundation for Conservation in the Riverina Bioregion. Unpublished Report. NSW National Parks and Wildlife Service, Hurstville. Cited in NSW NPWS 2003 *The Bioregions of New South Wales: Their Biodiversity, Conservation and History*.

Edmonds, V. 1990
An Archaeological Survey of the Proposed Echuca-Moama RSL and Citizen's Club Site, Moama, NSW. Report prepared for Echuca-Moama RSL and Citizen's Club Ltd.

Hamilton, S. *in prep.*
Flora and Fauna Assessment Report, Moama Sand Quarry (EAR ID No. 962). Report for EMM Group Pty. Ltd. Hamilton Environmental Services.

Howitt, A.W. 1996
The Native Tribes of South-East Australia. Aboriginal Studies Press: Canberra.

Lance, A 1985
An Archaeological Investigation of the Algeboia Shell Midden in the Moira State Forest, Murray Valley, NSW. A report to the Forestry Commission of NSW. ACT Archaeological Consultancies: Canberra.

Lance, A & S.G. Webb 1985
An Archaeological Investigation of a sand dune on the Murray River at Moama, NSW. A report to National Parks and Wildlife Service, NSW. ANU Archaeological Consultancies: Canberra.

Lloyd, A. 1993
Archaeological Survey of Proposed Moama Sewerage Treatment Works, Moama, NSW. Report to Moama Shire Council.

McPherson, A.; D. Clark; M. Cupper; C.D.N. Collins and G. Nelson 2012
'The Cadell Fault: a record of long-term fault behaviour in south-eastern Australia'. Australian Regolith and Clays Conference Mildura 7-10 February 2012.

Navin Officer Heritage Consultants 2009
Deniliquin to Moama 132kV Transmission Line Route. Aboriginal and Historical Archaeological Assessment. Report to Sinclair Knight Merz.

NSW National Parks and Wildlife Service (NPWS) 2003
The Bioregions of New South Wales: Their Biodiversity, Conservation and History. NSW National Parks and Wildlife Service: Hurstville.

Office of Environment and Heritage (OEH) 2011
Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW. Office of Environment and Heritage, NSW Department of Premier and Cabinet: Sydney.

Pels, S. 1966
Late Quaternary chronology of the Riverine Plains of south-eastern Australia. *Journal of Geological Society, Australia* 13:27-40.

Stern, H.; de Hoedt, G & Ernst, J. 2000
Objective Classification of Australian Climates. Bureau of Meteorology: Melbourne. Cited in NSW NPWS 2003 *The Bioregions of New South Wales: Their Biodiversity, Conservation and History*.

Stone, T. 1999
An Archaeological Survey of the Corridor of a Proposed Levee Bank near Moama, NSW. Report to Sinclair Knight Merz.

Stone, T. 2006
Late Quaternary Rivers and Lakes of the Cadell Tilt Block Region, Murray Basin, Southeastern Australia. Unpublished PhD Thesis. The University of Melbourne: Melbourne.

Tindale, N.B. 1974
Aboriginal Tribes of Australia. ANU Press: Canberra.

Legislation - New South Wales

Aboriginal Land Rights Act 1983
Environmental Planning and Assessment Act 1979
Environmental Planning and Assessment Regulations 2000
Heritage Act 1977
National Parks and Wildlife Act 1974
National Parks and Wildlife Regulations 2009
Native Title Act 1994

Legislation - Commonwealth

Aboriginal and Torres Strait Islander Heritage Protection Act 1984
Environment Protection and Biodiversity Conservation Act 1999
Native Title Act 1993

Satellite Imagery – Google Earth

NSW Globe (NSW Land and Property Information)

Historic Plans (NSW Land and Property Information)

- Parish of Bama, County of Cadell, 1914
- Parish of Bama, County of Cadell, 1928
- Parish of Bama, County of Cadell, no date

Aerial Photographs (NSW Land and Property Information)

- 1961 Aerial: Echuca Run 1 1082 5/46

- 1996 Aerial: Echuca 1:50000 NSW4341 M2012) Run 1 83-93
  12-12-96 7738m ASL

11.0 APPENDICES

Appendix 1: Qualifications of Cultural Heritage Advisor

Joanne Bell
Director
Jo Bell Heritage Services Pty. Ltd.

Qualifications:
BA (Hons) Archaeology, La Trobe University, Bundoora, 2000
Cert. IV Training and Assessment, ECEC 2006

Joanne is qualified in Indigenous Australian prehistory and non-Indigenous historic archaeology. She has more than fifteen years professional experience in heritage management, including development and research projects. Fields of research include Australian Indigenous archaeology, Australian historic archaeology, stone artefact analysis, cultural heritage management and heritage training.

Ashley Edwards
Project Archaeologist
Jo Bell Heritage Services Pty. Ltd.

Qualifications:
Master of Arts (Archaeology), University of New England, Armidale, 2010
BArch (Hons), La Trobe University, Bundoora, 2006

Ashley is qualified in Indigenous Australian prehistory and non-Indigenous historic archaeology. She has more than nine years' professional experience in heritage management, including development and research projects. Fields of experience include Australian Indigenous archaeology, Australian historic archaeology, stone artefact analysis and cultural heritage management.

Bridget Grinter
Project Archaeologist
Jo Bell Heritage Services Pty. Ltd.

Qualifications:
BA (Hons) Archaeology, La Trobe University, Bundoora 2008

Bridget is qualified in Indigenous Australian prehistory and non-Indigenous historic archaeology. She has more than six years' experience in the industry including survey, background research, artefact analysis and cultural heritage management.

Appendix 2: Documentation of Consultation

Consultation Record

Date	From	To	Description	Method	Notes
22 October 2015	Jo Bell (JBHS)	Moama LALC; Murray Shire Council; Murray CMA; NNTT, NTSCorp; OEH EPRG; ALR Registrar.	Letter requesting information in relation to any relevant Aboriginal people.	Letter	
27 October 2015	Joe Day, Moama LALC	Jo Bell	Response to initial letter.	Phone call	Message left
29 October 2015	Jo Bell	Joe Day, Moama LALC	Returning call.	Phone call	Joe indicated that MLALC would like to be involved and suggested that YYNAC should also be notified. He would also contact them and let them know
4 November 2015	ALR Registrar	Jo Bell	Response to initial letter.	Letter	No Registered Aboriginal owners. Suggested contacting the Moama LALC
6 November 2015	Peter Ewin (OEH)	Jo Bell	Response to request for information about relevant parties	Email / Letter	OEH provided a list of Aboriginal parties who may have an interest in the area, including Moama LALC; Deniliquin LALC; Bangerang Aboriginal Corporation; Yorta

Date	From	To	Description	Method	Notes
					Yorta Nation Aboriginal Corporation; Yarkuwa indigenous Knowledge Centre; Cummeragunga LALC; and Wakool Aboriginal Corporation
10 November 2015	Simon Arkinstall Director Environmental Services, Murray Shire	Jo Bell	Response to request for information about relevant parties	Letter	Suggested contacting Cummeragunja Land Council
10 November 2015	Sylvia Jagtman Senior Case Management Assistant, NNTT	Jo Bell	Response to request for information about relevant parties		No Native Title claims or Land Use Agreements for the activity area.
10 November 2015	Ashley Edwards (JBHS)	Riverine Herald	EOI Advertisement in Riverine Herald to go in tomorrow	Email	Deadline for responses 27 November 2015
19 November 2015	Vicki Atkinson (BAC)	Jo Bell Heritage Services (Bridget Grinter)	Vicki enquired into the EOI as she had not seen it. Asked for a copy to be emailed to her.	Phone	
19 November 2015	Bridget Grinter (JBHS)	Vicki Atkinson	EOI emailed to Vicki	Email	
24 November 2015	Vicki Atkinson	Jo Bell	Letter response to EOI indicating that they would like to be involved	Letter via Email	
25 November 2015	Jo Bell	Vicki Atkinson (BAC)	Thank you for the response. We will put her on the RAP register and contact her next week	Email	
27 November 2015	Wade Morgan (YYNAC)	Jo Bell	Letter response to EOI indicating that YYNAC would like to be involved	Letter via email	Letter has no date

Date	From	To	Description	Method	Notes
30 November 2015	Bridget Grinter	Peter Ewin (OEH)	Submission of RAP details	Email	
7 December 2015	Jo Bell	All Registered Aboriginal Parties	Invitation to first meeting to discuss the project, survey methodology and arrange a date for the field assessment	Email	
7 December 2015	Wade Morgan	Jo Bell	Confirmed attendance at inception meeting	Email	
9 December 2015	Bridget Grinter	Joe Day	Chasing up confirmation of attendance	Phone and Email	Confirmed attendance on phone
9 December 2015	Bridget Grinter	Vicki Atkinson	Chasing up confirmation of attendance	Phone and Email	Confirmed attendance on phone
16 December 2015	Bridget Grinter, Steve Hamilton (Hamilton Environmental Services) , Kane Henson (EMM Group)	Wade Morgan &, Tyrone Miller (YYNAC) Brett Hamilton (BAC) John Kerr (MLALC)		Face to Face meeting	Inception meeting held in Echuca with proponent. Arranged for field assessment to be undertaken on 6-7 January 2016.
4 January 2016	Bridget Grinter	All Registered Aboriginal Parties	Confirmed date and time for field assessment	Email	
6-7 January 2016	Bridget Grinter Jo Bell	John Kerr (MLALC) John B. Kerr (MLALC) Michael Bourke (YYNAC) Brett Hamilton (BAC)		Face to Face Field assessment	Carried out surface field assessment of the activity area. On-site discussion. Requested a statement of significance from each group. Will email through some information to assist

Date	From	To	Description	Method	Notes
					with the preparation of this
19 January 2016	Jo Bell	All Registered Aboriginal Parties	Provided maps showing the location of Aboriginal cultural heritage and information about significance assessments in preparation for the next meeting, which will discuss significance, impacts, management recommendations and any further requirements such as sub-surface testing and the AHIP process	Email	
29 February 2016	Jo Bell, Bridget Grinter, Steve Hamilton	OEH, Murray Shire Council, EMM Group		Face to Face on-site meeting	On-site meeting to discuss the proposed activity
26 February 2016	Bridget Grinter	All Registered Aboriginal Parties	Invitation to second meeting (11 March) to discuss the results, cultural significance, management recommendations and further investigations	Email	
3 March 2016	Bridget Grinter	All Registered Aboriginal Parties	Requested a change of date to 18 March 2016	Email	
3 March 2016	Wade Morgan	Bridget Grinter	Confirmation of attendance at meeting	Email	
	Bridget Grinter	Vicki Atkinson			Called a number of times to confirm. No response
17 March 2016	Joe Day	Bridget Grinter	Confirmation of attendance at meeting	Email	

Date	From	To	Description	Method	Notes
18 March 2016	Bridget Grinter, Jo Bell, Steve Hamilton, Kane Henson	Wade Morgan Brett Hamilton John Kerr	Delivered powerpoint on results of the assessment. Discussed cultural significance, impact assessment, avoiding harm, management recommendations and further investigations	Face to Face Meeting	
9 May 2016	Jo Bell	Wade Morgan, Vicki Atkinson, Joe Day	Copy of the draft Assessment report for comment with the request that comments be received by 6 June.	Email	No response

Sample letter sent to initiate consultation

21 October 2015
Our Ref: ARCH624

Peter Ewin
Senior Team Leader - Planning
Office of Environment and Heritage
PO Box 544
Albury NSW 2640

Dear Peter,

Re: Aboriginal Cultural Heritage Assessment for a Sand Quarry Extension at Moama – Notification of Project Proposal and Registration of Interest

Jo Bell Heritage Services Pty. Ltd. (JBHS) has recently been engaged by EMM Group Pty Ltd to undertake the Aboriginal Heritage Assessment component of the EIS being prepared by Steve Hamilton Environmental Consulting for a sand quarry extension at Lot 97 DP751140 (79 Rushy Road), Moama.

The approximate area of the extension is 53.9ha within a property of about 78ha in total. The property is located adjacent to Murray Valley National Park. Two existing sand extraction sites are located on the property, with a plan to extend this to other parts of the property. The subject land lies within the Murray Shire Council municipal boundary.

The proponent is Kane Henson, General Manager, EMM Group Pty Ltd, 26-42 Old Aerodrome Road, Echuca VIC 3564.

In accordance with the Office of Environment and Heritage (OEH, formerly DECCW) publication, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, we request information from you in relation to any relevant Aboriginal people who may hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places that may exist within the activity area.

Should you have any questions in relation to this, please feel free to contact me on 0427 505 335.

Yours sincerely,

Joanne Bell
Director

EOI advertised in Riverine Herald 11/11/2015

Expressions of Interest Invited

EMM Group Pty Ltd (26-42 Old Aerodrome Road, Echuca VIC 3564) proposes to extend the existing sand quarry at Lot 97 DP751140 (on 11 Mile Road or Rushy Road), Moama. The property is located adjacent to the Murray Valley National Park.

Jo Bell Heritage Services P/L has been engaged to undertake an Archaeological and Aboriginal Cultural Heritage Assessment for the proposed project.

Expressions of interest are invited by relevant Aboriginal persons or organisations who may hold cultural knowledge relevant to determining the significance of Aboriginal object(s) and/or place(s) in the area of the proposed project.

The purpose of community consultation with Aboriginal people is to assist the proposed applicant in the preparation of an application for an Aboriginal Heritage Impact Permit (AHIP) (if necessary) and to assist the Director General of the NSW Office of Environment and Heritage (OEH) in consideration and determination of the application.

Aboriginal persons or organisations are invited to register an interest in a process of community consultation with the proposed applicant regarding the proposed activity no later than COB Friday 27 November 2015.

Expressions of Interest may be submitted (in writing) to:
Jo Bell
Jo Bell Heritage Services Pty. Ltd.
PO Box 248
Euroa VIC 3666

Please note that details of all respondents will be provided to OEH and the LALC unless it is specified in the EOI that respondents do not wish their details released.

Appendix 3: Artefact Analysis

AHIMS No.	Depth (mm)	Raw Material	Primary Form	Cortex	Retouch (%)	Platform	Termination	Core scars	Longest Scar (mm)	Formal Tool / Core Type	Length (mm)	Width (mm)	Thick (mm)	Max. Dimension (mm)
MSQ1	0	Quartz	Complete Flake	0	0	Plain	Hinge				16.8	8.2	3.6.	17.7
MSQ1	0	Quartz	Core	0	0			3	23.3	Multidirectional	23.3	17.3	9.4	23.3
MSQ2	0	Mudstone	Cobble	0	100 (dressing)					Axe blank	94.4	73.2	24	103.4
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Axial				10.1	7.6	3.9	13.3
MSQ3	0	Quartz	Proximal Flake	0	0	Plain					12.9	13.7	5.1	19.2
MSQ3	0	Smoky Quartz	Complete Flake	0	0	Crushed	Feather				23.2	15.6	5.6	23.5
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Axial				19.5	11.5	4.4	19.5
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Feather				16.8	6.6	5.6	16.8
MSQ3	0	Quartz	Core	0	0			3	2		22.1	13.8	12	22.1
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Axial				17.2	14.5	6.1	18.5
MSQ3	0	Quartz	Complete Flake	0	0	Crushed	Hinge				24.4	12.7	8.9	25.6
MSQ3	0	Smoky Quartz	Complete Flake	0	0	Plain	Hinge				15.5	7.2	2.8	15.5
MSQ3	0	Quartz	Angular Fragment	0	0						14.5	6.9	5.5	14.5
MSQ3	0	Quartz	Complete Flake	0	0	Crushed	Hinge				19.6	12.3	5	19.7
MSQ3	0	Quartz	Angular Fragment	0	0						14.5	10.3	5.2	14.5
MSQ3	0	Smoky Quartz	Complete Flake	0	0	Plain	Axial				17.7	16.1	9.5	20.4
MSQ3	0	Quartzite	Complete Flake	0	0	Crushed	Feather				27	10	3.9	27

AHIMS No.	Depth (mm)	Raw Material	Primary Form	Cortex	Retouch (%)	Platform	Termination	Core scars	Longest Scar (mm)	Formal Tool / Core Type	Length (mm)	Width (mm)	Thick (mm)	Max. Dimension (mm)
MSQ3	0	Quartz	Angular Fragment	0	0						13.3	8.2	5.3	13.3
MSQ3	0	Quartz	Angular Fragment	0	0						8.4	9.5	3.2	9.5
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Feather				18.9	11.1	4.8	18.9
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Feather				20	7.3	4.8	20
MSQ3	0	Quartz	Complete Flake	0	0	Crushed	Feather				20.1	11.7	3.9	20.9
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Axial				16.3	8.8	6.7	21.1
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Feather				14.6	14.6	4.3	19.5
MSQ3	0	Quartz	Complete Flake	0	0	Crushed	Feather				12.9	15.5	6.4	22.3
MSQ3	0	Smoky Quartz	Complete Flake	0	0	Crushed	Feather				21.6	8.8	6.8	21.6
MSQ3	0	Smoky Quartz	Complete Flake	0	0	Crushed	Feather				15	5.7	3.1	15
MSQ3	0	Quartz	Angular Fragment	0	0						10	4.7	2.7	10
MSQ3	0	Quartz	Angular Fragment	0	0						17.2	8.2	6.5	17.2
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Feather				17	10	2.7	17.8
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Feather				11.6	7.9	1.7	11.6
MSQ3	0	Quartz	Broken Flake	0	0	Crushed					14.1	15.4	4.5	20.1
MSQ3	0	Smoky Quartz	Angular Fragment	0	0						13.5	10.5	5.1	13.5
MSQ3	0	Quartz	Complete Flake	0	0	Crushed	Axial				20.4	7.3	3.3	20.4
MSQ3	0	Quartz	Angular Fragment	0	0						14	8.4	5.4	14

AHIMS No.	Depth (mm)	Raw Material	Primary Form	Cortex	Retouch (%)	Platform	Termination	Core scars	Longest Scar (mm)	Formal Tool / Core Type	Length (mm)	Width (mm)	Thick (mm)	Max. Dimension (mm)
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Feather				17.3	8.8	6.5	17.3
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Axial				19.2	11.3	3	19.2
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Feather				22.7	8.7	7.3	22.7
MSQ3	0	Quartz	Complete Flake	0	0	Crushed	Axial				20	7	5.2	20
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Axial				12.1	9.5	2.2	12.8
MSQ3	0	Quartz	Complete Flake	0	0	Crushed	Hinge				14.6	8.6	3.8	14.6
MSQ3	0	Rose Quartz	Complete Flake	0	0	Plain	Axial				38.7	17.3	7.9	38.7
MSQ3	0	Quartz	Complete Flake	0	0	Plain	Feather				30.4	16.8	7.2	30.4
MSQ3	0	Silcrete	Complete Flake	0	0	Plain	Axial			Core rejuvenation flake	36.9	7.5	6.8	36.9
MSQ3	0	Silcrete	Complete Flake	20	0	Plain	Feather				24.7	16	4.7	27.4
MSQ3	0	Crystal Quartz	Angular Fragment	0	0						19.6	12.2	9.9	19.6
MSQ3	0	Quartz	Proximal Flake	0	0		Feather				24	7	2.4	24
MSQ3	0	Silcrete	Complete Flake	0	0	Plain	Feather				16.6	13.7	3.3	16.6
MSQ3	0	Silcrete	Complete Flake	0	0	Plain	Hinge				27.7	7.6	5.9	27.7
MSQ3	0	Silcrete	Complete Flake	0	0	Plain	Axial				32.4	22.6	8.6	32.5

Appendix 4: RAP Comments on Draft Report

None were received

Appendix 5: Glossary

Activity
The development or use of land

Activity Area
The area or areas to be used or developed for an activity

Archaeology
The study of the past through the systematic recovery and analysis of material culture.

Artefact Scatter
A group of stone artefacts found scattered on the ground surface.

Assemblage
A collection of artefacts that are derived from the same Aboriginal place.

Burial (Human skeletal remains)
Usually represented by a concentration of human bones or teeth. Burials can be associated with charcoal or ochre, shell, animal bone or stone tools. They tend to be located in sandy areas, which were easy to dig or in rock shelters or tree hollows. They are usually exposed through earthworks or erosion.

Earth Feature
Includes mounds, rings, hearths, post holes and ovens.

Excavation
The systematic recovery of archaeological data through the exposure of buried sites and artefacts.

Material Culture
The tangible evidence or cultural remains that are produced by human activity.

Scarred Tree
Trees from which bark has been removed for the manufacture of utilitarian items such as containers, shelter sheets, canoes or medicine.

Shell Midden
A midden is the remains of a meal. In the case of shell middens, marine or freshwater molluscs are the dominant component.