YANCOAL
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Moolarben Coal Project
Stage 1 Optimisation Modification

Environmental Assessment

Prepared for Moolarben Coal Operations Pty Limited | May 2013

Volume 3 – Supporting Appendices

MOOLARBENCOAL
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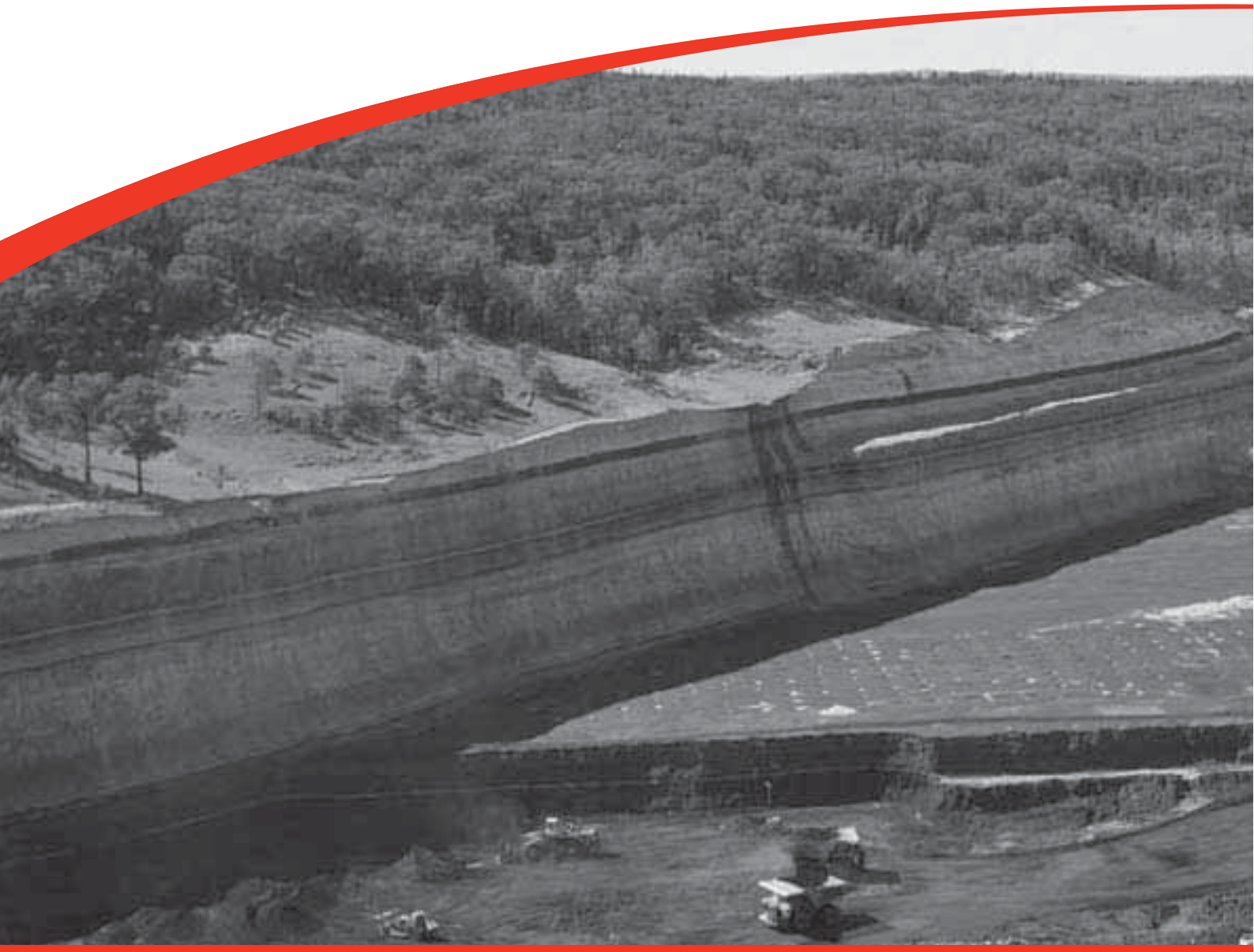
EMM
EMGA Mitchell McLennan

Appendix F – Aboriginal heritage impact assessment
Appendix G – Historic heritage impact assessment



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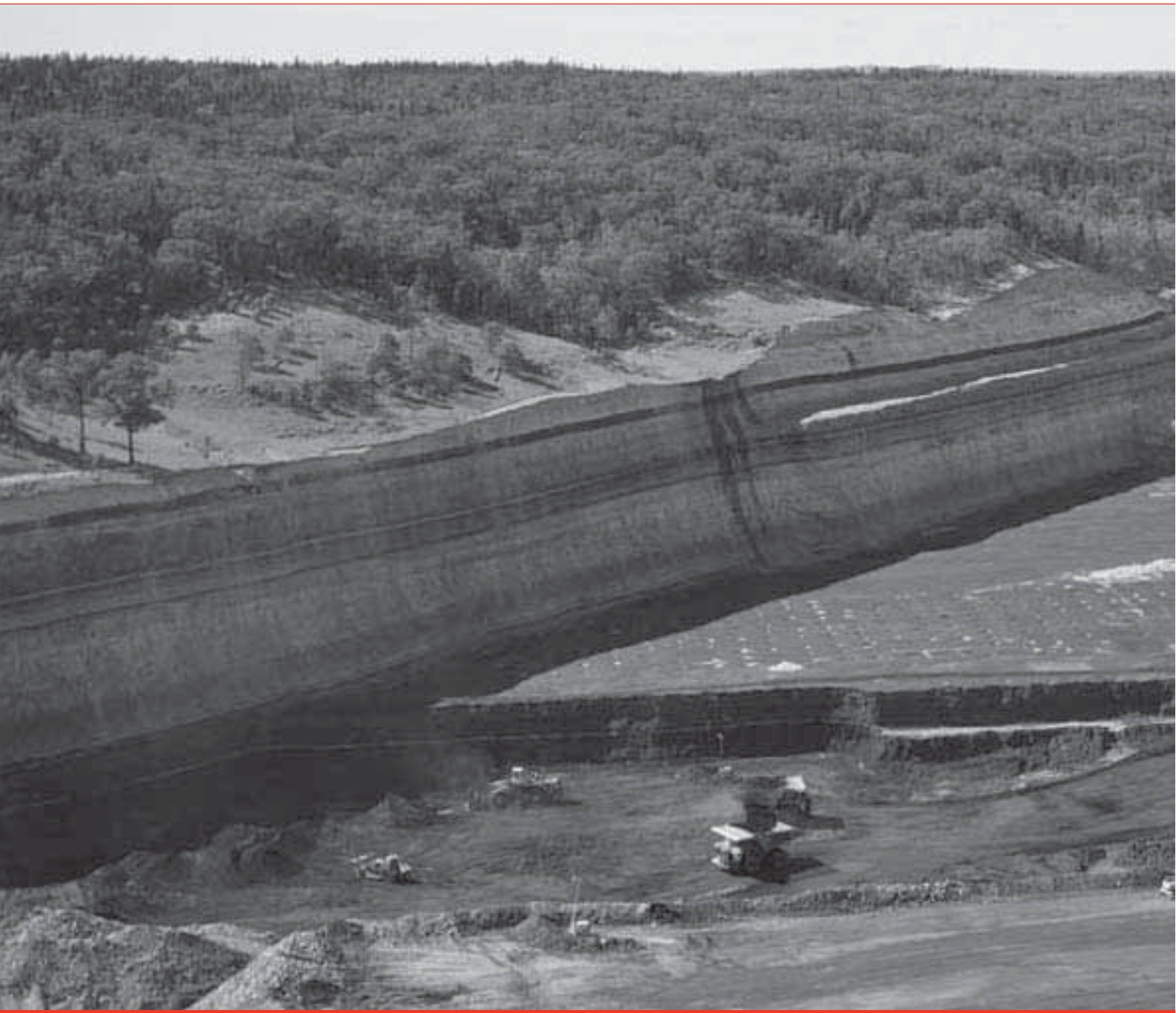

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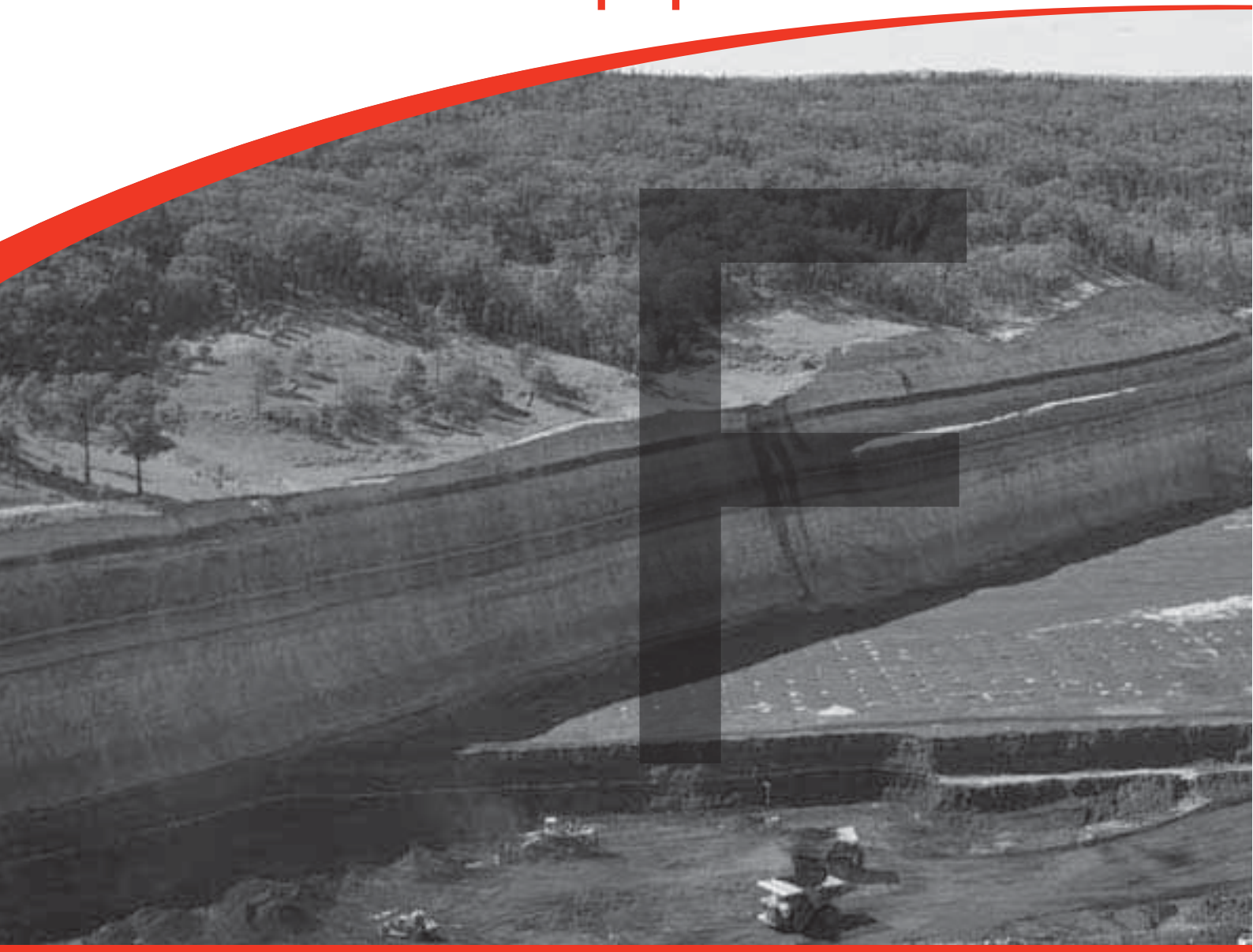

Aboriginal heritage impact assessment

Moolarben Coal Project Stage 1 Optimisation Modification, Environmental Assessment – May 2013

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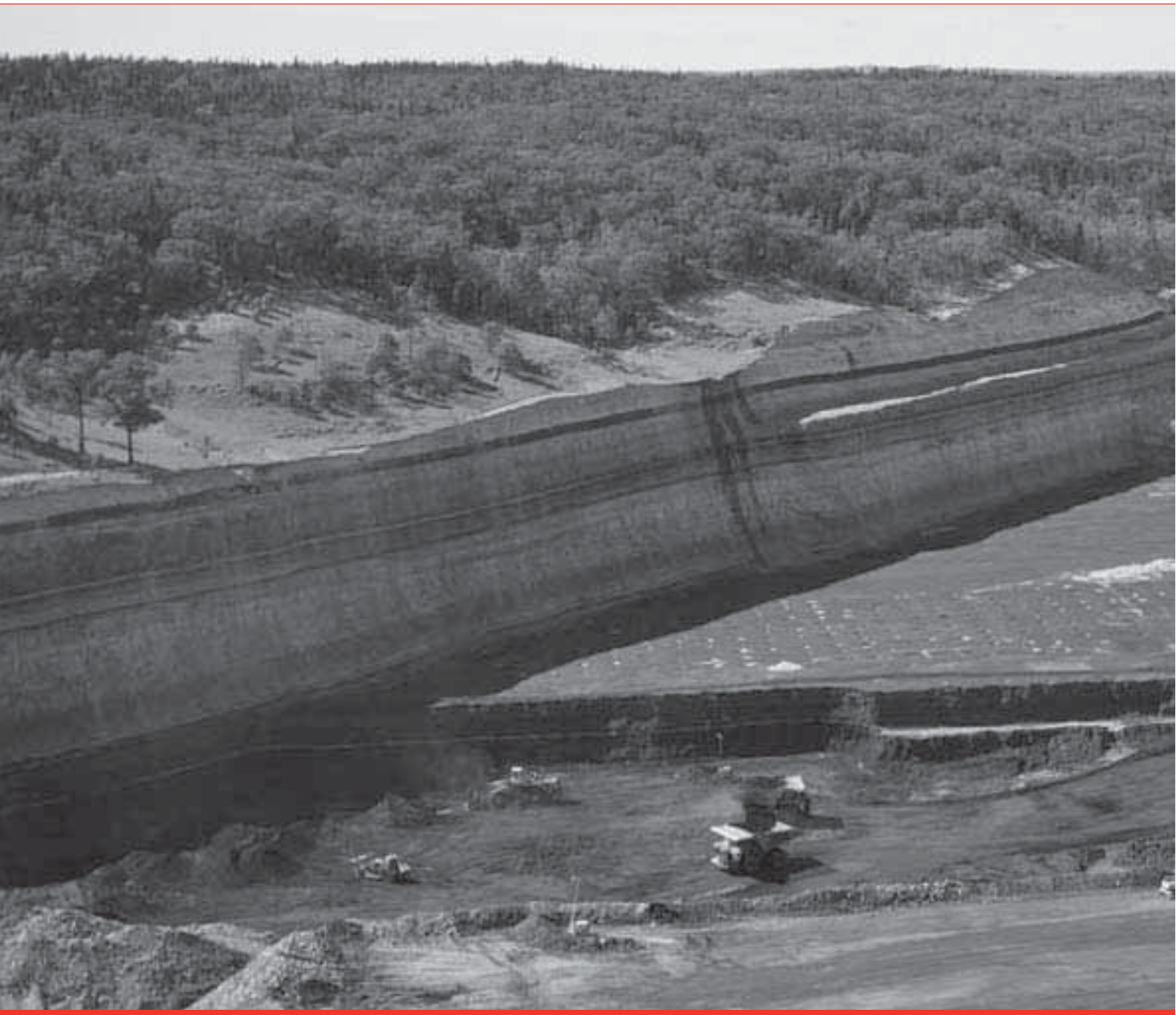

MOOLARBEN COAL PROJECT - STAGE 1 OPTIMISATION MODIFICATION, NEAR ULAN, CENTRAL TABLELANDS OF NEW SOUTH WALES: ABORIGINAL CULTURAL HERITAGE ASSESSMENT

A report to

Moolarben Coal Pty Limited

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EXECUTIVE SUMMARY

The Moolarben Coal Project (MCP) is an approved open cut and underground coal mine located in the Western Coalfields of New South Wales, approximately 40 kilometres north-east of Mudgee. The MCP is operated by Moolarben Coal Operations Pty Limited (MCO), under the Stage 1 Project Approval (MP 05_0117), granted by the Minister for Planning (NSW) in 2007 under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Since gaining approval, MP 05_0117 has been modified on seven occasions.

The current disturbance limit granted under MP 05_0117 is restricting the extraction of large quantities of the deposit which are economically viable in today's market. The proposed modification will extend the disturbance boundary, enabling increased resource utilisation, a longer life for Open Cuts 1 and 2 and promote the continuity of Stage 1 operations.

MCO is seeking approval from the Minister for Planning under Section 75W of the EP&A Act for the proposed Moolarben Coal Project Stage 1 Optimisation Modification (herein referred to as the 'proposed modification' or 'modification'). The modification principally comprises an extension of mining within Open Cuts 1 and 2 and the construction and operation of additional water management infrastructure, along with a minor change to the rehabilitation sequencing and final landform.

This Aboriginal cultural heritage assessment of the proposed modification has been prepared by South East Archaeology Pty Ltd for MCO to address the potential impacts of the proposed modification on Aboriginal heritage.

A comprehensive field survey sampling almost the entire 178.2 hectare investigation area was undertaken over nine days in November 2012, by qualified archaeologists from South East Archaeology assisted by representatives of the registered Aboriginal stakeholder organisations. Four organisations were registered as stakeholders for the Stage 1 and/or Stage 2 projects and have been the primary parties consulted by MCO in relation to ongoing Aboriginal heritage issues associated with the MCP. These organisations are the Mudgee Local Aboriginal Land Council, Warrabinga Native Title Claimants Aboriginal Corporation, Murong Gialinga Aboriginal and Torres Strait Islanders Corporation and North-East Wiradjuri Company Ltd.

Five Aboriginal sites (three isolated artefacts and two rock shelters with artefacts) and 28 rock shelters with Potential Archaeological Deposits (PADs) are known to occur directly within or immediately adjacent to the investigation area. Cultural areas and values have also been identified by the Aboriginal stakeholders, including the cultural value of the investigation area itself, Moolarben Ridge south of Carr's Gap, flora/fauna resources and the identified Aboriginal objects.

The evidence identified during the survey is consistent with the occupation model for the locality. The investigation area is located in contexts that do not conform to primary or secondary resource zones under the model of occupation. The area is generally of moderate to steep gradient, and distant from higher order watercourses. As such, rather than having represented focused occupation, Aboriginal use of the investigation area is therefore more likely to have related to hunting and gathering activities, along with transitory movement between locations and procurement of stone materials, and would have been of a generally low intensity.

The nature of the evidence from the investigation area is consistent with the results from the overall Stage 1 project and from the Stage 2 project. No specific aspects of the heritage evidence located within the modification investigation area are rare or unique within a local or regional context.

The significance of the Aboriginal heritage evidence was assessed. It is noted that all Aboriginal heritage is of interest and contemporary value to the Aboriginal community. Aboriginal heritage evidence represents a tangible link with the traditional past and with the lifestyle and values of community ancestors. The two rock shelters with artefacts (S1MC331 and S1MC344) and one of the rock shelters with PADs (S1MC343) were assessed as being of moderate significance within a local context. The remaining sites and PADs were assessed as being of low significance within a local context.

The potential impacts of the modification include:

- Broad-scale high level impacts, associated with the extended open cut pits, water management infrastructure and other areas of earthworks. These impacts are anticipated to be widespread across virtually the entire investigation area and will probably result in impacts to three open artefact sites, 25 rock shelters with PADs and one rock shelter with artefacts; and
- Indirect impacts, which may arise to Aboriginal sites on the margin or outside of the investigation area, from vibrations associated with blasting. This may affect three rock shelters with PADs and one rock shelter with artefacts identified during the survey marginally outside of the investigation area, but other previously reported sites and further sites that could be identified during future archaeological surveys may also be subject to impacts.

The proposed modification may also result in impacts to the cultural areas/values identified by the Aboriginal stakeholders. However, there is generally a low potential for other forms of heritage evidence to occur within the investigation area.

It is concluded that the impacts of the proposed modification on Aboriginal heritage would be low within a local context and very low within a regional context. By extension, the cumulative impacts of the proposed modification within a regional context would also be very low.

The following recommendations are made on the basis of legal requirements under the EP&A Act and *National Parks and Wildlife Act 1974* (NP&W Act) the results of the investigation and consultation with the registered Aboriginal stakeholder organisations:

1) Approval should be obtained from the Department of Planning and Infrastructure (DP&I) for the *Aboriginal Cultural Heritage Management Plan: Moolarben Coal Project Stage 1* (ACHMP) to manage all interactions of the project with Aboriginal heritage within Stage 1 (including those that relate to this modification), *in lieu* of a Section 90 Aboriginal Heritage Impact Permit (AHIP). After DP&I approval of the Stage 1 ACHMP and the Stage 1 Optimisation Modification, the provisions relating to the modification area will be implemented. The primary elements of the ACHMP relevant to the modification are outlined below:

a) Further investigation will occur for specific heritage sites or areas, including:

   i) As detailed mine planning progresses, assessment will be undertaken by an appropriate expert of the potential effects of blasting on rock shelter sites/PADs, and in particular, identification of the potential zone of impact associated with blasting in the modification area. Systematic archaeological survey of those portions of the potential zone of impact that have not already been subject to sampling will occur to facilitate identification of those sites that may be subject to impacts, and assessment by an appropriate expert of the potential effects of blasting on those sites/PADs. Where rock shelter sites/PADs are identified as being subject to potentially substantial impacts from blasting (involving major cracking and/or rock fall, such that human entry to the shelter is considered to be an unacceptable safety risk and/or total collapse of the shelter is anticipated to occur as a direct consequence), management of those sites/PADs will occur in accordance with the Stage 1 ACHMP;

   ii) Archaeological survey will occur for all potential impact areas that could not be sampled during the present investigation, currently totalling 10 hectares within the investigation area boundary, and potentially including areas adjacent to the investigation area that may lie within the potential zone of impact from blasting. The survey will be conducted by a qualified archaeologist in consultation with the registered Aboriginal stakeholder organisations using the same methodology as for the present investigation, prior to any impacts occurring. Subsequent to the survey, management strategies can be implemented as outlined in the ACHMP for previously unrecorded sites;

b) In order to mitigate the impacts of the proposed modification on scientific and cultural values and/or to retrieve and conserve samples of the heritage evidence, mitigation measures will be implemented prior to any impacts occurring to specified sites and areas, including:

   i) Site S1MC331, a rock shelter with artefacts, will be subject to test excavation, in accordance with the procedures outlined in the Stage 1 ACHMP. Where it is determined that more detailed salvage excavation is required, this will occur in accordance with the provisions in the Stage 1 ACHMP;

c) All heritage investigation and mitigation measures undertaken will be adequately documented and distributed to relevant stakeholders (such as the DP&I and the OEH and the registered Aboriginal stakeholder organisations) within appropriate timeframes;

d) All heritage evidence salvaged will be curated in an appropriate manner, in accordance with the procedures outlined in the Stage 1 ACHMP;

e) Where impacts from surface works will be avoided to identified heritage evidence, appropriate site-specific precautionary measures will be implemented for those sites within close proximity of the area of works;

f) Within 18 months of approval of the Stage 1 ACHMP, relevant contractors and employees (as identified by MCO through a risk-based assessment), will receive an Aboriginal Heritage Awareness Training Program to broaden general awareness and understanding of Aboriginal culture and heritage;

g) The Aboriginal Site Database that lists known Aboriginal sites within the project area will continue to be maintained and regularly updated;

h) Site records will be lodged in a timely manner with the OEH for any previously unrecorded Aboriginal heritage evidence that is identified within the investigation area during the course of operations and/or further heritage assessments, or that is subject to salvage;

i) Any future alterations that may be proposed to the mine plan will be assessed in accordance with the Stage 1 ACHMP;

j) Any previously unrecorded Aboriginal heritage evidence within the area of potential impacts from the modification, that may be identified during future investigations or works, will be managed in accordance with the procedures outlined in the Stage 1 ACHMP;

k) Should any skeletal remains be detected during the course of the project, work in that location will cease immediately and the finds will be reported to the appropriate authorities, including the Police, the OEH and the registered Aboriginal stakeholder organisations. Subject to the Police requiring no further involvement, the management of any Aboriginal skeletal remains will be determined in consultation with the DP&I and the Aboriginal stakeholders, in accordance with the procedures outlined in the Stage 1 ACHMP;

l) Archaeological investigations will only be undertaken by archaeologists qualified and experienced in Aboriginal heritage, in consultation with the registered Aboriginal stakeholder organisations, and occur prior to any development impacts occurring to those specific areas or sites;

m) The ACHMP will be verified to establish that it is functioning as designed (ie. policies adhered to and actions implemented to the standard required);

2) Under the terms of the NP&W Act it is an offence to harm or desecrate an object that the person knows is an Aboriginal object, or to harm an Aboriginal object ('strict liability offence'). Therefore, no activities or work should be undertaken within the Aboriginal site areas as described in this report without a valid Section 90 AHIP or until Section 75W approval of this modification is granted, the Stage 1 ACHMP is approved, and all relevant heritage management measures have been implemented; and

3) Copies of this final report should be forwarded to each registered Aboriginal stakeholder organisation and the DP&I and the OEH within 30 working days of completion.

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PLATES (APPENDIX 4)

1. INTRODUCTION

1.1 Background

The Moolarben Coal Project (MCP) is an approved open cut and underground coal mine located near Ulan in the Western Coalfields of New South Wales, approximately 40 kilometres north-east of Mudgee (Figure 1).

The MCP is operated by Moolarben Coal Operations Pty Limited (MCO), under the Stage 1 Project Approval 05_0117 (MP 05_0117), granted by the Minister for Planning (NSW) in 2007 under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Since gaining approval, MP 05_0117 has been modified on seven occasions to make administrative changes, changes to infrastructure and allow the construction of a borefield.

The main components of the MCP Stage 1, as modified, comprise:

- Three open cut pits, referred to as Open Cuts 1, 2 and 3, which have an approved combined maximum extraction rate of 8 million tonnes per annum (Mtpa) of run of mine (ROM) coal;
- One underground mine, referred to as Underground 4, which has an approved maximum extraction rate of 4 Mtpa of ROM coal;
- Coal handling, processing, rail loop, load-out and water management infrastructure; and
- Associated facilities such as offices, bathhouses, workshops and fuel storages (refer to Figure 2).

To date, mining has occurred within Open Cut 1 only, commencing at the south-western perimeter and progressing in a north-easterly direction.

The current disturbance limit granted under MP 05_0117 is restricting the extraction of large quantities of the deposit which are economically viable in today's market. The proposed Moolarben Coal Project Stage 1 Optimisation Modification (herein referred to as the 'proposed modification' or 'modification') will extend the disturbance boundary, enabling increased resource utilisation, a longer life for Open Cuts 1 and 2 and promote the continuity of Stage 1 operations. All of the elements of the proposed modification are listed in Section 1.2.

The MCP is located within the Mid-Western Regional Council local government area, in the Central Tablelands of NSW, and is bordered by the:

- Goulburn River to the north-west;
- Privately owned grazing land to the north;
- Goulburn River National Park, Wilpinjong Coal Mine and Munghorn Gap Nature Reserve to the east;
- Privately-owned grazing land to the south; and
- Privately-owned grazing land, Ulan settlement and Ulan Coal Mine to the west.

This Aboriginal cultural heritage assessment of the proposed modification has been prepared by South East Archaeology Pty Ltd for MCO. EMGA Mitchell McLennan Pty Limited (EMM) has been engaged by MCO to prepare an Environmental Assessment (EA) for the proposed modification, of which this Aboriginal cultural heritage assessment will form a component.

1.2 Overview of Proposed Modification

The elements of the proposed modification to MP05_0117 comprise:

- The extension of mining within Open Cuts 1 and 2;
- The construction and operation of additional water management infrastructure; and
- A minor change to the rehabilitation sequencing and final landform.

The project approval will be extended to accommodate the proposed modification.

No other changes are proposed under the modification. There will be no change to the maximum annual rate of coal production, mining methods, equipment, manning levels, coal handling and processing, external coal transport or operating hours.

The proposed modification elements are shown in Figure 3. They are all located within the Stage 1 project approval boundary, which forms the 'project area' for the proposed modification. Within the project area, the Open Cut 1 and 2 Extension Areas are referred to collectively as the 'proposed extension areas'. It is noted that the proposed extension areas include a disturbance buffer of up to 50 metres that will enable the development of a services road and infrastructure if required, such as water pipelines. This ensures that all potential impacts associated with the proposed extension to mining have been assessed,

Risks to Aboriginal heritage and to other environmental variables were considered during the mine design process. Measures to avoid adverse potential impacts are reflected in the final mine design, including ensuring no direct impacts occur to the Moolarben Creek riparian zone and the Underground 2 Aboriginal Rock Shelter Management Area.

Approval for the proposed modification is being sought under Section 75W of the EP&A Act from the Minister for Planning.

1.3 Study Purpose

This study has been prepared by South East Archaeology to assess the potential impacts of the proposed modification to Aboriginal cultural heritage and to develop measures that would avoid, minimise, mitigate and monitor any potential impacts.

It is noted that a Major Project Application for Stage 2 of the MCP (MP08_0135) lodged under Part 3A of the EP&A Act is currently being assessed by the Department of Planning and Infrastructure (DP&I). If approved, Stage 2 will consist of one open cut pit (Open Cut 4) and two underground mines (Underground 1 and Underground 2) (refer to Figure 2). Approval is also being sought for additional associated infrastructure. This study is based on the assumption that Stage 2 of the MCP will be approved, thus enabling potential worst-case impacts to be assessed.

Director General's Requirements (DGRs) for the proposed modification were not required and have not been obtained. In their absence, it has been assumed that Aboriginal cultural heritage would be a key issue for the Environmental Assessment, with the following requirements needing to be addressed:

- A detailed description of the existing environment;
- Consideration of all relevant environmental planning instruments;
- An assessment of the potential impacts of the development, including cumulative impacts;
- Effective consultation with Aboriginal communities in determining and assessing impacts, and developing and selecting mitigation options and measures;
- A description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the development; and
- An assessment taking into account relevant guidelines, policies and plans. In relation to Aboriginal heritage, these are primarily assumed to comprise the draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (DEC 2005).

It is noted that the draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (DEC 2005) require an assessment in accordance with the *Aboriginal Cultural Heritage Standards and Guidelines Kit* (DEC 1997) and *Interim Community Consultation Requirements for Applicants* (DEC 2004), notwithstanding that the latter policies have now effectively been superseded by the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b) and the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* policy (DECCW 2010c).

The primary aims and tasks of this Aboriginal cultural heritage assessment have therefore been to:

- Building on the study completed for the Stage 1 EA (Hamm 2006a), undertake register searches, research, Aboriginal community consultation and an archaeological survey, and where required excavations, to identify and record any Aboriginal heritage evidence or areas of potential evidence or cultural values within the investigation area for the proposed modification;
- Assess the potential impacts of the proposed modification upon any identified or potential Aboriginal heritage evidence or cultural values;
- Assess the significance of any Aboriginal heritage evidence or cultural values identified;
- Provide details of any Aboriginal heritage evidence in accordance with the OEH[1] requirements;
- Consult with the Aboriginal community in accordance with the consultation process established for the Stage 1 Project (refer to Hamm 2006a), consistent with the OEH policy entitled *Interim Community Consultation Requirements for Applicants* (DEC 2004);

[1] Prior to April 2011 the Office of Environment and Heritage (OEH) in the Department of Premier and Cabinet was known as the Department of Environment, Climate Change and Water (DECCW), and previously as the Department of Environment and Climate Change (DECC) and Department of Environment and Conservation (DEC) and National Parks and Wildlife Service (NPWS).

- Present recommendations for the management of any identified Aboriginal heritage evidence and potential heritage resources or cultural values; and
- Prepare a formal archaeological report to meet the requirements of the above (primarily with reference to the 2005 draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation*).

An application for a Section 90 Aboriginal Heritage Impact Permit (AHIP) from the OEH will not be required, due to exemptions under Part 3A of the EP&A Act.

For the purposes of this Aboriginal cultural heritage assessment, the investigation area totals 178.2 hectares, as marked on Figures 4 and 5. Within this area, property access limitations at the time of the field survey or additions to the investigation area that occurred after the completion of the field survey apply to 10 hectares (5.6%) of the investigation area. Approximately 3.6 hectares (2% of the investigation area) had been totally modified by previous land use, such that negligible potential for Aboriginal heritage evidence exists. The remaining 164.5 hectares (92.4% of the investigation area) was subject to detailed systematic archaeological survey sampling (refer to Section 5). Additional survey sampling was obtained in 12.2 hectares of land immediately bordering the investigation area (due to revisions to the investigation area boundaries subsequent to completion of the field survey).

This report builds on the previous heritage assessments of Stage 1 (Hamm 2006a) and Stage 2 (Hamm 2008a) and does not seek to repeat background information contained within those reports.

1.4 Authorship

This assessment has been prepared by Peter Kuskie, an archaeologist with a BA (Honours) degree in Aboriginal archaeology and over 23 years experience in the conduct of Aboriginal cultural heritage assessments throughout Australia.

The field investigation was undertaken by Peter Kuskie and Birgitta Stephenson. Birgitta Stephenson has a BA (Honours) degree in Aboriginal archaeology and Bachelor of Pharmacy degree and over three years experience in the conduct of Aboriginal heritage surveys and use-wear residue analysis.

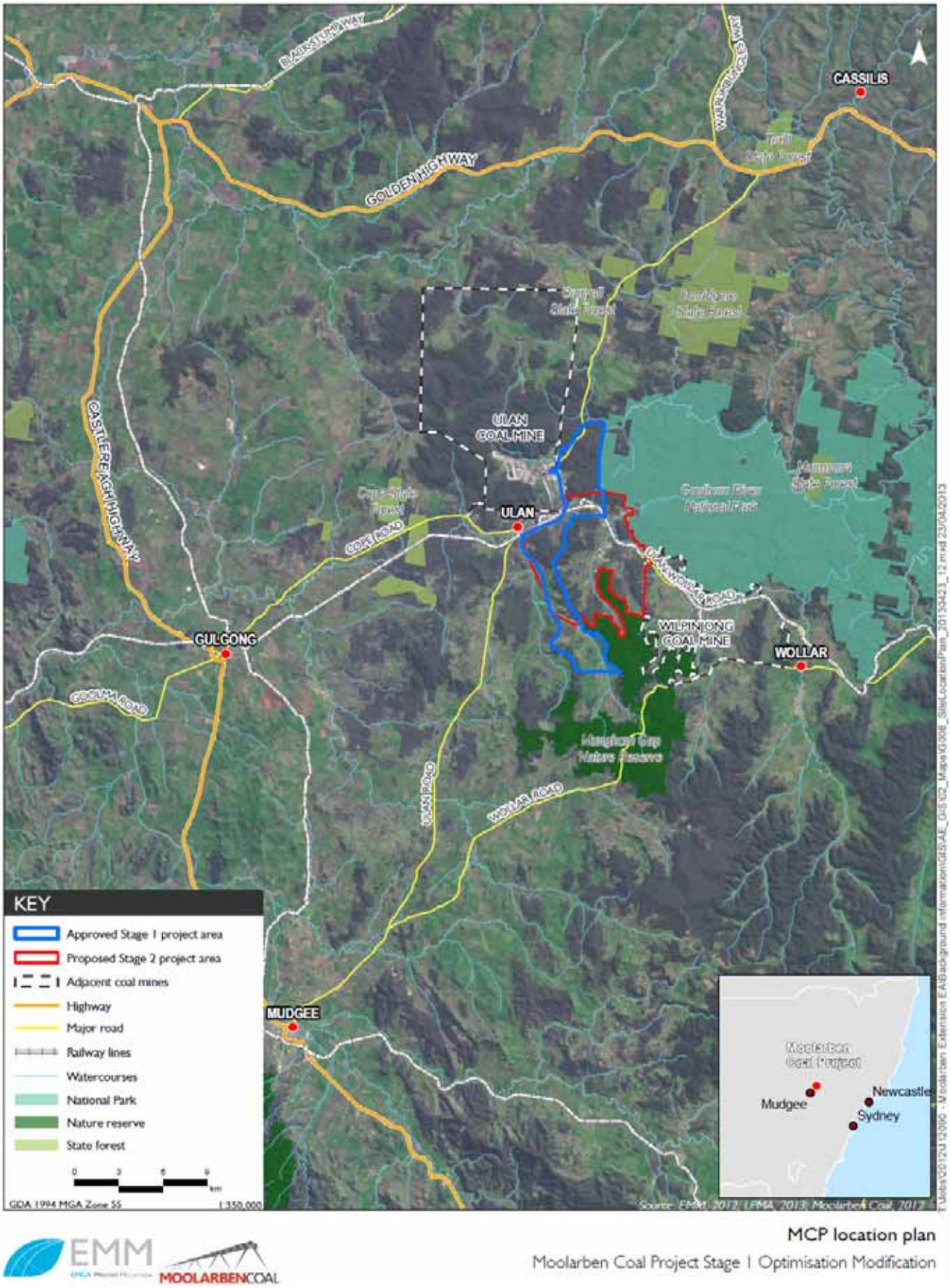

Figure 1: Location of project area (courtesy EMM).

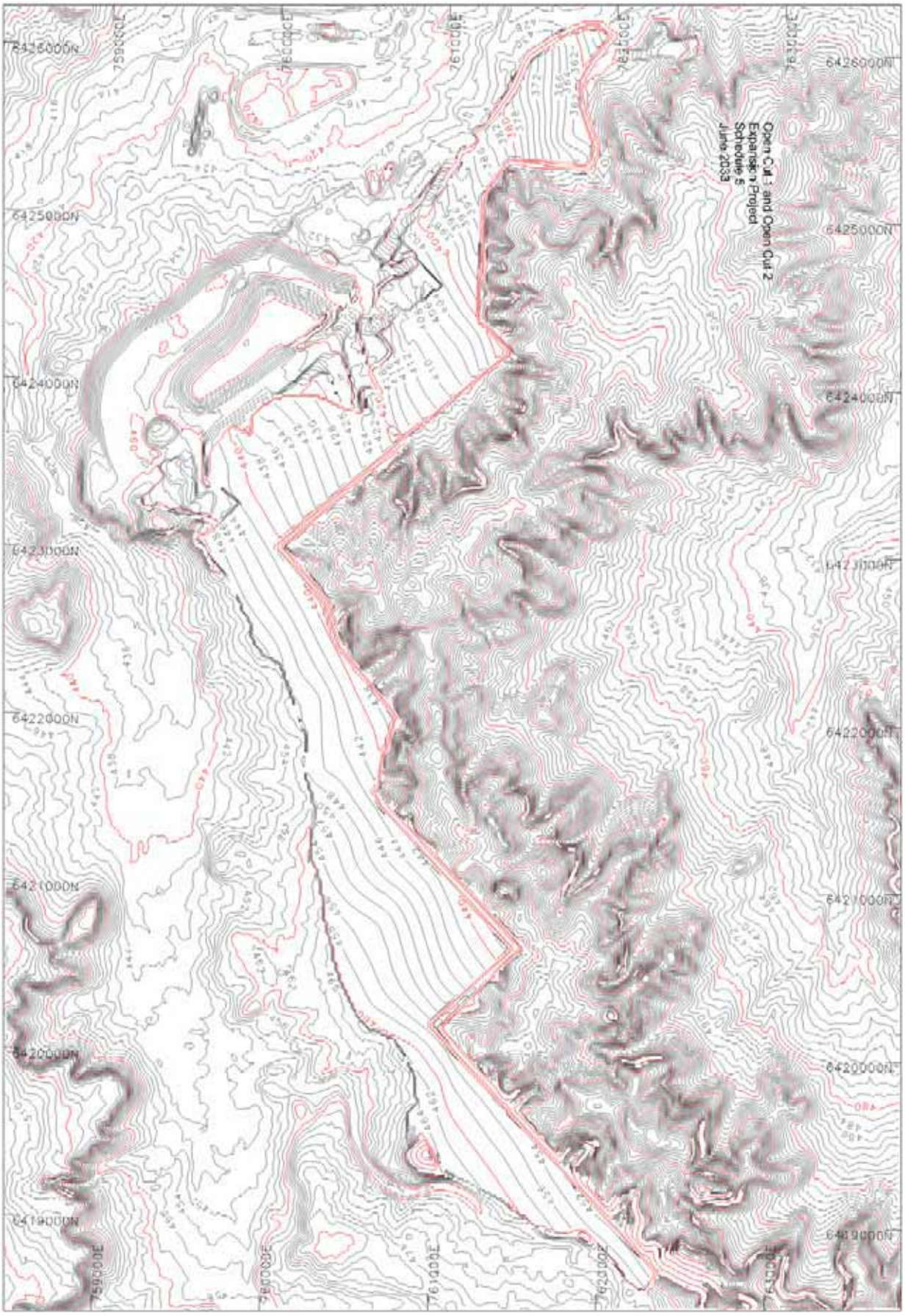

Figure 3: Proposed modification (courtesy EMM).

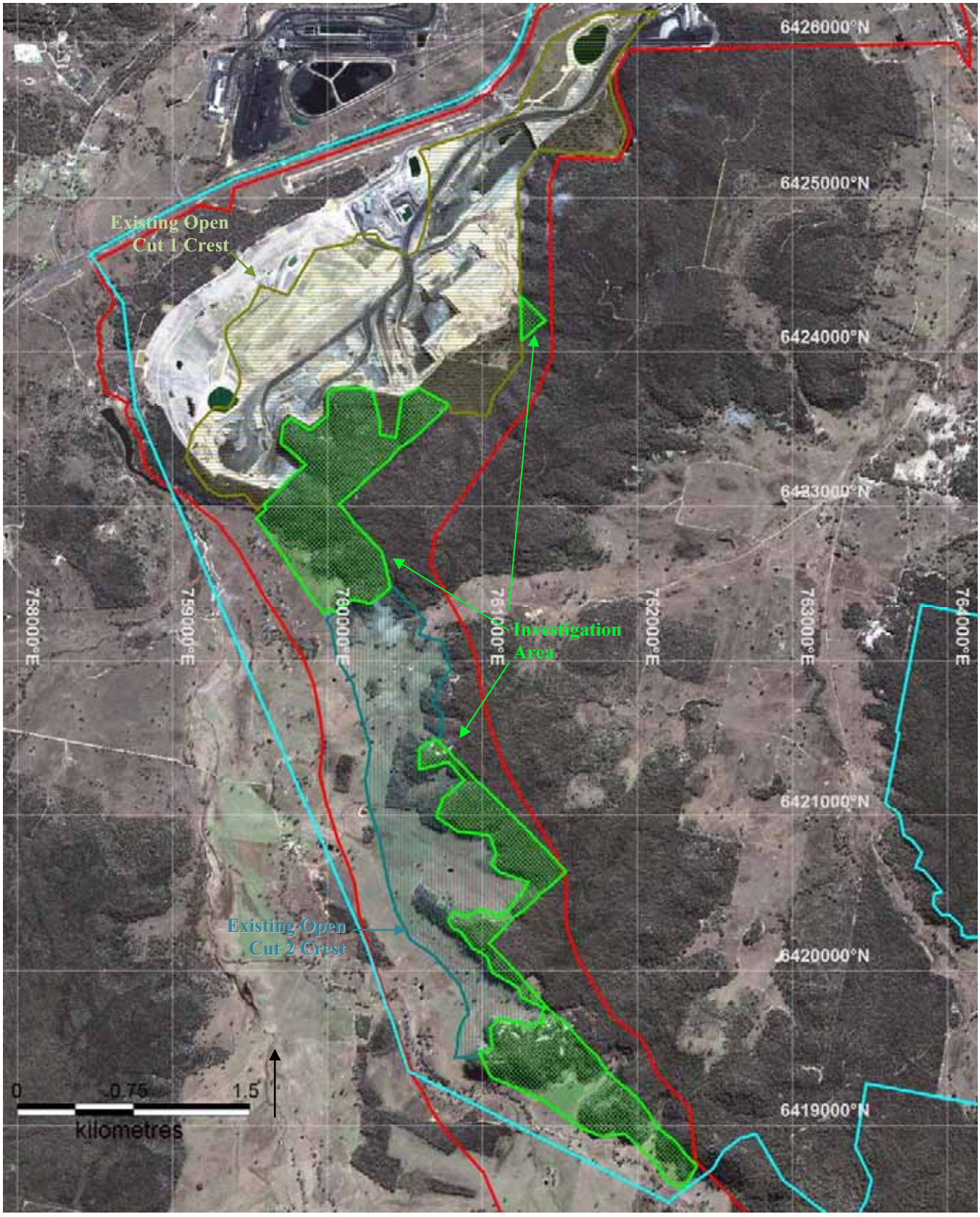

Figure 4: Location of investigation area (green shading) (aerial photograph courtesy MCO; one kilometre MGA grid; Stage 1 approved project boundary - red; Stage 2 project boundary - blue).

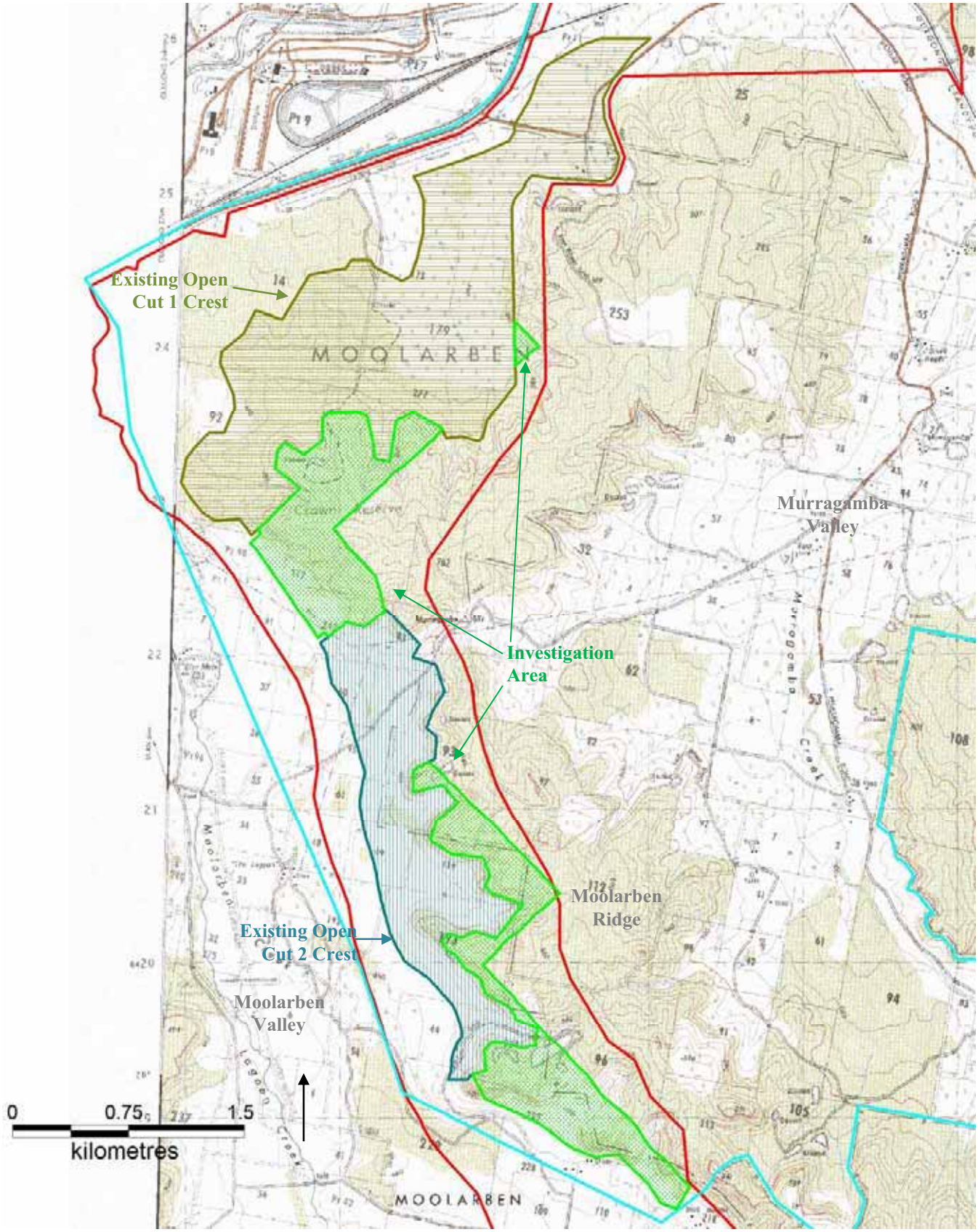

Figure 5: Location and topographical context of investigation area (green shading) (Wollar 8833-2N AMG 1:25,000 topographic map; Stage 1 approved project boundary - red; Stage 2 project boundary - blue).

2. ENVIRONMENTAL CONTEXT

The investigation area is located in the Central Tablelands region of NSW. It is situated in the Mid-Western Regional Council local government area and extends between MGA grid reference eastings 759500 and 762400 and northings 6418600 and 6426100 on the Wollar 8833-2N 1:25,000 topographic map (refer to Figure 5).

It essentially comprises three areas of land in the Moolarben Stage 1 approved project area, two adjoining the eastern/southern margin of Open Cut 1 (herein referred to as the 'Open Cut 1 Extension Area'), and one adjoining the eastern margin of Open Cut 2 (herein referred to as the 'Open Cut 2 Extension Area') (refer to Figure 4).

The investigation area is located marginally east of the Great Divide. It primarily comprises the moderate to steeply inclined side-slopes of the major ridgeline (Moolarben Ridge), which separates the Moolarben Creek valley in the west from the Murragamba Creek valley in the east. Portions of the investigation area fringe the Moolarben Creek valley and portions include more gently inclined, elevated terrain on the crest of the ridge system. Elevation typically varies between 460 metres Above-Height-Datum (AHD) on the valley margins to 560 metres AHD on the ridge crest.

The investigation area is mostly located within the Moolarben Creek catchment. However, comprising elevated terrain on the margins of the valley, only lower order watercourses (typically first order) are present. The northern portion of the investigation area is located within the Goulburn River catchment. The Open Cut 1 Extension Area approaches to within 430 metres of the higher order Moolarben Creek. However, the Open Cut 2 Extension Area is located closer to Moolarben Creek, within 50 to 100 metres along most of its western margin. Moolarben Creek is a tributary of the Goulburn River, the confluence with Sportsmans Hollow Creek being located two kilometres north-west of the investigation area.

In terms of the surface area of the 176.7 hectares of land subject to detailed archaeological survey sampling (as derived from two-dimensional base mapping), moderately and steeply inclined slopes (>5.45º, as per McDonald *et al* 1984) comprise 62.6% of this area, gently inclined slopes (1.45-5.45º) comprise 35.8% and level to very gently inclined slopes (<1.45º) comprise 1.6%. In relation to landform units, simple slopes occupy 57.7% of this survey sampling area, ridge crests 23.4%, drainage depressions 15.6%, spur crests 3% and hillocks 0.3% (refer to Table 3).

Much of the investigation area is situated on land owned by MCO, with portions on land owned by Ulan Coal Mines Limited (UCML) and Crown land. Access for field investigations was restricted in some of these areas (refer to Figure 4). Munghorn Gap Nature Reserve approaches to within 100 metres of the south-eastern corner of the Open Cut 2 Extension Area.

The investigation area is located at the western limit of the geological formation known as the Sydney Basin and at the southern end of the Gunnedah Sub-basin, adjacent to the Lachlan Fold Belt. Much of the investigation area is dominated by Late Permian age Illawarra Coal Measures, with sandstone, mudstone, claystone, coal, torbanite and rhyolitic tuff. Elevated portions of the investigation area, typically on or near the ridge crests, are dominated by Triassic era Narrabeen Group sandstone, mudstone and conglomerate.

Sandstone rock formations occur within the investigation area, including boulders, shelters, overhangs and open surfaces. These can host evidence of Aboriginal occupation, such as deposits of artefacts and cultural material in rock shelters or overhangs, rock art on surfaces of shelters or overhangs, and grinding grooves on exposed bedrock or isolated cobbles/boulders.

The presence of tuff within the geology of the Illawarra Coal Measures and quartz and quartzose rich conglomerates indicates that stone materials suitable for manufacturing Aboriginal artefacts may occur in various locations throughout the investigation area.

Deposits containing evidence of Aboriginal occupation that is older than 10,000 years of age (ie. Pleistocene) may exist both within rock shelters and certain open contexts.

Much of the investigation area lies within the Lees Pinch Soil Landscape. The Lees Pinch Landscape contains shallow sandy soils, extensive rock outcrops, sandstone cliffs and debris slopes. It also includes grey and yellow earths and yellow podzolic soils on lower slopes (Murphy and Lewis 1998). Small portions of the lower elevation areas are located within the Ulan Soil Landscape. This contains yellow podsolic soils on lower slopes and drainage lines with patches of yellow solodic soils in association with salt sands. Yellow and brown earths are also present on footslopes with minor areas of earthy sands (Murphy and Lewis 1998).

Hence, much of the investigation area comprises areas that are anticipated to be erosional contexts (for example, the mid and upper portions of slopes). However it is noted that soil formation processes are complex and can vary over time in any locality (for example, episodes of major erosion in a typically depositional context). These processes can both remove, obscure or affect the integrity of archaeological evidence (particularly stone artefacts).

The climate of the locality is characterised by warm to hot summers with dry electrical storms and cold winters with frequent frosts. The Ulan climate is comparable to meteorological data from Gulgong. Average daily summer temperatures range between 21.3 and 22.4 degrees Celsius (ºC), with the highest monthly average daily temperature occurring in January (22.4ºC). The average daily temperatures in winter vary between 8.3 and 9.6ºC and the lowest monthly average daily temperature occurs in July (9.2ºC). Average annual rainfall is approximately 630 millimetres (mm), with a slight increase in rain during the summer months. While slight to moderate droughts in the Ulan area occur infrequently, severe and prolonged droughts have been recorded in the past.

The investigation area is largely occupied by native vegetation, with Ironbark dominated forests and Scribbly Gum dominated woodlands. A number of mature native trees are present, although significant timber extraction has occurred in historical times. Portions of the investigation area have been cleared of vegetation and are currently dominated by introduced and/or native grasses. These areas are typically currently used for the agistment of livestock. The cover of vegetation acts to reduce ground surface visibility and thereby reduces the potential to identify archaeological evidence during a field survey. Nevertheless, where mature native trees are present, the potential occurrence of carved or scarred trees cannot be discounted.

The investigation area only comprises a single resource zone (woodland/forest) and higher-order watercourses are absent (although are close-by to the western margin of the Open Cut 2 Extension Area). This is likely to have been a significant factor in relation to Aboriginal occupation of the locality (refer to Section 3).

In the late Pleistocene, during the last glacial maximum from about 24,000 to 17,000 years ago, the climate was cooler (possibly 6-10º C) and drier than at present. Potable water was probably not frequently available in the locality. In terms of subsistence resources and potable water, the investigation area would not have represented an environment conducive to Aboriginal occupation.

After temperatures rose, potable water may have been more frequently available in the locality, particularly in the nearby higher-order watercourses such as Moolarben Creek. As such, the locality was more conducive to occupation in the Holocene period, although as discussed in Section 3, occupation may have been focused outside of the immediate investigation area in locations where conditions were more favourable.

The Mudgee and Gulgong district was settled in 1822 (Haglund 1996a). In 1826 the entire region was opened to private settlement. Numerous large stations and estates were established at this time. The stock brought to the Central Tablelands initially was cattle, however by 1828 sheep outweighed cattle by four to one in the region as a whole (Heritage Office 1996). In the Ulan area, sheep and cattle grazing was supplemented by agriculture, with wheat and oat crops being cultivated in cleared alluvial flats (Haglund 1981a).

The gold rush began in the 1850s and brought thousands of people to the Central Tablelands and caused the exponential growth of many towns in the region. Alluvial mining was followed by reef and shaft mining across the region, peaking in the 1870s and thereafter declining but continuing into the 1920s (Heritage Office 1996). However, the gold rush appears to have had little direct impact upon the Ulan area (Haglund 1999a) apart from possibly an increase in land selection between 1873-1877 (Moolarben Coal Mines 2008).

Railway lines reached the Central Tablelands in the 1870s, although the link from Lithgow to Mudgee was not established until the 1880s and a railway line between Mudgee and Gulgong was not created until 1909. With the introduction of the railway, commerce and urban development boomed in many towns, while additional discoveries of coal, copper, silver, zinc, antimony and oil shale led to the creation of a long-lasting mining industry in the wider area (Heritage Office 1996). "Mudgee stone", used for ornamental building, was extracted from near Ulan (Haglund 1981a), including from several quarries directly within the present investigation area.

The village of Ulan was proclaimed in 1897. In 1908, the post office was reported to be serving a district of 35 families and a population of 196 (Moolarben Coal Mines 2008). Extraction of timber, including pine and ironbark, was an important local industry for many early settlers. Timber was notably used for railway sleepers and props in the underground mine.

Ulan expanded with the discovery of coal in the 1920s and the subsequent mining industry which, apart from a short period of inactivity, has continued to flourish (Haglund 1999a). Coal deposits were first exploited in the 1920s and sporadically through the 1950s for domestic use. The No. 1 Underground Mine at Ulan commenced in 1942 and the No. 2 Underground Mine in 1957, the latter to supply a power house built near Ulan village in the 1950s. The power station closed in 1969 and mining of the No. 2 Underground continued on a limited basis, becoming fully mechanised in 1977 (Connell Wagner 1995). Mining operations at Ulan expanded substantially in the 1980s and commenced at Moolarben in 2010.

Non-indigenous settlement has resulted in some impacts to the investigation area, most noticeably from timber harvesting, various unsealed vehicle tracks, and quarrying activities. However, these impacts are generally minor (or have affected small areas) and are not anticipated to have had a substantial impact on any heritage evidence, other than that the removal of mature trees may have impacted any scarred or carved trees, had they been present, and the focalised impacts may have impacted any other evidence present. However, in general, disturbance levels are low across the investigation area and should sub-surface deposits of artefacts occur, they may exhibit reasonable integrity. Approximately 3.6 hectares (2% of the investigation area) has been totally modified by previous land use, such that negligible potential for Aboriginal heritage evidence remains.

3. ABORIGINAL ARCHAEOLOGICAL CONTEXT

3.1 Heritage Register Searches

Searches were undertaken on 7 November 2012 of the OEH Aboriginal Heritage Information Management System (AHIMS), between MGA grid coordinates 759000 and 763000 east and 6422000 and 6426500 north (search #1) and 759000 and 763500 east and 6418000 and 6422000 north (search #2). A total of 145 Aboriginal sites and/or Potential Archaeological Deposits (PADs) are listed on the OEH register within this area of 36 square kilometres, which encompasses the present investigation area. The sites identified in the broad search area are predominantly open artefact sites, but several scarred trees and rock shelters with art have also been recorded.

South East Archaeology has prepared a draft Aboriginal Cultural Heritage Management Plan (ACHMP) for the entire Moolarben Coal Complex (MCC) (including the approved Stage 1 and the Stage 2 area currently pending approval). As part of that process South East Archaeology prepared:

- A list of all identified Aboriginal heritage sites located within the MCP Stage 1 and Stage 2 Project area (ACHMP area), with their OEH AHIMS numbers, proposed management strategies and current management status; and
- The *Moolarben Coal Complex Aboriginal Site Database*, in both tabular (Excel spreadsheet) and GIS[2] format, for the entire MCC.

One Aboriginal heritage site (an open artefact site), along with two rock shelters with PADs, are listed on the Moolarben Aboriginal Site Database (and OEH AHIMS register) as having been previously recorded directly within or immediately adjacent to the investigation area (refer to Figure 6 and Table 1). Full descriptions of these sites are presented in Appendix 1.

No Aboriginal heritage sites are listed within the investigation area on any other heritage registers or planning instruments, including the *Mid-Western Regional Local Environmental Plan 2012*, *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* or the *EPBC Act 1999* (Commonwealth Heritage List or National Heritage List).

The Aboriginal community has disclosed a number of associations with the MCP Stages 1 and 2 area of contemporary cultural significance and identified the contemporary value of the archaeological evidence (refer to Hamm 2006a, 2008a, 2008b and AECOM 2011a). These areas include the Moolarben Ridge south of Carr's Gap, an area that extends to within the Open Cut 2 Extension Area.

[2] Geographic Information System (GIS) - MCO maintains this Aboriginal Site Database in MapInfo GIS format.

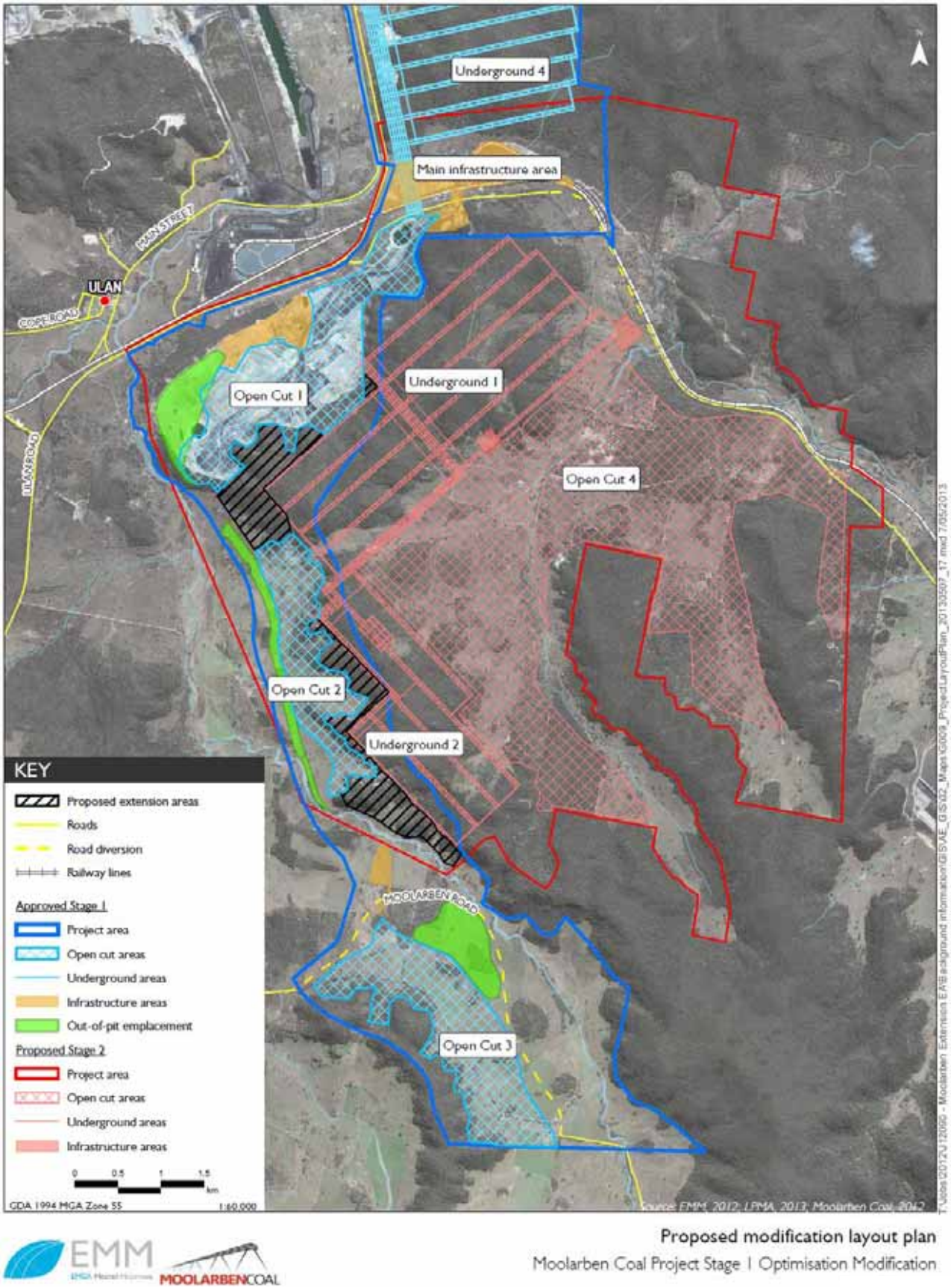

Figure 2: General arrangement of approved Stage 1 and proposed Stage 2 project and modification (courtesy EMM).

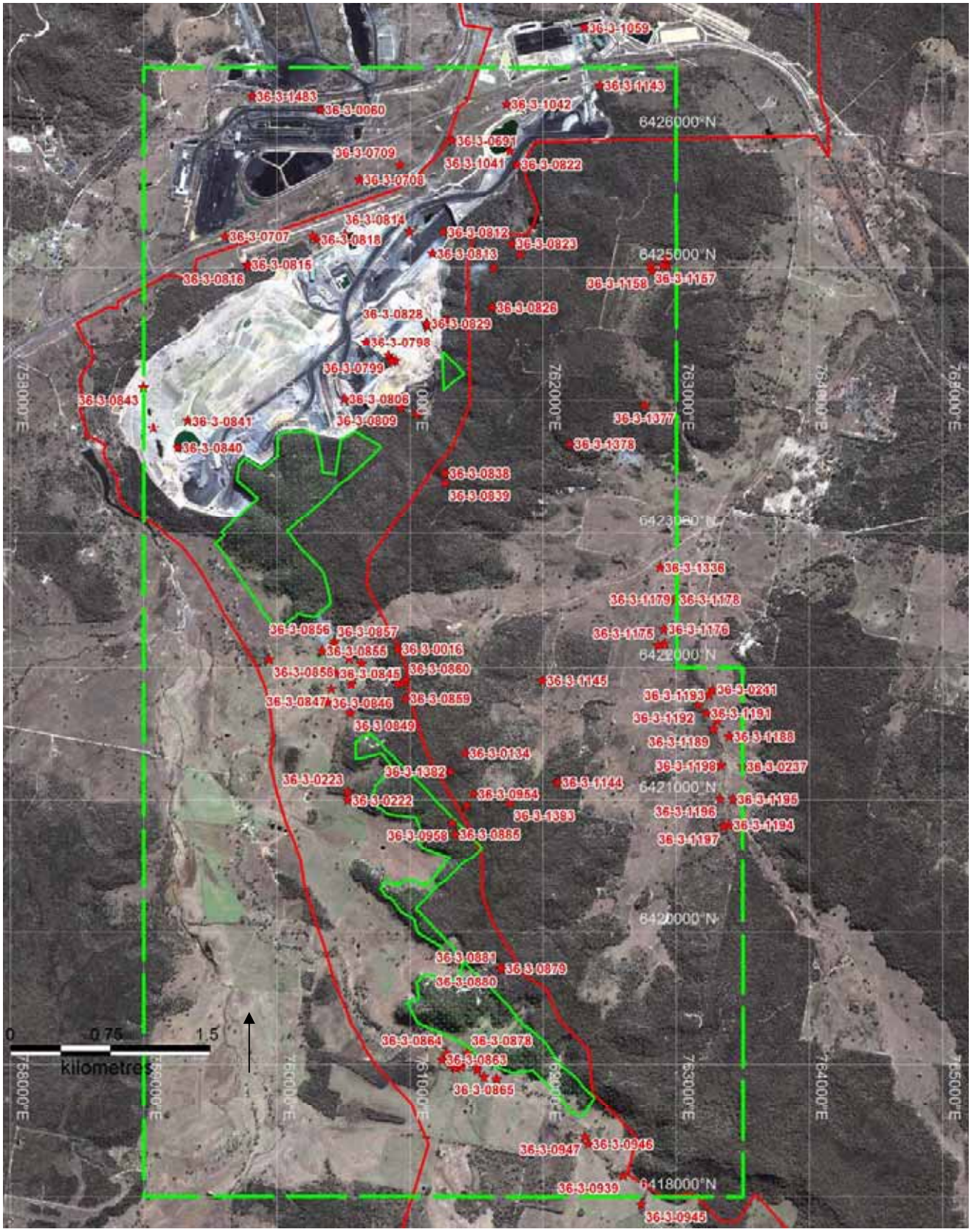

Figure 6: Location of investigation area (solid green border), AHIMS search area (broken green border) and previously recorded Aboriginal heritage sites (red stars) (aerial photograph courtesy MCO; one kilometre MGA grid; site data courtesy OEH but not guaranteed to be free from error or omission - refer to Figure 14 for latest version of Aboriginal site locations incorporating current survey results).

Table 1: Previously recorded Aboriginal sites within the investigation area as listed on the MCC Aboriginal Site Database and OEH AHIMS[3].

Site Name	OEH AHIMS #	Site Type	MGA (GDA) Easting	MGA (GDA) Northing	Recorder	Current Management Status	Notes
S1MC077	36-3-0882	Isolated Find	761597	6419653	Hamm	Insitu ongoing risk for MCO	PPR says surface collection (but not reported as increased change). Stage 1 approval says conservation.
PAD 6 Moolarben Coal	36-3-0885	PAD	761341	6420748	Hamm	Insitu ongoing risk for MCO	AHIMS listed with incorrect Datum, should be GDA not AGD. PPR says test excavation where monitoring indicates impacts are likely, Stage 1 approval says conservation.
PAD 12 Moolarben Coal	36-3-0958	PAD	761318	6420832	Hamm	Insitu ongoing risk for MCO	AHIMS listed with incorrect Datum, should be GDA not AGD.

*Extracted from MCC Aboriginal Site Database Revision 1, August 2012.

3.2 Previous Archaeological Research

A number of Aboriginal heritage investigations have been undertaken within the vicinity of the investigation area, principally for Environmental Impact Assessments relating to the Moolarben Coal Project and adjacent Ulan Coal Mine.

Brief discussion of the most relevant investigations will highlight the range of site types and variety of site contents in the region, identify typical site locations, and assist with the construction of a predictive model of site location for the investigation area. Investigations undertaken for the Moolarben Coal Project are listed in Table 2. For a detailed discussion of previous studies, refer to the primary reports for Stage 1 (Hamm 2006a), Stage 2 (Hamm 2008a) and the UCML Continued Operations Project (Kuskie 2009).

3.2.1 Moolarben Stage 1

The Aboriginal heritage component of the EA for the Stage 1 project area, which measured 3,480 hectares in total, was prepared by Archaeological Risk Assessment Services (Hamm 2006a, 2006b).

Hamm (2006a) conducted an archaeological survey sampling portions of the Stage 1 project area (refer to Figure 7 for survey coverage obtained during the Stage 1 and Stage 2 investigations). Hamm (2006a) employed a strategy using transects that sampled parts of this area, with a team comprising archaeologists and Aboriginal representatives, and obtained effective survey coverage of approximately 1.1% of Stage 1.

[3] Site data courtesy OEH AHIMS not guaranteed to be free from error or omission - a number of errors associated with OEH listing of the site data have been identified and corrected where base data {site cards} were available.

Hamm (2006a) identified 222 Aboriginal sites, comprising 156 isolated artefacts and 47 artefact scatters, 17 rock shelters with artefacts and/or art, one scarred tree and one grinding groove site, along with 12 PADs. In the Environmental Assessment (WES 2006) it is stated that 302 Aboriginal sites were recorded, with 1,598 Aboriginal objects comprising 219 isolated artefacts, 63 artefact scatters, 18 rock shelters with artefacts and/or art, one scarred tree and one grinding groove site, along with 14 PADs. Hamm (2006a) noted that the most concentrated occupation areas were the central Moolarben Creek and Bora Creek alluvial flats and the northern ridge lines.

Hamm (2006a) recommended a range of mitigation measures for the sites which may be impacted by Stage 1, including surface collection for 51 sites, test excavation and salvage for 43 sites, intensive recording and salvage for three sites, subsidence monitoring for 10 sites, and subsidence monitoring and intensive recording for 13 sites, with the remainder to be left *in situ* to be either impacted or subject to conservation.

During the EA exhibition period, a number of submissions were made, including many relating to Aboriginal heritage. The Minister for Planning directed that an Independent Hearing and Assessment Panel (IHAP) be constituted to examine key aspects of the proposal in further detail. In a response to the issues raised (Hamm 2006b) reports that three "cultural landscapes" were identified by the Aboriginal stakeholders, comprising the Bora Creek alluvial flats, Goulburn River and "The Drip". The underground mine plan was subsequently revised to reduce impacts to rock shelter sites from underground mining (Hamm 2006b).

3.2.2 Moolarben Stage 1 Open Cut 1 and Main Infrastructure Area Salvage

An Aboriginal Heritage Management Plan (AHMP) was prepared by Hamm (2008b) for the Stage 1 Main Infrastructure Area (MIA) and Open Cut 1 and approved with conditions by the Department of Planning on 29 August 2008.

DP&I approval of an ACHMP for the remainder of the Stage 1 project area, including the areas in which the proposed modification are located, is pending[4].

Heritage mitigation actions required within the MIA and Open Cut 1, an area of approximately 530 hectares, have been completed[5] and are reported by Hamm and Foley (2010), with ongoing protection of sites to which impacts are to be avoided. The salvage activities included:

- A preliminary geomorphological assessment;
- Details of avoidance of impacts to a number of Aboriginal sites;
- Additional surface survey of minor areas for the rail loop expansion, resulting in the identification of three sites (six others were recorded during another investigation for a Modification to the Stage 1 Approval);
- Surface collection (generally within a grid of 20 x 20 metre collection units) of 34 open artefact sites within the MIA and 32 open artefact sites within OC1;

[4] The *Aboriginal Cultural Heritage Management Plan: Moolarben Coal Project Stage 1* has been prepared by South East Archaeology and MCO in consultation with the Aboriginal stakeholders and lodged on 11 March 2013 with the DP&I for approval;

[5] Heritage mitigation measures for Stage 1 outside of the MIA and OC1 are pending completion (post-approval of the ACHMP for this area).

Table 2: Summary of previous Aboriginal heritage investigations within the Moolarben Coal Project Stages 1 and 2.

Author	Year	Type	Details	Report Title
Hamm	2006a	Survey / EA	Survey and assessment for MCP Stage 1. 302 Aboriginal sites reported, comprising 219 isolated artefacts, 63 artefact scatters, 18 rock shelters with artefacts and/or art, one scarred tree and one grinding groove site, along with 14 PADs.	*Moolarben Coal Project - Aboriginal Cultural Heritage Assessment Report*
Hamm	2006b	EA Response	Response to submissions raised in relation to the Stage 1 EA Aboriginal heritage assessment.	*Responses to Issues Raised in Respect of the Moolarben Coal Project Aboriginal Cultural Heritage Assessment Report*
Hamm	2008a	Survey / EA	Survey and assessment for MCP Stage 2. 258 Aboriginal sites (in addition to several previously recorded sites) reported, comprising 102 isolated artefacts and 150 artefact scatters, five rock shelters with artefacts and one grinding groove site, along with 33 PADs.	*Moolarben Coal Project - Aboriginal Cultural Heritage Assessment Report Stage 2*
Hamm	2008b	Management Plan	Aboriginal Heritage Management Plan prepared, only applicable to the Stage 1 Open Cut 1 and Main Infrastructure Area.	*Aboriginal Heritage Plan for MCP Stage 1 Development Areas: Open Cut 1 and Main Infrastructure Area*
Urban Tree Manage-ment Australia	2008	Assessment Report on Scarred Tree	Arboricultural assessment of scarred tree S1MC1. Scar determined to be of non-Aboriginal origin.	*Report: Arboricultural Assessment of Scarred Tree ref. (36-3-0798: S1MC1) at Ulan, New South Wales for Moolarben Coal Project Stage 1*
Hamm	2009a	Survey for Modification	Survey and assessment for MCP Stage 1 modification, involving infrastructure area and proposed water-sharing pipeline.	*Aboriginal Cultural Heritage & Archaeological Assessment for Moolarben Coal Project Stage 1 Infrastructure Area & Proposed Water Sharing Pipeline Modification Project in Support of a Section 75w (2) Approval*
Hamm	2009b	Survey for Modification	Survey and assessment for MCP Stage 1 Northern Borefield Area. 12 Aboriginal sites were recorded, consisting of three artefact scatters (two with PADs) and seven isolated finds concentrated along a broad spur.	*Aboriginal Cultural Heritage & Archaeological Assessment for Moolarben Coal Project Stage 1 Northern Borefield Area*
Hamm	2009c	Summary Report	Executive summary report for Stages 1 and 2.	*Moolarben Coal Project Executive Summary Report*
Coffey Natural Systems	2009	EA Response	Response to submissions raised in relation to the Stage 2 EA Aboriginal heritage assessment.	*Response to Submissions Report - Part A Moolarben Coal Project - Stage 2*
Hamm	2010	Investigation Report	Advice on sites along Murragamba Road in Stage 2, potentially affected by grading works.	*Disturbance Report for Moolarben Coal Project Stage 2*
Hamm and Foley	2010	Salvage Report	Report documenting all the salvage measures undertaken for the Stage 1 OC1 and MIA under the approved AHMP.	*Cultural Heritage Management Report on Moolarben Coal Project Stage 1: Open Cut 1 & Main Infrastructure Area*

Author	Year	Type	Details	Report Title
Kuskie	2010	Investigation Report	Advice on sites along Murragamba Road in Stage 2, potentially affected by grading works.	*Moolarben Coal Project Stage 2: Aboriginal Heritage Advice on Potential Impacts to Aboriginal Sites*
AECOM	2011a	Preferred Project Report	Reassessment of heritage mitigation and management measures for Stage 2 in relation to modifications to the Stage 2 project design.	*Moolarben Preferred Project Report: Aboriginal Archaeological and Cultural Heritage Addendum*
AECOM	2011b	Collection	Collection of artefacts under Modification 7 to Stage 1 project in preparation for construction of the Northern Borefield.	*Archaeological Collection & Excavation: Northern Borefield, Moolarben Coal Operations, Ulan, NSW*
AECOM	2011c	Due Diligence Assessment	Due diligence assessment, including field inspection, of several proposed exploration boreholes in EL6288.	*Due Diligence Assessment of Proposed Exploration Drill Sites EL6288*
AECOM	2012	Due Diligence Assessment	Due diligence assessment, including field inspection, of several proposed exploration boreholes in EL6288.	*Due Diligence Assessment of Proposed Exploration Drill Sites EL6288*
Hansen Bailey	2012	EA Response	Response to issues raised in relation to the Stage 2 EA Aboriginal heritage assessment Preferred Project Report.	*Moolarben Coal Project Stage 2 Preferred Project Report Response to Submissions*
Kuskie	2012a	Due Diligence Assessment	Due diligence assessment, including field inspection, of several proposed geotechnical investigation areas in Stage 2 project area.	*Moolarben Coal Project Stage 2 - Preliminary Report on Aboriginal Heritage Survey of Geotechnical Investigation Areas*
Kuskie	2012b	Due Diligence Assessment	Due diligence assessment, including field inspection, of proposed realignment of Ulan - Wollar Road and Country Energy powerline in Stage 2 project area.	*Moolarben Coal Project Stage 2 - Preliminary Report on Aboriginal Heritage Survey of Proposed Ulan - Wollar Road and Country Energy 66 kV Powerline Realignment*
Kuskie	2012c	Due Diligence Assessment	Due diligence assessment, including field inspection, of proposed Temporary Workers Accommodation facility.	*Moolarben Coal Project: Preliminary Aboriginal Heritage Assessment of Proposed Temporary Workers Accommodation near Ulan, Central Tablelands of New South Wales*
Kuskie	2013a	Due Diligence Assessment	Due diligence assessment, including field inspection, of proposed drilling areas within Stage 1 Open Cut 2.	*Moolarben Coal Project Stage 1 - Preliminary Report on Aboriginal Heritage Survey of Open Cut 2 Drilling Areas*
Kuskie	2013b	EA Modification Assessment	Survey and assessment for Stage 1 Optimisation Modification.	*Moolarben Coal Project - Stage 1 Optimisation Modification, Near Ulan, Central Tablelands of New South Wales: Aboriginal Cultural Heritage Assessment*
Kuskie	2013c	Investigation Report	Report to support Section 90 application for proposed realignment of Ulan - Wollar Road and Country Energy powerline in Stage 2 project area.	*Moolarben Coal Project Stage 2: Aboriginal Heritage Assessment of Proposed Ulan - Wollar Road and Essential Energy Powerline Realignments, Near Ulan, Central Tablelands of New South Wales*
Kuskie	2013d	Due Diligence Assessment	Due diligence assessment, including field inspection, of proposed drilling areas within Stage 2 Open Cut 4.	*Moolarben Coal Project Stage 2 - Preliminary Report on Aboriginal Heritage Survey of Open Cut 4 Drilling Areas*

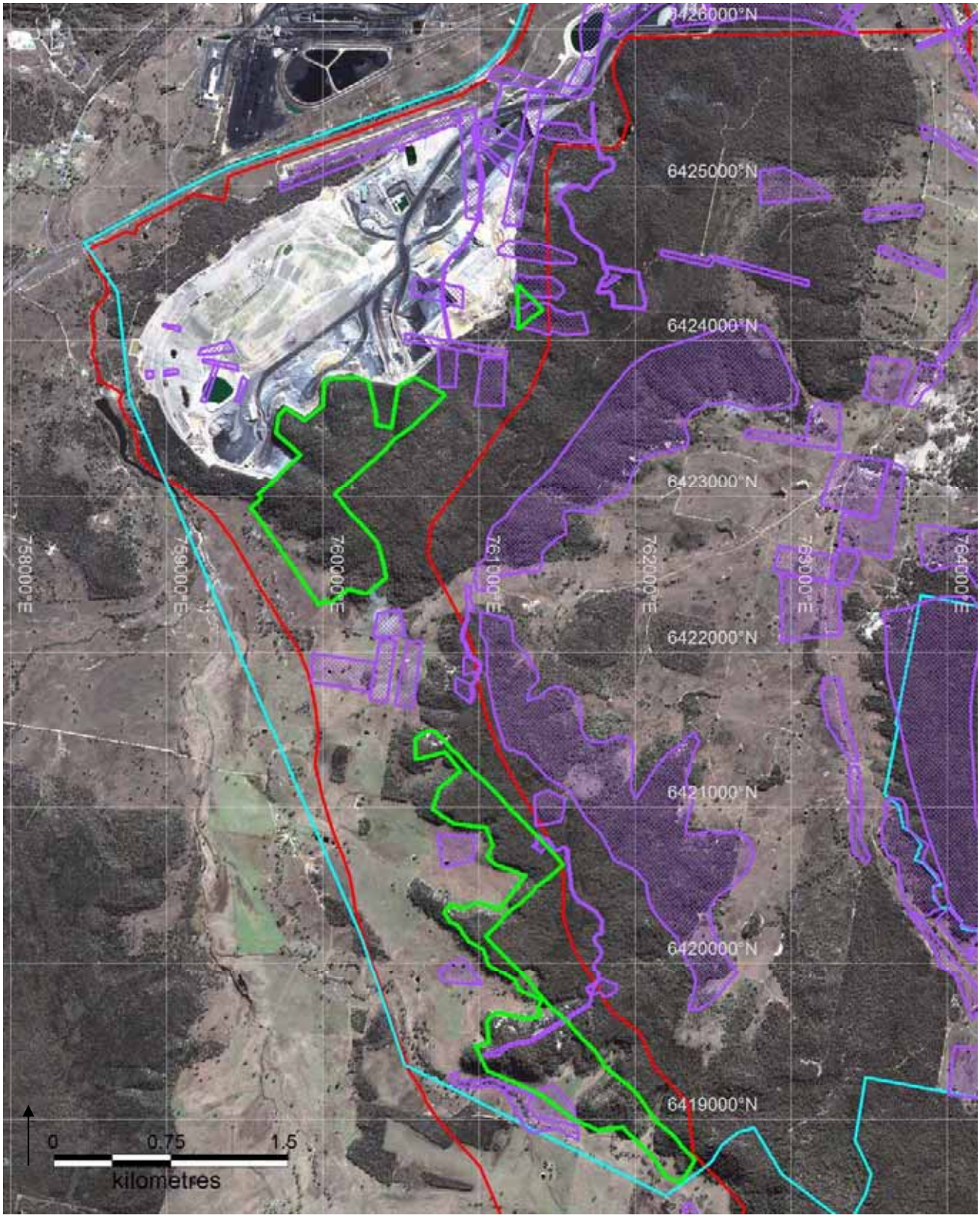

Figure 7: Location of investigation area (solid green border) and adjacent areas within the Moolarben Coal Project Stages 1 and 2 subject to archaeological survey to current OEH standards (purple shading) (aerial photograph courtesy MCO; one kilometre MGA grid; Stage 1 approved project boundary - red; Stage 2 project boundary - blue).

- Surface scrapes (each measuring approximately 50 x 4 metres) at 12 locations in the MIA, 17 locations within the rail loop development and 12 locations within OC1;
- Hand excavation, including three shovel test pit locations within the MIA and two within OC1;
- Assessment of the scarred tree S1MC1 by a professional arborist;
- Artefact analysis and reporting; and
- Recommendations for further implementation of the Stage 1 AHMP conditions and additional recommendations arising from the results of the salvage investigation.

In total, an approximate surface area of 13,700 m^2 was subject to controlled mechanical exposure (surface scrapes) and 271 m^2 excavated by hand in the shovel testing, resulting in the recovery of 2,643 artefacts and identification of 35 new open artefact sites (Hamm and Foley 2010).

All salvage operations undertaken in Stage 1 were completed by archaeologists in conjunction with members of the Aboriginal stakeholder organisations:

- Mudgee Local Aboriginal Land Council (Mudgee LALC);
- Murong Gialinga Aboriginal and Torres Strait Islander Corporation (MGATSIC); and
- Warrabinga Native Title Claimants Aboriginal Corporation (Warrabinga or WNTCAC).

3.2.3 Moolarben Stage 2

The Aboriginal heritage component of the EA for the Stage 2 project area, which measures in total 37 square kilometres, was prepared by Archaeological Risk Assessment Services (Hamm 2008a). The Major Project Application for Stage 2 (MP08_0135), lodged under Part 3A of the EP&A Act, is currently being assessed by the DP&I.

Hamm (2008a) employed a similar survey strategy to Stage 1, using transects that sampled portions of this area over a period of 40 days in late 2006 and early 2007, with additional surveys in June 2008. The survey resulted in coverage of approximately 20% of the Stage 2 project area, with effective survey coverage of about 1.9% (refer to Figure 7 for survey coverage obtained during the Stage 1 and Stage 2 investigations).

Hamm (2008a) identified 258 Aboriginal sites (in addition to several previously recorded sites within the area), comprising 102 isolated artefacts and 150 artefact scatters, five rock shelters with artefacts and one grinding groove site. Hamm (2008a) also reported 33 PADs (associated with the open artefact sites, not rock shelters). A total of 4,825 stone artefacts were recorded during the sample survey. Hamm (2008a) identified the "most concentrated occupation areas" as being:

- The central and southern portions of Murragamba Creek, within 100 metres of the channel;
- Eastern Creek, a tributary of Wilpinjong Creek, within 100 metres of the channel;
- The headwaters of the Wilpinjong North Creek catchment, within 100 metres of the creek; and
- Moolarben Ridge, south of Carr's Gap, and "Trig Station eastern flank of the ridge".

Substantial impacts were anticipated to occur from the open cut mine and infrastructure, with potentially 173 sites affected. Hamm (2008a) recommended a range of mitigation measures for the sites which may be impacted, including surface collection of 133 sites, test excavation and salvage of 34 sites, and intensive recording for six of those sites.

Subsequent to the Stage 2 project application being lodged with the DP&I, modifications to the project arose. These were assessed by AECOM (2011a) and included in a Preferred Project Report (PPR). The investigation primarily involved a reassessment of impacts and management strategies with respect to modifications to the Stage 2 design, with minimal field investigation. Numerous comments were made in relation to the Preferred Project Report. These were addressed in a response to submissions by Hansen Bailey (2012), however approval of Stage 2 is still pending.

3.2.4 Ulan Coal Mine

Comprehensive details of the archaeological investigations undertaken to date at Ulan Coal Mines Limited (UCML), immediately adjacent to Moolarben, are presented by Kuskie (2009). The investigation of the North 1 Panels modification and test excavation of three rock shelter sites within the North 1 Panels are reported by Kuskie (2010b, 2012d).

Haglund and Associates had completed many of the heritage assessments at UCML prior to the year 2000 and South East Archaeology has undertaken investigations at UCML since that date. The key investigations are noted below (refer to Kuskie 2009 for further details):

- Haglund's (1980) initial work involved a preliminary archaeological survey of the Ulan Colliery and No. 2 Underground Mine areas (lease CCL741). This survey resulted in the identification and recording of six sites and numerous isolated finds, largely within the area proposed for open cut mining;
- Further studies were conducted of this area by Haglund between 1980 and 1981 (Haglund 1981a, 1981b). These studies involved the collection of historical and ethnographic information for the region, an intended minimum 50% survey coverage of areas to be affected by the proposed open cut mining and associated works, sampling of sites to be directly impacted by the mining activities, and test excavations of rock shelters and other sites;
- Corkill (1991) surveyed a four kilometre route of a coal conveyor between the ROM stockpile and just east of the Underground Office, and a 400 x 150 metre area to be impacted by mine infrastructure development northwest of the Underground Office, within CCL741. A proposed diversion channel for Ulan Creek was also investigated. Two artefact scatters and one isolated find were located;
- Haglund (1992) undertook further surveys in relation to a preliminary investigation of a northward extension of the No. 3 underground mine, a basalt quarry, a new access road and other infrastructure. Sixteen Aboriginal sites were recorded during these investigations, which included "intensive" survey of the areas of proposed surface facilities and access routes and "reconnaissance" inspection of the underground extension area;
- A shelter site recorded during Haglund's (1992) investigation, ID# 116 (OEH #36-3-177), was subsequently the focus of a salvage excavation (Haglund 1996a), which remains one of the few rock shelters to be excavated within the locality. The salvage excavation was undertaken in February 1996 with a total area of 20 m^2 excavated and 765 artefacts recovered at a density equating to 139 artefacts/m^3;

- Haglund (1996b) recorded eight rock shelter sites and three artefact scatters during a survey of longwall panels 11 and 12 and associated surface infrastructure;

- Edgar (1997) surveyed longwall panels 13-17 in the Spring Gully area in 1996 and recorded an additional 16 sites (to those previously recorded by Haglund), including a number of rock shelters and an ochre quarry;

- The SG5 (Spring Gully 5) rock shelter site (ID# 132), above longwall panel 13, was subject to an extensive salvage excavation in May 1998, prior to undermining. The results were reported by Haglund (2001a, 2001b) and White (2001a, 2001b), with a section on use-wear and residue analysis by Therin (2000). A total of 37 m^2 was subject to salvage excavation and 10,002 stone artefacts recovered. Radiocarbon dates were obtained for a number of charcoal samples, including one of 4,147 ± 60 years Before Present (BP) (*NZA 10766*), which equates to an age calibrated to two standard deviations of 4840 - 4446 calBP;

- Further surveys were undertaken by Haglund from November 1995 to December 1997 as part of the preparation of an EIS for a second longwall mine (Ulan West) and additional lease area, now ML1468 (Haglund 1999a, 1999b). The survey focused on areas susceptible to subsidence impacts and areas of high archaeological potential, but the overall coverage involved a relatively small sample. A total of 59 rock shelters with archaeological deposits were found and at least seven shelters with rock art were also recorded (Haglund 1999a, 1999b). Five rock shelters were associated with grinding grooves, both portable and permanent. Sixteen artefact scatters were located, along with a grinding groove site in an open context;

- Haglund (1999c, 1999d) conducted further investigations for infrastructure in the northern longwall panels, an irrigation area, earthworks at the aircraft landing strip south of Ulan Road and additional highwall trenches and associated water management measures west of the open cut mine (Open Cut Extension). A number of artefact scatters and potential Pleistocene creek terrace deposits were reported;

- Kuskie (2000a) investigated the grinding groove site Bobadeen 5 (BO5, ID# 202), within Longwall Panels 25 and 26 and an offset site, Bobadeen 13 (ID# 323);

- Kuskie and Webster (2001) undertook a comprehensive survey of longwall panels 18-22, with direct coverage of 57.8 hectares (12% of the 498 hectare study area) and 56 open artefact sites, one rock shelter with archaeological deposit and one ochre quarry located;

- A proposed basalt quarry was investigated in 2002 (Kuskie 2002);

- In 2003, as part of a proposal to consolidate existing development consents, South East Archaeology prepared a two volume report (Kuskie and Clarke 2003, Kuskie 2004) focused on the assessment of new works and a comprehensive review of all of the previous heritage assessments at Ulan, along with preparation of a revised site database;

- Further investigations of the area west of the open cut were conducted by South East Archaeology (Kuskie 2004, Kuskie and Clarke 2005a), locating mainly open artefact sites, including evidence of tuff quarries;

- Kuskie and Clarke (2005a) undertook further investigations of the Open Cut Extension and irrigation area, confirming the probable presence of contexts suitable for the preservation of Pleistocene age evidence of Aboriginal occupation;

- Kuskie and Clarke (2005b) undertook a comprehensive survey of longwall panels 23-26 and W1, with direct coverage of 85.8 hectares (10% of the 840 hectare study area) and 52 open artefact sites, seven rock shelters with artefacts, three grinding groove and artefact scatter sites, two other grinding groove sites and one scarred tree being recorded;

- Kuskie and Clarke (2007) undertook a comprehensive survey of longwall panels W2 and W3, with direct coverage of 75.8 hectares (21% of the 351 hectare study area) and 22 open artefact sites, two rock shelters with grinding grooves and artefacts, two rock shelters with grinding grooves, and two rock shelters with artefacts reported (including several previously recorded sites);

- Kuskie (2010b) investigated the North 1 Panels, in relation to a modification to the Continued Operations Part 3A project approval. A comprehensive field survey sampling almost the entire 236 hectare investigation area was undertaken in 2010, with 32 rock shelters with PADs, nine rock shelters with artefacts, one rock shelter with art, one rock shelter with grinding grooves and artefacts and seven open artefact sites recorded;

- Test excavation of rock shelter sites ID# 104, 105 and 1420 within the North 1 Panels was undertaken by South East Archaeology (Kuskie 2012d). A total of 2,896 stone artefacts were retrieved in the three square metres of test excavations, comprising 1,709 artefacts from ID# 104, 904 from ID# 105 and 283 from ID# 1420. An Aboriginal fireplace in ID# 105 was radiocarbon dated to around 3,200 to 3,500 years ago;

- Salvage excavation of rock shelter sites ID# 104 and 105 within the North 1 Panels was undertaken by South East Archaeology in 2012, with excavation of 2 m^2 in ID# 105 and 6.75 m^2 in ID# 104;

- Test excavation by South East Archaeology of 12 rock shelter sites within longwall panels W3 and W4 has been partially completed; and

- Numerous ongoing activities have occurred under the Part 3A approved Heritage Management Plan (reporting pending), including surveys along roads, pipeline corridors, conveyor routes and other infrastructure locations with surface collections of artefact sites where required, surveys of areas previously not subject to inspection, blast monitoring of rock shelter sites, and salvage by collection and excavation of sites within the Open Cut Extension area.

However, the most significant investigation at UCML relates to the Ulan Coal - Continued Operations project (Kuskie 2009), a Part 3A Major Project application for an extension of open cut mining west of the existing pit, underground mining of the Ulan No.3 and Ulan West areas, and new infrastructure primarily associated with the operation of the Ulan West mine, along with continued use and/or modification of existing infrastructure.

For the purpose of the Continued Operations assessment, the study area primarily comprised those areas within the broader project area in which Aboriginal heritage may exist and which may be subject to impacts from the project. This area measured about 5,431 hectares in area and included 5,075 hectares of potential subsidence impacts and 419 hectares of potential surface impacts (including about 63 hectares of potential surface impacts that overlap with the subsidence impact area and are excluded from the combined total).

A field survey was conducted over 104 days in 2008 by archaeologists from South East Archaeology assisted on every day by generally two representatives of each of the four key Aboriginal stakeholder organisations (Warrabinga, MGATSIC, North-East Wiradjuri and Mudgee LALC). The survey involved inspection of 1,888 environmentally discrete survey areas that sampled a total area of about 4,785 hectares (including areas subsequently outside of the study area). Direct (effective) survey coverage of a total area of approximately 609 hectares was achieved. In addition, approximately 8.6% of the study area recently surveyed by South East Archaeology using the same methodology, consistent with current standards, was incorporated into the assessment. The current and recent surveys sampled a total of about 4,770 hectares or 88% of the overall study area (Kuskie 2009).

In total, 709 Aboriginal heritage sites are known to occur in or within about 50 metres of the study area, along with 296 rock shelters with potential archaeological deposits (PADs). These sites comprise 558 open artefact sites, nine open grinding groove sites, 128 rock shelters with artefacts, art and/or grinding grooves, five scarred trees, five stone arrangements, two ochre quarries, a waterhole/well and a combined groove and artefact scatter site. The Aboriginal representatives disclosed a number of associations of contemporary significance and identified the contemporary value of the archaeological evidence (Kuskie 2009).

During the survey 8,774 stone artefacts were recorded in detail. In a broader analysis area, where a total of 9,373 artefacts had been recorded, quartz is the overwhelmingly most common material used (72.8% of the combined assemblage). Tuff is the next most common material (11.9%) of the combined analysis area assemblage, followed by a low frequency of chert (5.6%) and very low frequencies (less than 3%) of other materials. Flakes are the most commonly occurring lithic type in the combined analysis area assemblage (40.3%). Flake portions (distal, medial, proximal and longitudinal) account for 19.1% of the combined assemblage and lithic fragments, synonymous with "flaked pieces", 19.3%. These items represent debris from stone knapping. Formal tool types are evidenced within several of the artefact categories (eg. axe, bondi point, geometric microlith, grindstone and hammerstone), but occur in low frequencies (Kuskie 2009).

A detailed occupation model for the Ulan locality and a predictive model of site location were devised and reassessed during the project. Overall, artefacts occur at a very low mean density of 0.0176 per square metre of effective survey coverage within the analysis area. The spatial distribution and nature of evidence is largely consistent with background discard, interspersed by occasional focalised areas of higher artefact density where activities or repeated activities occurred. This evidence indicates that Aboriginal utilisation of the study area was generally of a low intensity. In large part this probably relates to the limited presence of higher order watercourses within the analysis area (being situated on and around the crest of the Great Divide) (Kuskie 2009).

The significance of the Aboriginal heritage evidence was assessed. In overall terms, 74.8% of the sites were assessed as being of low significance within a local context, with 10.7% of sites assessed as being of low to moderate significance, 6.3% of moderate significance, 4.9% of moderate to high significance and 3.3% of high significance. Five sites were assessed as potentially being of significance within a regional context, four of them stone arrangements and one a large artefact scatter site at Old Ulan Village (Kuskie 2009).

The impacts of the project on Aboriginal heritage, both direct impacts from surface works, and indirect impacts to the ground surface through underground mining induced subsidence, were assessed. The greatest potential impact, both in terms of site numbers and significant sites, is from underground mining induced subsidence. Approximately 35% of the total number of sites in the study area (primarily rock shelters) may be subject to subsidence impacts (greater than 10% probability of perceptible impacts), prior to the implementation of mitigation measures. In the absence of appropriate management and mitigation measures, it was concluded that the impacts of the project on Aboriginal heritage will be high within a local context, but relatively low within a regional context (Kuskie 2009).

A range of mitigation and management strategies were considered and recommended strategies presented for the 1,005 Aboriginal sites or PADs within the study area/potential impact area (Kuskie 2009). The key management and mitigation measures were incorporated within a Heritage Management Plan, subsequently approved by the DP&I, that guides the management of the Aboriginal heritage resource *in lieu* of a Section 90 Aboriginal Heritage Impact Permit.

3.2.5 Other Relevant Regional Investigations

In the broader Ulan region, there have been several relevant archaeological investigations, as listed below:

- Initial surveys in the Gulgong - Ulan - Cassilis area were undertaken by the Australian Museum in the period 1965 - 1967. A small rock shelter, BOB/1, was excavated in 1967, with the results reported by Moore (1970). A relatively high total of 16,609 artefacts were recovered from the small shelter, at a density of around 4,260 artefacts/m^3. Moore (1981) concluded that occupation of the site began about 6,000 years BP;

- Pearson (1981) undertook a broad-ranging PhD study of Aboriginal settlement in the Bathurst - Mudgee - Wellington region and more recent non-indigenous settlement. This included sample surveys for Aboriginal sites in various locations, including the "Mudgee - Cooyal area", extending across the Moolarben, Cooks Gap and Cooyal localities, along with test excavation of the Botobolar 5 rock shelter;

- McBryde conducted an archaeological survey that sampled portions of an area of 5,000 km^2 in the region of Dunedoo, Gulgong, Wollar and Coolah. Thirty Aboriginal heritage sites were located during this investigation, which was part of research focusing on rock art within the western slopes of the New England region (Haglund 1981a);

- Haglund (1985) undertook a desktop assessment of the Aboriginal heritage resources of Mudgee Shire;

- Haglund (1980b, 1981c) undertook a heritage study for the Kerrabee Dam proposal, across much of the area that is now conserved as the Goulburn River National Park. A total of 343 Aboriginal sites were recorded, including rock shelters with deposits and/or art, artefact scatters and grinding grooves;

- Purcell (2002) undertook a broad regional cultural heritage study of the Brigalow Belt South Bioregion, which stretches west from the Ulan area to Dubbo and north to Moree and measures over 52,000 square kilometres in area. In a wide-ranging project, over 110 oral history interviews were conducted, 60 traditionally used plant species documented, extensive landform mapping was undertaken, and 1,110 Aboriginal sites were located and recorded;

- OzArk (2005) conducted a survey of the Wollar to Wellington 330 kV electricity transmission line, which passes through the Moolarben and Ulan locality, with 26 open artefact sites located; and

- At Wilpinjong Coal Mine, immediately east of Moolarben, Navin Officer (2005) undertook surveys in 2004 and 2005, with 235 Aboriginal sites recorded. These included several artefact scatters with over 500 artefacts, numerous other artefact scatters and isolated artefacts, rock shelters with artefacts, PADs and/or art and scarred trees, along with places of other cultural significance. Salvage of sites has subsequently occurred, along with additional surveys and the baseline recording of rock art sites (Navin Officer 2006a, 2006b, Kayandel 2006).

3.2.6 Synthesis

Several archaeological surveys and salvage programs have been undertaken within portions of the current investigation area, or in the immediate surrounds, primarily in relation to the Moolarben Stage 1 and Stage 2 projects (Hamm 2006a, Hamm 2008a, Hamm and Foley 2010). However, the extent of existing archaeological survey coverage of the current investigation area is very limited, with only small areas having been subject to direct sampling (refer to Figure 7). Prior to the conduct of the present investigation, one open artefact site and two rock shelters with PADs were known to occur within or immediately adjacent to the investigation area (refer to Figure 6, Table 1 and Appendix 1).

Archaeological investigations at Moolarben, Ulan and elsewhere in the locality have resulted in the identification of a large number of rock shelter sites with archaeological deposits and/or rock art or grinding grooves, along with many shelters with potential deposits. The large numbers of shelter sites partly reflects the focus of the underground mining related surveys, which have predominantly targeted sandstone rock formations within elevated terrain. These sites have been identified in isolated rock formations and more commonly along more extensive rock formations. The shelter sites vary widely in terms of topographical context (eg. distance to watercourse, size/order of watercourse and aspect), contents, nature (eg. size of shelter and extent of habitable floor area) and potential (eg. depth and extent of potential artefact deposits). Apart from several major sites such as the "Hands on Rock" complex adjacent to the project area, rock art occurs relatively infrequently in the recorded shelters and tends to comprise red ochre hand stencils (Kuskie 2009).

Numerous open artefact occurrences have also been identified in the locality. The numbers of artefacts vary from minor scatters and numerous isolated finds, for which details have not often been recorded in earlier studies, to dense concentrations of lithic material with hundreds of artefacts present. A conservative conclusion is that artefact evidence is distributed in a widespread manner across the locality, in generally low densities equating to background discard (manuport and artefactual material which is insufficient either in number or in association with other material to suggest focused activity in a particular location; *cf*. Rich 1993, Kuskie and Kamminga 2000), with occasional higher densities representing more focused occupation (eg. encampments, or events of longer duration or involving larger numbers of people) or repeated occupation in favourable environmental contexts. Such contexts appear to include elevated, well-drained and low gradient flats, terraces, spur crests, ridge crests and simple slopes adjacent to watercourses, particularly higher order watercourses and/or multiple subsistence resource zones. The identified artefact evidence tends to predominantly comprise items associated with non-specific stone flaking, on quartz and to a lesser extent tuff, chert and other stone materials. Other activities are also represented, such as microblade and microlith production, discard of microliths and discard of non-microlith tools, many of which are associated with working of plant and/or animal materials, food preparation or tool maintenance (Kuskie 2009).

Grinding groove sites in the Ulan locality are typically located in sedimentary bedrock along watercourses, but also occur on open surfaces of sandstone in other contexts (eg. simple slopes) and on smaller sandstone slabs or surfaces in rock shelters.

Other Aboriginal site types have been recorded in low numbers within the Ulan locality, including scarred trees, ochre quarries, lithic quarries, stone arrangements and a possible burial. Sites of traditional or historical cultural significance to Aboriginal people (excluding the contemporary significance attached to the site types noted above), have also been reported within the locality.

Excavations of rock shelters provide valuable information about the nature and chronology of Aboriginal occupation in the locality. Moore's (1970, 1981) investigations of the Bobadeen 1 site provide a basal date of about 6,000 years BP for the locality, while Pearson (1981) recovered an occupation date of 5,500 years BP from a shelter at Botobolar, towards Mudgee. Nevertheless, a number of contexts have been identified within the locality that could host older evidence of Aboriginal occupation extending back into the Pleistocene period (ie. over 10,000 years of age), including creek terrace deposits covered by colluvial slopewash and rock shelter sites.

3.3 Local Aboriginal Culture

The investigation area lies within the north-eastern portion of the territory of the Wiradjuri people as defined by Tindale (1974) and Horton (1994, 2000), close to the boundary with the Kamilaroi to the north, and the Geawegal and Wonnarua further to the east (refer to Figure 8).

Pearson (1981:75-76) inferred from the ethnohistorical evidence of Gunther, Lawson, Cox and others, that the upper Macquarie was inhabited by large localised groups of Aboriginal people, who in the normal course of life were divided into small groups of up to 20 people. These groups could easily come together for short periods for subsistence, ceremonial or social reasons and form larger groups of 80 to 150 people.

Pearson (1981:81) inferred that the Wiradjuri in the Upper Macquarie River region was probably subdivided into three groups, one centered in the general Mudgee-Rylstone area and the others in the general areas of Bathurst and Wellington. Haglund (1999a) noted that these groups may have comprised several clans each, with descendants of one of at least two clans in the Mudgee-Rylstone group still living in the locality. Pearson's (1981:81a) map of the hypothetical group distributions places the Mudgee-Rylstone group in the vicinity of the Ulan locality, albeit on the fringe of other (probable Kamilaroi) territory to the north.

A wide variety of subsistence resources were available in the past to the local Aboriginal people. Ethnohistorical and other evidence suggests that the diet of the local Aboriginal people would have included amongst other foods, possum, kangaroo, wallaby, wombat, kangaroo rat, platypus, lizards, snakes, goanna, tortoise, fish, mussels, crayfish, various birds, insects, and various plants (Pearson 1981:335). More than 20 species of native mammals, various reptiles and over 100 species of native birds have been recorded at Ulan, many of which would have been utilised as food resources.

Predominantly within the immediate vicinity of the area that is the subject of the present investigation it was the subsistence resources of forest and woodland environments that were available for exploitation. Moolarben Creek, where more reliable potable water and subsistence resources would have been available, lies at least 430 metres west of the Open Cut 1 Extension Area, but within 50 to 100 metres of the western margin of the Open Cut 2 Extension Area.

The material culture of the local Aboriginal population would have included a range of items related to subsistence, cultural and social activities and shelter. However, in the archaeological record, few of these items are preserved. Stone, bone and shell are the materials most frequently represented in archaeological sites.

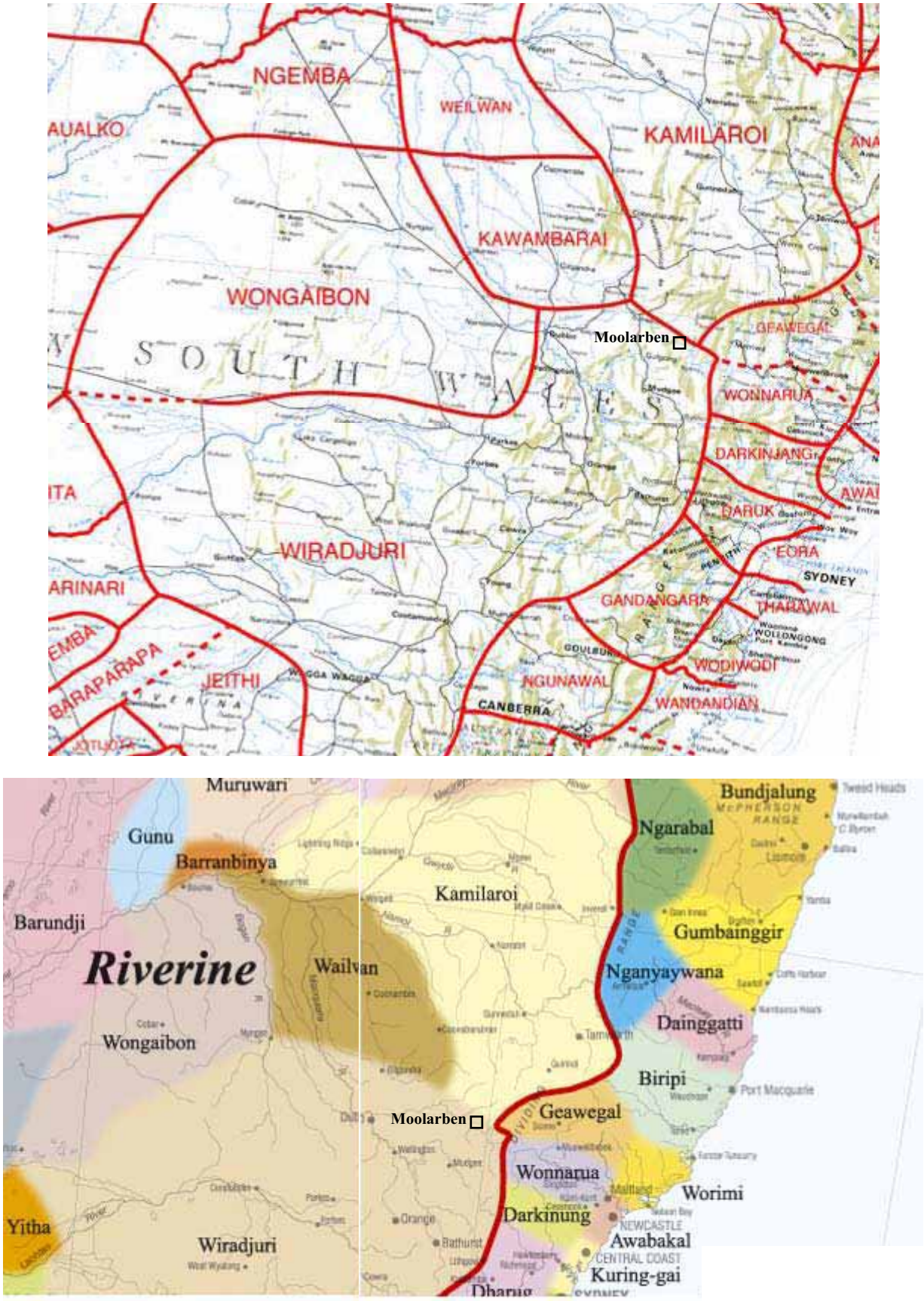

Figure 8: Cultural group boundaries in the Ulan locality (Tindale 1974 above and Horton 2000 below).

The influx of non-indigenous settlers into the region had profound effects upon the Wiradjuri, as the newcomers sought to gain the land for agricultural and pastoral utilisation and later for mining the valuable mineral resources present (Clayton and Barlow 1997). In the Ulan area, fighting between non-indigenous and Aboriginal people occurred in the 1820s as settlers sought to establish grazing runs, with hostilities peaking between 1824 and 1826 (Haglund 1999a). The dramatic increase in the number of non-indigenous settlers around Mudgee, Bathurst and Gulgong from the 1850s to the 1870s, during the gold rush, resulted in the displacement of the Aboriginal people and further incidents of warfare (Burless 1997).

Despite all this, the Wiradjuri people survived. A vibrant Aboriginal population remains in the region today and takes an active interest in the management of their heritage (refer to Section 6 for details of consultation with the Aboriginal community in relation to the present assessment).

3.4 Occupation Model

In order for any investigation to contribute effectively to the management of the heritage resource, the following key elements of a research design (*cf.* Boismier 1991) are essential:

1) Identification of the specific environmental and cultural characteristics of the area;

2) Construction of a model of Aboriginal occupation for the locality;

3) Definition of the expected nature and distribution of evidence;

4) Formation of a methodology to test the predictive model and relevant research questions, in consideration of the expected nature and distribution of evidence; and

5) Analytical techniques for the evidence recovered that are appropriate to address the research questions and project objectives.

The environmental context of the investigation area has been outlined in Section 2, and the proposed methodology and analytical techniques are discussed in Section 4. The model of Aboriginal occupation for the locality and expected nature and distribution of evidence are discussed below and in Section 3.5.

Several occupation models or elements thereof have been proposed during archaeological studies at Ulan, primarily to explain the results from individual sites (eg. Edgar 1997, Haglund 1999a, 1999d, Witter 1994). These have tended to be narrowly focused on particular aspects of Aboriginal occupation, rather than on the development of a broader model of Aboriginal occupation for the Ulan locality.

More recently, White (2001a) has discussed broader regional models of occupation (eg. Attenbrow 1987, Hiscock 1994, McDonald 1994) in relation to the ID# 132 salvage excavation at UCML, particularly with respect to changes over time. White (2001a:8-9, 144-146) presented a revised model of the Eastern Regional Sequence for the region:

- *Pre-Bondaian phase:* The region was visited sporadically from the end of the Late Pleistocene, probably by small groups of highly mobile people. Tool-kits are inferred to have been highly portable, but inter-site variation is expected in relation to the nature of locally available stone materials and tasks performed, potentially along with the duration and nature of occupation (eg. rare/occasional use of a site or more frequent use);

- *Early-Bondaian phase:* Occupation of the region increased in the Early Bondaian, but people remained highly mobile. Backed artefacts were more numerous than other retouched and/or utilised tools and were used for a variety of on-site and off-site tasks. Figurative pigment art and possibly open engraved art were developed at this time with increased social interaction (*cf.* McDonald 1994:348);

- *Middle-Bondaian phase:* Occupation of the region was well established, and people remained highly mobile. Backed artefacts were an integral part of the toolkit and still outnumbered other retouched and/or utilised tools. Backed artefacts were produced *en masse*, particularly in or in proximity to more open valleys. The high discard rate in shelter sites was probably a result of backed artefact production rather than more intensive occupation. McDonald (1994) identifies that pigment and engraved art were important for negotiating increased social interaction during this phase, and backed artefacts and their production techniques may also have related to social factors; and

- *Late-Bondaian phase:* Group mobility decreased markedly, with people occupying residential sites for longer periods of time, although not semi-permanently or in a sedentary manner. Toolkits changed (probably relating to a shift in emphasis towards the production and use of wooden items), with less discard of backed artefacts, increased discard of edge-ground artefacts, eloueras and grindstones, and increased use of bipolar flaking. McDonald (1994) argues that people stopped using shelters as residential sites (leading to a decline in artefact density), but began to live in larger groups and as such, preferred open site locations for residential camping, using shelters only to escape wet weather or on short-term trips by small numbers of people. White (2001a) however identifies that at ID# 132 lower artefact densities were also a result of the way stone technology was organised at the site.

Kuskie and Clarke (2005b, 2007) proposed several elements that may relate to a general model of occupation for the Ulan locality. Kuskie (2009) further developed this model and identified the nature of evidence required to test the model, so that ultimately through field survey and excavation the model could be refined.

The general model of occupation for the Ulan locality is outlined below (Kuskie 2009) with the nature of expected *archaeological* evidence to test the individual elements specified in *italics*:

- Members of the north-eastern clan of the Wiradjuri, that was centered around the Mudgee-Rylstone area, predominantly occupied the study area. Interactions with and visitation from members of neighbouring cultural groups (particularly the Kamilaroi) may also have sporadically occurred;

  - *No specific evidence expected of particular cultural groups.*

- Occupation primarily occurred within the past 5,000 years, but may have extended as far back as 30,000 - 40,000 years BP (although it is uncertain that any evidence for this may remain);

  - *Charcoal in a cultural context may be radiocarbon dated or other forms of dating may be used to establish the age of occupation.*
  - *Specific artefact types may also provide evidence on the age of occupation.*

- Occupation was predominantly focused on the relatively more abundant and diverse resource rich zones within the north-east Wiradjuri territory (eg. the junction of multiple resource zones) particularly along higher order watercourses (eg. the Goulburn River and Talbragar River). Within these *primary resource zones*, such occupation could include nuclear/extended family base camps, community base camps and occasional larger congregations of groups where resources permitted. Encampments in more favourable locations (eg. abundant resources and water) may have been the subject of stays of longer duration and more frequent episodes of occupation than in other areas (eg. *secondary resource zones*, refer below);

    - *Substantially higher counts and densities of artefacts and numbers of activity areas, along with a greater range of stone material and artefact types may occur in the primary resource zones than in other areas.*
    - *Encampments in more favourable locations used for longer durations and more often may exhibit greater superimpositioning of activity areas, greater quantity and density of evidence, and evidence of different episodes in the form of in situ deposits with stratified or vertically separated evidence of activity events and datable material.*
    - *Refer below for discussion of expected evidence for different occupation types.*

- Outside of the primary resource zones sporadic occupation of *secondary resource zones*, focused on the watercourses and swamps/wetlands, particularly within close proximity of higher order watercourses and associated flats and terraces (eg. the higher order portions of Moolarben Creek, etc.). These zones were utilised for encampments by small parties of hunters/gatherers and nuclear/extended family groups during the course of the seasonal round. There was a strong preference for camping on level ground, adjacent to reliable water sources and more abundant subsistence resources. A greater range and frequency of activities were undertaken at the encampments, rather than in the surrounding landscape. Camp sites near the watercourses were occupied by these small groups of people for varying lengths of time (but of typically short duration), during both the course of the seasonal round and in different years. Occupation of these camp sites was predominantly sporadic, rather than continuous;

    - *Moderately higher counts and densities of artefacts and numbers of activity areas, along with a relatively broad range of stone material and artefact types may occur in the secondary resource zones than in other areas, but to a much lesser degree than in the primary resource zones.*
    - *Refer below for discussion of expected evidence for different occupation types and identifying whether occupation is sporadic or continuous.*

- Occupation outside of the primary resource zones and secondary resource zones tended to involve hunting and gathering activities by small parties of men and/or women and children, along with transitory movement between locations and procurement of stone materials. However, the utilisation of these areas (eg. typically simple slopes, ridge crests, spur crests and lower order watercourses) was far less intense than along the higher order watercourses or swamp margins where encampments were situated and potable water and more abundant resources present. These areas outside of the primary and secondary resource zones were probably typically exploited during the course of the normal daily round by inhabitants of encampments located in the primary or secondary resource zones, foraging within an area of up to ten kilometres radius from their campsites;

    - *Evidence of low intensity occupation that may include low to very low artefact counts and densities and low numbers of activity areas, along with dates/stratigraphy indicating sporadic occupation over time, not continuous occupation.*
    - *Refer below for discussion of expected evidence for different occupation types.*

- Occupation outside of the primary and secondary resource zones also involved special purpose journeys (eg. to procure stone or ochre from a known source or to access an area for ceremonial/spiritual purposes) and non-secular activities (eg. ceremonial activities);

    - *Evidence of lithic or quarry sites may occur at stone/ochre sources. More abundant evidence at a particular location may indicate repeated and special-purpose visits, as may the absence of evidence associated with other occupation types.*
    - *Refer below for discussion of expected evidence associated with ceremonial activities.*

- Thus, occupation extended over the entire tribal territory, with varying intensities and involving different activities, and occurring at different times of the year and different periods within the overall time-span of occupation;

    - *Evidence of occupation at different times of year may be tested only if specific seasonal plant/food evidence and/or associated tool types involved in their processing can be identified in association with occupation.*
    - *Identification of different episodes of occupation over time would require in situ deposits with stratified or vertically separated evidence of activity events and datable material.*

- Activities such as food procurement (hunting, gathering and land management practices such as burning-off), food processing, food consumption, maintenance of wooden and stone tools, production of stone tools (including systematic production of types such as backed artefacts, as well as hafting of implements and casual, opportunistic production of other items on an as needed basis), production of wooden tools and other implements, procurement of stone, erection of shelters, children's play, ceremonial activity, spiritual activity, human burials and social and political activity were among the types of pursuits engaged in by the local Aboriginal people across the tribal territory;

    - *Food procurement (including hunting, gathering and land management): minimal evidence expected for most types of food procurement, apart from the presence of stone artefacts such as eloueras, wooden implements where preserved, such as digging sticks, or food refuse (eg. shell and bone) in sites.*
    - *Food processing and consumption: evidence expected includes tools with specific use-wear/residues on cutting/chopping/pounding edges, specific tools that are related to processing certain foods (eg. eloueras, seed grinding slabs), evidence associated with hearths or ovens, and food refuse (eg. shell and bone) in sites.*
    - *Production and maintenance of wooden implements: expected evidence includes stone and shell tools with design and/or use-wear/residues consistent with working wood, and the presence of wooden implements in sites.*
    - *Production of stone tools: evidence expected includes hammerstones, anvils and most abundantly knapping debitage (eg. cores, flakes, flake portions, microblades, etc), along with some of the finished tools themselves.*
    - *Production of backed artefacts: evidence expected includes finished microliths (unused), bondi point preforms, backing flakes, chimblers/hammerstones, high quantities of debitage including a high frequency of elongated flakes (microblades);*
    - *Maintenance of stone tools: expected evidence includes cutting-edge rejuvenation flakes (eg. flakes from utilised edges of eloueras or other tools), portable whetstones, and axe-grinding grooves in sandstone.*
    - *Procurement of stone: presence of stone sources and evidence for procurement at those sources (lithic quarry sites).*
    - *Ceremonial activity: presence of ochre in sites, and evidence of ceremonial sites (bora grounds, stone arrangements, carved trees, rock engravings, etc).*
    - *Spiritual, social and other activity: presence of ochre in sites, evidence of ceremonial sites (bora grounds, stone arrangements, carved trees, etc) and rock art and engravings.*

- Activities varied in frequency and occurrence within the landscape (and between the different occupation site types), probably in relation to numerous variables such as topography, distance to resource zones, distance to water, aspect, slope and cultural choice. However, few activities will be evident within the archaeological record other than those involving the use of stone, or where preservation conditions permit, other materials such as bone, shell and wood. The majority of evidence within an archaeological context will relate to the reduction of stone, but some evidence will exist of hearths, food processing, food procurement and ceremonial and other activities;

    - *Predominance of stone artefacts as the surviving physical evidence of occupation.*
    - *Occasional evidence of hearths and other activities (refer elsewhere in this section).*

- The stone material quartz was favoured for stone working activities, largely because of its local availability. Tuff was also used, along with chert in lower frequencies, with the relatively intensity of use of each material dependent upon the proximity of local colluvial and alluvial and terrestrial outcrop sources;

    - *Predominance of quartz within the artefact assemblages. Evidence of nature and location of stone sources and attributes on individual artefacts that can potentially be linked to sources (eg. cortex, size, extent of reduction).*

- Stone was typically procured during the course of normal daily and seasonal movements, without the need for special purpose trips. The conservation of the most commonly used stone materials was not a priority. However, high quality less commonly utilised materials may have been procured from more distant sources by special purpose journeys and/or trade;

    - *Presence of stone sources and evidence for procurement at those sources (lithic quarry sites). More abundant evidence at a particular location may indicate repeated and special-purpose visits, as may the absence of evidence associated with other occupation types. Particular stone materials may be traced by chemical/physical tests.*

- Casual and opportunistic reduction of stone or selection of flakes to meet requirements on an 'as needed' basis was a widespread occurrence. Suitable flakes (sometimes after being retouched) were used in domestic tasks such as fashioning or repairing a wooden implement, while a higher proportion of flaked products were simply discarded at the site of their manufacture, without use;

    - *Limited evidence of activity areas associated with microblade/microlith production, and presence of artefacts relating to non-specific knapping with a low proportion of items possessing retouch or use-wear may be expected.*

- A low frequency of items was knapped using bipolar technology. This technology is largely, although not entirely, restricted to the reduction of quartz. It is likely that this technology was mainly employed to reduce small pebbles rather than as strategy to prolong the use-life of existing cores;

    - *Presence of artefacts associated with bipolar knapping in relatively low frequencies, and mostly on quartz.*

- Exposed sandstone bedrock was used for the shaping and/or maintenance of ground-edge hatchets. This activity may have been occasional and incidental to transitory movement or short-term occupation during the course of the normal daily hunting/gathering round, rather than a result of special purpose visits;

- *Sites with grinding grooves may exhibit evidence consistent with transitory movement or hunting/gathering without camping. Sites with extensive evidence of grinding and limited evidence of other activities will not occur.*

- Plant foods were processed and consumed at temporary hunter/gatherer encampments, at family base camps, and where larger groups of people congregated, as well as at the sites of procurement. A range of plant resources was available in the region. Women played a much larger role than men in obtaining and processing plant foods;

    - *Evidence relating to food processing and consumption occurring in association with evidence representative of these site types.*

- Animal foods were processed and consumed at temporary hunter/gatherer encampments, at family base camps, and where larger groups of people congregated, as well as at the sites of procurement. Men hunted for larger game, while women played a key role in obtaining smaller game.

    - *Evidence for consumption and processing of animal food located in association with evidence interpreted as representing these occupation types.*

The proposed model of occupation for the Ulan locality (Kuskie 2009) has been derived from archaeological, ethnographic, ethnohistorical and anthropological information. However, as these data are generally scant and subject to biases and other constraints, the proposed model is highly inferential and speculative in nature and subject to reassessment by more detailed future investigations throughout a wide range of environmental/cultural contexts in the region.

The investigation area for the proposed modification is located in contexts that do not conform to primary or secondary resource zones. The area is generally of moderate to steep gradient, and distant from higher order watercourses (notwithstanding that the western margin of the Open Cut 2 Extension Area approaches to within 50 to 100 metres of Moolarben Creek, where more reliable potable water and subsistence resources would have been available). According to the modelling above, occupation of the investigation area is therefore more likely to have related to hunting and gathering activities, along with transitory movement between locations and procurement of stone materials, and have been of a generally low intensity.

In general terms, the nature of occupation at each site within the investigation area could represent a variety of circumstances (Kuskie and Kamminga 2000), for example:

- Transitory movement;
- Ceremonial activity;
- Hunting and/or gathering (without camping);
- Camping by small hunting and/or gathering parties;
- Nuclear/extended family base camp;
- Community base camp; or
- Larger congregation of groups.

The evidence could represent a single episode or multiple episodes of one or more of the above types of occupations. The episodes of occupations could have occurred at different times over the entire time-span of occupation in the region. Each episode of occupation could also have been for a different duration of time.

Unless the archaeological evidence for individual activity events is readily identifiable, it can be highly problematic to determine the types of occupation, number of episodes, and times and duration represented by evidence at a particular site. Suitable circumstances are rarely present in open sites, due to mixing of evidence by post-depositional processes and the superimpositioning of evidence caused by repeated episodes of occupation.

Listed below is a brief description of the nature of each type of occupation and the material circumstances or evidence that may relate to such occupation types within the present investigation area (*cf.* Kuskie and Kamminga 2000):

Transitory movement:

- May occur when an individual or group of people are moving between base camps, or from a campsite to resources or a ceremonial or other special purpose site;
- Duration would be less than a day and probably less than a few hours;
- Total numbers of people would generally be relatively low;
- Could occur on most topographical units and classes of slope, but possibly more frequently on ridge and spur crests and along watercourses and valley flats;
- Could occur in any type of rock shelter (ie. any size, topographic location, or distance from water source) where shelter may be sought from inclement weather;
- Proximity to potable water was probably not important;
- Proximity to food resources was probably not important;
- Evidence may represent accidental discard, repair of hunting or gathering equipment, children's play or knapping activity;
- Quantity and density of evidence and range of artefact and stone types are expected to be low, consistent with 'background discard', with few discrete activity areas unless repeated episodes have occurred causing superimpositioning;

Ceremonial activity:

- May occur when a group of people gathers at a particular location to perform a ceremony;
- Evidence may be present of ceremonial site features such as earthen rings or stone arrangements, or ochre;
- Evidence of large encampments (similar to that expected for the 'larger congregation of groups' listed below) may be present nearby, including in locations with an aspect towards the ceremonial site;

Hunting and/or gathering (without camping):

- May occur when an individual, or more likely a small group of closely related people, engage in hunting activities (more likely to be a party of men) or gathering activities (more likely to be women and children);
- Duration would be less than a day, with people returning to a base to sleep;
- Total numbers of people would be relatively small;

- Would be expected to occur where food resources were available, which for different foods may be a seasonal or annual occurrence;
- Could occur in any type of rock shelter (ie. any size, topographic location, or distance from water source) particularly where shelter may be sought from inclement weather;
- Proximity to potable water was probably not important;
- Evidence may represent accidental discard, loss during use, repair of hunting or gathering equipment, children's play or knapping activity;
- Quantity and density of evidence and range of artefact and stone types are expected to be low, consistent with 'background discard', possibly with a few discrete activity areas. Loss or discard of specific tool types may be a useful indicator (particularly items with use-wear/residue that are not in association with evidence of their manufacture or maintenance). Repeated visits to particularly food sources may cause a build up of unrelated evidence over a period of time in a specific location.

Camping by small hunting and/or gathering parties:

- May occur when an individual, or more likely a small group of closely related people, that are engaged in hunting activities (more likely to be a party of men) or gathering activities (more likely to involve women and children) camp overnight near the resource being procured;
- Duration would be one or several days;
- Total numbers of people would be relatively small;
- Would be expected to occur close to where food resources were available, which for different foods may be a seasonal or annual occurrence;
- Would be expected to occur in open contexts and also in rock shelters, particularly relatively larger rock shelters with sufficient habitable floor areas for activities and sleeping. Aspect of the rock shelter towards the rising or setting sun may have been important;
- Proximity to potable water probably was important, although temporary sources may have been sufficient;
- Evidence may represent accidental discard, repair of hunting or gathering equipment, children's play, stone knapping activity, food processing or temporary camp fires;
- Quantity and density of evidence and range of artefact and stone types are expected to be low to moderate, and distinguishable from 'background discard', with at least several activity areas. A reasonably broad range of artefact and stone types may be discarded (although not as diverse as expected at a base camp). Items likely to be cached for future use at a base camp, or unlikely to be carried around on a hunting or gathering journey (eg. grindstones) are not expected to occur. Time-consuming activities like construction and use of ovens or heat treatment pits are also unlikely to have occurred.

Nuclear/extended family base camp:

- May occur when a single nuclear family or extended family camps together;
- Duration uncertain but probably dependent on availability of food resources and potable water in the locality;

- Total numbers of people would be relatively small;
- In open sites, probably situated on level or very gently inclined ground, close to potable water and close to food resources;
- In rock shelters, probably occurred in shelters close to potable water (with greater potential near higher order sources), close to food resources and only in large rock shelters with sufficient habitable floor area for activities and sleeping. Aspect of the rock shelter towards the rising or setting sun may have been important;
- The encampment area in open contexts may consist of a several small huts, dispersed in a spatial patterning depending on the social mix of the people;
- Evidence may represent accidental discard, repair of equipment, children's play, stone knapping activity, food processing, campfires, heat treatment of silcrete and manufacturing of tools;
- Quantity and density of evidence and range of artefact and stone types discarded are expected to be high. Discrete activity areas should occur. Repeated visits to a camp site or stays of long duration may cause a build-up of evidence over a period of time in a specific location. Items are likely to have been cached for future use at a base camp. Specific artefact indicators include grindstones. Evidence of casual knapping and production of tools is expected to be common. The significant differences with a temporary hunter/gatherer's camp include the possible presence of features such as heat treatment pits and ovens, broader range of artefact and stone types, presence of specific artefact indicators, higher density of evidence (reflecting more activity and longer duration of use) and relatively common evidence for the production of tools.

Community base camp:

- May occur when a number of nuclear families camp together;
- Duration uncertain but probably dependent on availability of food resources;
- Total numbers of people could be relatively large (30+);
- Probably situated on level or very gently inclined ground in open contexts;
- Probably situated close to potable water;
- Probably situated close to food resources (eg. conjunction of wetlands and forest zones);
- The encampment area may exceed 100 m^2 and consist of a number of individual groups and huts, dispersed in a spatial patterning depending on the social mix of the groups;
- Quantity and density of evidence and range of artefact and stone types discarded are expected to be high. Spatially discrete evidence of individual camp sites would be expected (if the resulting evidence has not been affected by disturbance or superimpositioning). Items may not have been cached for future use. Specific artefact indicators include grindstones, relatively more common evidence of food processing and possibly ochre. Evidence of casual knapping and production of tools is expected to be common. However, features such as heat treatment pits may not occur.

Larger congregation of groups:

- May occur in relation to special events (eg. major ceremonies) or when a particularly desirable food was most abundant;

- Probably of short duration (eg. <1-2 weeks) but potentially for longer duration (eg. up to several months);
- Total numbers of people could vary widely, but possibly exceed 100;
- Probably situated on level or very gently inclined ground in open contexts;
- Probably situated close to potable water;
- Probably situated close to food resources;
- A large area or areas of encampments would be expected, possibly covering hundreds of square metres or more;
- Spatially discrete evidence of individual camp sites would be expected (if the resulting evidence has not been affected by disturbance or superimpositioning);
- Quantity and density of evidence and range of artefact and stone types discarded are expected to be high (similar to community base camp). Items may not have been cached for future use. Specific artefact indicators include grindstones, relatively more common evidence of food processing and possibly ochre, and possibly evidence of processing uncommon foods for which the gathering may be related. Evidence of casual knapping and production of tools is expected to be common. However, features such as heat treatment pits may not occur (Kuskie 2009).

To distinguish whether single or multiple episodes of occupation occurred, several factors can be examined. Multiple episodes of occupation would tend to exhibit superimpositioning of artefact evidence (eg. mix of unrelated stone materials and artefact types and activity areas). However, identifying which items belong to which activity events can be problematical. Also, distinguishing the effects of post-depositional disturbance from cultural superimpositioning is problematical (*cf*. Koettig 1994). The analysis of distributions of stone material and artefact types is of benefit in some circumstances. In a stratified deposit, multiple episodes of occupation would be indicated by evidence in different stratigraphic layers, particularly discrete activity areas to exclude the possibility that items have moved vertically through the deposit by bioturbation.

Another indicator of multiple occupation is an expectation of a relatively higher density of artefacts within a locality (combined with superimpositioning as discussed above). Larger areas of occupation may also result, when occupations only partially overlap (eg. Camilli 1989).

Identification of different episodes of occupation over time would require *in situ* deposits with stratified or vertically separated evidence of activity events and datable material (eg. charcoal or midden deposits).

Identification of the duration of individual episodes of occupation may prove very difficult. Where a single episode of occupation has occurred, a greater quantity of items, frequency of discrete activity events and size of contemporaneous shell midden deposit may be indicative of a longer stay.

Identification of the types of occupations when multiple episodes have occurred may prove highly problematical. Unless specific artefact indicators for different types of occupation are present, the superimpositioning of evidence from unrelated occupations (eg. transitory movement over a nuclear family base camp) may not be possible to determine.

3.5 Predictive Model of Site Location

A predictive model of site location is constructed to identify areas of archaeological sensitivity (ie. locations where there is a potential of archaeological evidence occurring), so it can be used as a basis for the planning and management of Aboriginal heritage. Predictive modelling involves reviewing existing literature to determine basic patterns of site distribution. These patterns are then modified according to the specific environment of the investigation area to form a predictive model of site location. A sampling strategy is employed to test the predictive model and the results of the survey used to confirm, refute or modify aspects of the model.

The use of land systems and environmental factors in predictive modelling is based upon the assumption that they provided distinctive sets of constraints that influenced Aboriginal land use patterns. Following from this is the expectation that land use patterns may differ between each zone, because of differing environmental constraints, and that this may result in the physical manifestation of different spatial distributions and forms of archaeological evidence (Hall and Lomax 1993:26).

The predictive model is based on information from the following sources:

- Identification of land systems and landform units;
- Previous archaeological surveys conducted within the region;
- Distribution of recorded sites and known site density;
- Traditional Aboriginal land use patterns; and
- Known importance of any parts of the investigation area to the local Aboriginal community.

In certain circumstances, such as where low surface visibility or recent sediment deposition precludes effective assessment of the potential archaeological resource, sub-surface testing may be a viable alternative for further testing the predictive model and assessing the investigation area.

The following is a brief description of the site types that may occur within the investigation area.

Artefact Scatters:

In most archaeological contexts, an artefact scatter has been defined as either the presence of two or more stone artefacts within 50 or 100 metres of each other, or a concentration of artefacts at a higher density than surrounding low density 'background scatter'. The definition of an artefact scatter 'site' is often an arbitrary one, which can offer benefits from a heritage management perspective but is a source of theoretical/analytical debate for heritage practitioners.

Due to the nature of the underlying evidence, its identification only within exposures created by erosion or disturbance, and the limited suitability of existing definitions, artefact scatter sites are defined within this study as the presence of one or more stone artefacts within a *survey area* (*cf*. Kuskie 2000b). The boundaries of the site are defined by the boundaries of the visible extent of artefacts within the survey area. The survey areas are based on discrete, repeated environmental contexts termed *archaeological terrain units* (eg. a particular combination of landform unit and class of slope). It is generally assumed that there is a similar probability for comparable evidence to occur elsewhere within the same survey area.

As such, while the visible site boundaries are defined by the extent of visible evidence (consistent with the definition of an Aboriginal object under the *National Parks & Wildlife Act 1974*), across the entire survey area in which a site is identified there exists a *potential resource* of comparable evidence.

An artefact scatter may consist of surface material only, which has been exposed by erosion, or it more typically involves a sub-surface deposit of varying depth. Other features may be present within artefact scatter sites, including hearths or stone-lined fireplaces, and heat treatment pits.

Artefact scatters may represent the evidence of:

- Camp sites, where everyday activities such as habitation, maintenance of stone or wooden tools, manufacturing of stone or wooden tools, management of raw materials, preparation and consumption of food and storage of tools has occurred;
- Hunting or gathering events;
- Other events spatially separated from a camp site (eg. tool production or maintenance); or
- Transitory movement through the landscape.

The detection of artefact scatters depends upon conditions of surface visibility and ground disturbance and whether recent sediment deposition has occurred (*cf*. Dean-Jones and Mitchell 1993). Vegetation cover and deposition of sediments generally obscures artefact scatter sites and prevents their detection during surface surveys. High levels of ground disturbance can also obscure or remove evidence of a site.

Artefact scatters are a common site type in the Ulan locality and the broader Central Tablelands region. There is potential for stone artefact evidence to occur in the investigation area wherever A unit soil is present, apart from in areas which have been substantially impacted by recent land-use (ie. areas in which the A unit or upper soil horizon has been totally removed). In general, the artefact evidence may be of a low to very low density consistent with background discard, as much of the investigation area is distant from higher order watercourses, on moderate or steeply inclined terrain, and not consistent with a *primary or secondary resource zone* under the model proposed by Kuskie (2009).

However, a higher artefact density and potentially deposits of research significance may occur where more focused occupation (eg. encampments, or events of longer duration or involving larger numbers of people) and/or repeated Aboriginal occupation has occurred. These contexts may comprise areas of lower gradient close to Moolarben Creek.

Bora/Ceremonial Sites:

Bora grounds are a type of ceremonial site associated with initiation ceremonies. They are usually made of two circular depressions in the earth, sometimes edged with stone. Bora grounds can occur on soft sediments in river valleys and elsewhere, although occasionally they are located on high, rocky ground where they may be associated with stone arrangements. Pearson (1981:104-105) identified that the location of ceremonial sites appears to have related to a desire to isolate the site in a secret or seldom visited location.

The potential for bora/ceremonial sites within the investigation area is assessed as being very low, but cannot be discounted. The presence of "Bora Creek" to the north of the investigation area is noted.

Burials:

Human remains tended to be placed in hollow trees, caves, rock shelters or sand deposits. The location of burials may once have been marked by carved trees (eg. Etheridge 1918:85), although subsequent tree clearing and the long passage of time since the disruption of this practice has rendered these markers extremely rare. Pearson (1981:102-104) noted on the basis of recorded burials and ethnohistorical observations that burials in the region took place relatively close to encampments, due to the fact that most people unless killed by hunting accidents or in warfare tended to die in or close to camp, and movement of bodies over long distances by foot was problematic. A number of these observations (eg. by Reverend Gunther and Dr Curtis) identify burials within a mile of a campsite, in soft ground, with trees around carved.

Usually burials are only identified when eroding out of sand deposits or creek banks, or when disturbed by development. The probability of detecting burials during archaeological fieldwork is extremely low. The potential for burial sites to occur within the investigation area is assessed as being very low, but cannot be discounted.

Carved Trees:

Carved trees were still relatively common in NSW in the early 20th century (Etheridge 1918). They were commonly used as markers for ceremonial or symbolic areas, including burials.

Both vegetation removal and the long passage of time since the practice of tree carving was prevalent have rendered this site type rare. Given these factors and the extent of recent land use impacts, the potential for carved trees to occur within the investigation area is considered to be low, but cannot be discounted where mature native trees remain.

Cultural Significant Sites or Areas:

Sites of cultural significance to Aboriginal people (excluding the contemporary significance attached to the other site types listed here) can take three forms:

- Sites or places associated with ceremonies, spiritual/mythological beliefs and traditional knowledge, which date from the pre-contact period and have persisted until the present time;

- Sites or places associated with historical associations, which date from the post-contact period and are remembered by people today (for example, plant and animal resource use areas and known camp sites); and

- Sites or places of contemporary significance (apart from those areas for which Aboriginal objects remain, which are discussed elsewhere here), for which the significance has been acquired in recent times.

Although these sites do not qualify as Aboriginal objects under the *National Parks and Wildlife Act 1974* they can be declared as Aboriginal places under the Act.

Mythological sites, or other sites of traditional, historical or contemporary significance to Aboriginal people, can occur in any location. Often natural landscape features may be related to important mythological stories. Consultation with the local Aboriginal community is essential to identify the presence of such cultural significant sites. Physical evidence of historical contact can occur in the form of artefacts manufactured from introduced materials (eg. porcelain or glass).

Grinding Grooves:

Grinding grooves are typically elongated narrow depressions in soft rocks (particularly sedimentary) and are generally associated with watercourses. The depressions are created by the shaping and sharpening of ground-edge hatchets and grinding of seeds and processing of other plant matter and animal foods.

Grinding grooves are typically located in sedimentary bedrock along watercourses, but also occur in the Ulan locality on open surfaces of sandstone in other contexts (eg. simple slopes) and on smaller sandstone slabs or surfaces in rock shelters. Sandstone rock formations are common within the investigation area and the potential for grinding grooves sites to occur, both in association with rock shelters and in open contexts, is assessed as moderate.

Quarry Sites:

A lithic quarry is the location of an exploited stone source (Hiscock and Mitchell 1993:32). Sites will only be located where exposures of a stone type suitable for use in artefact manufacture occurs.

Geological mapping of the investigation area indicates that materials suitable for stone knapping are likely to be exposed, including quartz and tuff. As such, the potential for lithic quarry evidence within the investigation area is assessed as moderate.

Ochre quarry sites are an uncommon site type, however, several have been recorded at Ulan. Ochre quarries take the form of circular depressions or tunnels and are frequently associated with artefacts utilised in the process of extracting ochre (Hiscock and Mitchell 1993:62). The potential for evidence of ochre quarries within the investigation area is assessed as low.

Rock Engravings:

Rock engravings include outlines or filled-in figures, created on rock surfaces (typically sedimentary stone) by pecking, hammering or scraping.

Rock engravings are more common on exposed sandstone bedrock on ridge and spur crests than in the bases of valleys or margins of steep slopes. Although rock engravings have not been recorded within the Ulan locality, suitable sandstone bedrock is present in the investigation area and engravings are known to occur elsewhere in the region (Haglund 1985, Navin 1990). The potential for rock engravings is assessed as very low, but cannot be discounted.

Rock Shelters With Art, Deposits and/or Grinding Grooves:

Rock shelters include rock overhangs, shelters or caves which were used by Aboriginal people. Rock shelter sites may contain artefacts, deposits and/or rock art or grinding grooves. These sites will only occur where suitable geological formations are present.

In the Ulan and Moolarben locality, numerous rock shelter sites have been identified, many with artefacts and some with art and/or grinding grooves. Numerous other rock shelters have been noted with PADs. Although artefacts may not have been visible at the time of recording, these shelters have some probability of containing artefact deposits, which can be confirmed or refuted by test excavation. These sites have been recorded in isolated rock formations and along more extensive rock formations.

Rock shelter sites in the Ulan locality vary widely in terms of contents (eg. containing artefacts, potential deposits, painted art and/or grinding grooves), location (eg. topographic context, distance to watercourse, size/order of watercourse and aspect), nature (eg. size of shelter, extent of habitable floor area, number and types of artefacts and stone materials) and research potential (eg. depth and extent of potential artefact deposits). Stone artefacts would be the primary form of expected evidence within the rock shelters, in anything from very low to very high densities. Charcoal from fireplaces/hearths may also occur, as may bones and/or shell from fauna used by Aboriginal people for subsistence (or incorporated into the deposit by other means, such as animal activity or natural processes). The presence of other evidence, such as the remains of wooden implements, cannot be discounted, even though their occurrence has rarely been documented in the region.

Apart from several major sites such as the nearby "Hands on Rock" complex, rock art occurs relatively infrequently in the recorded shelters and tends to comprise red ochre hand stencils. Hand stencils were part of a complex form of communication and utilised in the representation of signatures, special occasions, individuals, messages, stories, myths and spiritual events.

Sandstone rock formations occur widely in the study area, including boulders, shelters and overhangs and as such, the potential for rock shelter sites is assessed as high.

Scarred Trees:

Scarred trees contain scars caused by the removal of bark for use in manufacturing canoes, containers, shields or shelters. Mature trees, remnants of stands of the original vegetation, have the potential to contain scars.

Considering the long time period elapsed since this practice was prevalent and the extent of vegetation removal from within the investigation area, the potential for scarred tree sites to occur is assessed as low, but cannot be discounted where mature native trees remain.

Stone Arrangements:

Stone arrangements include circles, mounds, lines or other patterns of stone arranged by Aboriginal people. Some were associated with bora grounds or ceremonial sites and others with mythological or sacred sites.

Pearson (1981:106) noted that stone arrangements in the region typically occur as lines or cairns on bare, exposed hill crests in the plateau/isolated hill areas, or on bare areas of flat land where flatter land predominates. The stone arrangements on hill crests are noted as being often a considerable distance from water, and therefore not within close proximity of any camp sites.

Hill tops and ridge crests which contain stone outcrops or surface stone, and have been subject to minimal impacts from recent land use practices, are potential locations for stone arrangements. Given the presence of these contexts within the investigation area, the potential for stone arrangements to occur is assessed as moderate to low.

4. METHODOLOGY

During the initial stages of the investigation, research was conducted into the environmental, cultural and archaeological background of the investigation area, building on the substantial work already completed by South East Archaeology over the past decade at the adjacent Ulan Coal Mine and in the past year for MCO. Searches were undertaken of the OEH Aboriginal Heritage Information Management System and other relevant heritage registers and planning instruments (refer to Section 3.1).

Director-General's requirements for the proposed modification were not obtained. In order to address the anticipated requirements (refer to Section 1.3), the investigation involved:

- Consultation with the Aboriginal community in accordance with the consultation process established for the Stage 1 Project (refer to Hamm 2006a and Section 6), consistent with the OEH policy entitled *Interim Community Consultation Requirements for Applicants* (DEC 2004); and
- A cultural heritage assessment conducted in accordance with the *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (DEC 2005).

This report builds on the previous heritage assessments of Stage 1 (Hamm 2006a) and Stage 2 (Hamm 2008a) and does not seek to repeat background information contained within those reports.

Field inspection of the investigation area was undertaken over nine days between 12 November and 29 November 2012, by Peter Kuskie and Birgitta Stephenson of South East Archaeology, assisted by representatives of the registered Aboriginal stakeholders (refer to Section 6). Full details of the registered stakeholders involvement in the survey are presented in the consultation database in Appendix 5. During the course of the survey, assistance was provided by the following individuals:

- North-East Wiradjuri - Coral Williams, Shaen Morgan, Donna Whillock and Kelsey Williams;
- Warrabinga - Kevin Williams, Donna Whillock and Wendy Lewis;
- MGATSIC - Larry Foley, Steven Flick and Shannon Foley; and
- Mudgee LALC - Christine Maynard, Larry Foley, Tammy Newton and John Newton.

The investigation occurred in accordance with the methodology dated 9 November 2012 that was provided to the registered Aboriginal stakeholders and finalised without modification, as no issues or concerns were raised.

For the purposes of this Aboriginal cultural heritage assessment, the investigation area totals 178.2 hectares, as marked on Figures 4 and 5. Within this area, property access limitations for the field investigation applied to approximately 10 hectares (5.6% of the investigation area). Recommendations are presented to address this issue (refer to Section 11). Approximately 3.6 hectares (2% of the investigation area) had been totally modified by previous land use, such that negligible potential for Aboriginal heritage evidence exists. The remaining 164.5 hectares (92.4% of the investigation area) was subject to detailed systematic archaeological survey sampling (refer below). As a result of revisions to the investigation area boundaries after completion of the field survey, additional survey sampling was obtained in 12.2 hectares of land immediately bordering the current investigation area.

The investigation area was divided into particular combinations of environmental variables that are assumed to relate to Aboriginal usage of the area. These *archaeological terrain units* or *environmental contexts* were defined on the basis of landform element and class of slope (following McDonald *et al* 1984). They are discrete, recurring areas of land for which it is assumed that the Aboriginal land use and resultant heritage evidence in one location may be extrapolated to other similar locations. Therefore *survey areas* were defined as the individual environmental context that is bounded on all sides by different environmental contexts (*cf*. Kuskie 2000b).

Detailed recording of the archaeological *survey areas* was made on survey recording forms, including environmental variables and heritage resources identified or potentially present. Each *survey area* was assigned a unique sequential number (refer to survey coverage database in Appendix 2).

Within each *survey area*, the areas inspected on foot correspond to the OEH (DECCW 2010b) definition of *survey units*. The *survey units* typically comprised general transects through vegetated terrain, or coverage of and separate recording of specific exposure types, such as vehicle tracks. Data for each *survey unit* was recorded separately on the survey area recording forms and representative photographs of survey units and survey areas were taken and are included in Appendix 4 where relevant and informative.

For the purposes of the analysis, *survey unit* data from each *survey area* are combined (refer to Appendix 2), and data from each survey area can be combined with comparable survey areas to analyse coverage and artefact density with respect to environmental variables such as landform element and slope (refer to Table 3). For a thorough discussion of the rationale for use of the individual artefact as the basic unit of analysis, including the problems with open artefact site definitions due to exposure/obscurement issues, and the margins of error, variables and constraints associated with the data collection procedures and analysis, refer to the comprehensive discussion in Kuskie (2000b).

The general survey procedure involved separation of the crew into two teams, each comprising an archaeologist and several Aboriginal community representatives, or working together as a single team, inspecting each survey area.

The survey teams were equipped with high resolution 1:3,000 scale mapping of the investigation area, with two metre contours, a 100 metre MGA grid and an aerial photograph underlay. Along with the use of hand-held Global Positioning System (GPS) units (generally accurate to within five metres), these features assisted with defining survey areas and survey units and accurately establishing the location of Aboriginal sites and marking the above onto the detailed base mapping (refer to Figures 9 - 14 and Appendices 2 and 3).

Hence, the survey sampled the entire geographic extent of the investigation area (excluding the 5.6% where property access was not available and the 2% of totally modified ground), within individual survey areas based on specific combinations of landform element and class of slope. The extent of the sample and nature of survey coverage is discussed in Section 5.1. As the investigation area encompassed the proposed impact areas, the coverage sampled much of the potential impact areas of the proposed modification.

Within each survey area:

- Inspection was made widely for the obtrusive site types, such as rock shelters with deposit and/or art, grinding grooves and scarred trees; and
- Inspection was also made widely for stone artefacts and other cultural evidence, focusing on areas with ground surface visibility.

Aboriginal heritage site recording forms for each identified site were also completed. Spatially separate locations of heritage evidence were recorded as separate site loci named after the sequential Stage 1 Moolarben Coal ('S1MC') site numbering system of Hamm (2006a) (refer to Section 3.5 for further discussion of site definitions and delineation of site boundaries and Appendix 3 for detailed descriptions of all newly identified sites).

As required under Section 89A of the NP&W Act, site records have been completed for all new or updated site recordings conducted during the assessment and lodged with the OEH.

Stone artefacts were recorded on a lithic item recording form, including details about provenance, stone material type, artefact type, size class, cortex and other relevant attributes (refer to Appendix 3).

During the survey and throughout the consultation process registered Aboriginal stakeholders were also asked of their knowledge of any areas of cultural significance within the investigation area, for example:

- Sites or places associated with ceremonies, spiritual/mythological beliefs and traditional knowledge, which date from the pre-contact period and have persisted until the present time;
- Sites or places associated with historical associations, which date from the post-contact period and are remembered by people today (for example, plant and animal resource use areas and known camp sites); and
- Sites or places of contemporary significance (apart from those areas for which Aboriginal objects remain, which are discussed above), for which the significance has been acquired in recent times.

The results of the investigation are presented in Section 5. Photographs of the identified sites are presented in Appendix 3 and additional photographs of survey areas and the general investigation area are presented in Appendix 4.

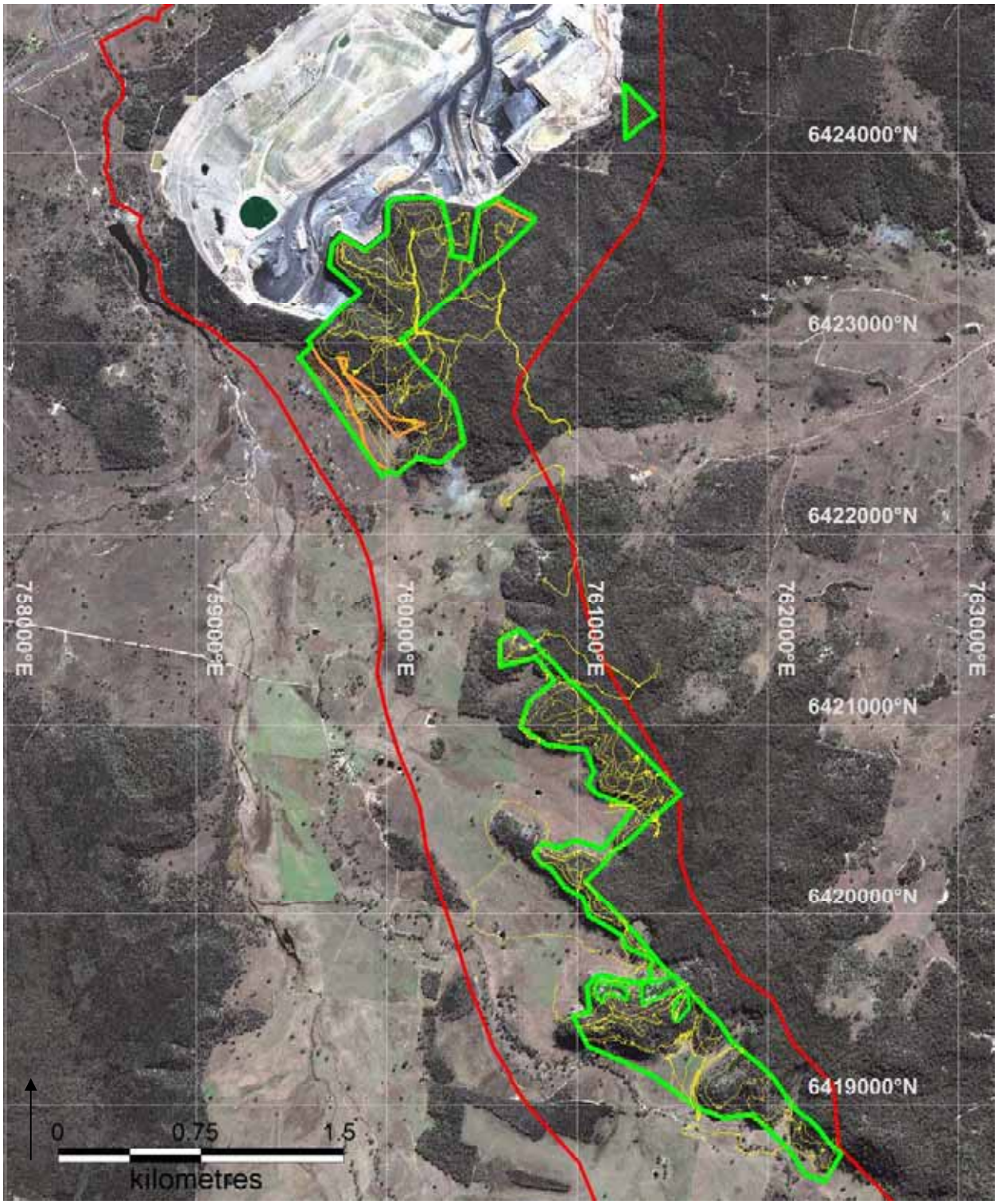

Figure 9: Approximate location of GPS recorded transects (yellow lines) within the investigation area (green border) (noting that dense vegetation cover limited the effectiveness and accuracy of the hand-held GPS units at times; that the field teams involved a number of participants, only one of which in each team carried a GPS unit; and that some coverage outside of the investigation area relates to access, not direct survey coverage) (area of limited property access cross-hatched orange) (aerial photograph courtesy MCO; one kilometre MGA grid).

5. RESULTS AND DISCUSSION

5.1 Survey Coverage

Comprehensive archaeological survey coverage was obtained across the geographic extent of the 178.2 hectare investigation area (potential impact area), apart from a 10 hectare portion that could not be sampled due to property access constraints at the time of the survey or revisions to the investigation area boundary that occurred after completion of the field survey (refer to Figure 10). Portions of this area had previously been surveyed by Hamm (2006a). Recommendations are presented to address this issue (refer to Section 11).

Approximately 3.6 hectares (2% of the investigation area) had been totally modified by previous land use, such that negligible potential for Aboriginal heritage evidence exists. Detailed survey was not conducted within these areas (refer to Figures 11 - 13).

The remaining 164.5 hectares (92.4% of the investigation area) was subject to detailed systematic archaeological survey sampling (refer to Figure 10). As a result of revisions to the investigation area boundaries after completion of the field survey, additional survey sampling was obtained in 12.2 hectares of land immediately bordering the current investigation area.

The area subject to survey sampling of 176.6 hectares (including 92.4% of the current investigation area and 12.2 hectares of additional adjacent land), was subdivided into a total of 133 archaeological survey areas, each representing a specific combination of landform unit and class of slope (definitions as per McDonald *et al* 1984). Each archaeological survey area was inspected for Aboriginal heritage evidence. The environmental contexts surveyed included the five landform elements and four classes of slope present (Table 3).

The locations of the individual survey areas are marked on Figures 11 - 13 and descriptions are presented in Appendix 2. A summary of the survey coverage is presented in Table 3 for the combined environmental contexts and individual classes of slope and landform elements.

The total survey coverage (ground physically inspected for heritage evidence) equated to approximately 308,684 m^2, or 17.5% of the sampled area[6]. As this coverage only refers to an area of several metres width directly inspected by each member of the survey team, the actual coverage for obtrusive site types (for example, scarred trees and rock shelters) was significantly greater than this. The total effective survey coverage (*visible* ground surface physically inspected with potential to host heritage evidence) equated to around 22,080 m^2, or 1.25% of the sampled area.

Conditions of surface visibility were generally low across the investigation area, due to the dense cover of vegetation and leaf litter (Appendix 2). Archaeological visibility, the actual visible ground surface with potential for heritage evidence (accounts for factors such as ground disturbance and sediment deposition), was generally similar to surface visibility. Mean archaeological visibility across the entire survey sample was approximately 7%. Exposures tended to be present along vehicle tracks and other areas of recent ground disturbance, such as animal diggings and erosion.

[6] It is inferred that a similar percentage of coverage was obtained for the investigation area, which is marginally smaller than the total area subject to systematic sampling (due to the subsequent revisions to the investigation area boundary after completion of the field survey).

Several mature native trees exist within the investigation area and where identified, these were inspected for evidence of Aboriginal scarring. Rock formations, both open surfaces and raised features such as boulders, rock walls and scarps, are relatively common within the investigation area. These were targeted for inspection during the survey.

Notwithstanding the low surface visibility and resulting low proportion of effective survey coverage as a percentage of the entire investigation area, the level and nature of effective survey coverage is considered satisfactory enough to present an effective assessment of the Aboriginal heritage resources identified and potentially present within the investigation area. The coverage was relatively comprehensive for obtrusive site types (for example, scarred trees, grinding grooves and rock shelters) but limited for the less obtrusive stone artefacts.

Nevertheless, in view of the predictive modelling and results obtained from the sample of effective coverage, it is concluded that the survey provides a valid basis for formulating recommendations for the management of the identified and potential Aboriginal heritage resources.

Table 3: Environmental contexts, class of slope and landform elements - summary of survey coverage and artefact density for heritage study area.

Environmental Context	Total Area of Context (m^2)	% Context Comprises of Investigation Area	Total Area Surveyed (m^2)	% Surveyed of Context	Effective Survey Coverage Total (m^2)	% Effective Survey Coverage of Context	Total # Artefacts (open sites)	Artefact Density (# artefacts per m^2 effective survey coverage)
gentle drainage depression	68,248	3.86%	15,260	22.36%	568	0.83%	0	-
moderate drainage depression	144,719	8.19%	26,940	18.62%	1,688	1.17%	0	-
steep drainage depression	62,814	3.55%	19,920	31.71%	1,742	2.77%	0	-
gentle simple slope	161,968	9.17%	27,404	16.92%	613	0.38%	0	-
moderate simple slope	470,710	26.64%	72,340	15.37%	6,500	1.38%	1	0.0002
steep simple slope	385,967	21.84%	19,920	5.16%	3,733	0.97%	0	-
level-very gentle spur crest	6,469	0.37%	600	9.28%	21	0.32%	0	-
gentle spur crest	6,251	0.35%	2,160	34.55%	132	2.11%	0	-
moderate spur crest	40,590	2.30%	8,060	19.86%	515	1.27%	0	-
level-very gentle ridge crest	15,330	0.87%	1,800	11.74%	90	0.59%	0	-
gentle ridge crest	396,467	22.44%	75,760	19.11%	6,288	1.59%	1	0.0002
moderate ridge crest	1,604	0.09%	300	18.70%	30	1.87%	0	-
level-very gentle hillock	5,875	0.33%	800	13.62%	160	2.72%	0	-
Totals/Means	**1,767,012**	**100%**	**308,684**	**17.47%**	**22,080**	**1.25%**	**2**	
Class of Slope								
level-very gentle	27,674	1.57%	3,200	11.56%	271	0.98%	0	-
gentle	632,934	35.82%	120,584	19.05%	7,601	1.20%	1	0.0001
moderate	657,623	37.22%	107,640	16.37%	8,733	1.33%	1	0.0001
steep	448,781	25.40%	77,260	17.22%	5,475	1.22%	0	-
Totals/Means	**1,767,012**	**100%**	**308,684**	**17.47%**	**22,080**	**1.25%**	**2**	
Landform Element								
drainage depression	275,781	15.61%	62,120	22.53%	3,998	1.45%	0	-
simple slope	1,018,645	57.65%	157,084	15.42%	10,846	1.06%	1	0.0001
spur crest	53,310	3.02%	10,820	20.30%	668	1.25%	0	-
ridge crest	413,401	23.40%	77,860	18.83%	6,408	1.55%	1	0.0002
hillock	5,875	0.33%	800	13.62%	160	2.72%	0	-
Totals/Means	**1,767,012**	**100%**	**308,684**	**17.47%**	**22,080**	**1.25%**	**2**	

*Totals and coverage exclude 10 hectares of land for which property access was not available at the time of the survey or areas that were added to the investigation area after the completion of the survey and 3.6 hectares of totally modified ground. Totals include minor additional coverage (approximately 12.2 hectares) outside of the investigation area (due to late revisions to the investigation area boundary following completion of the survey).

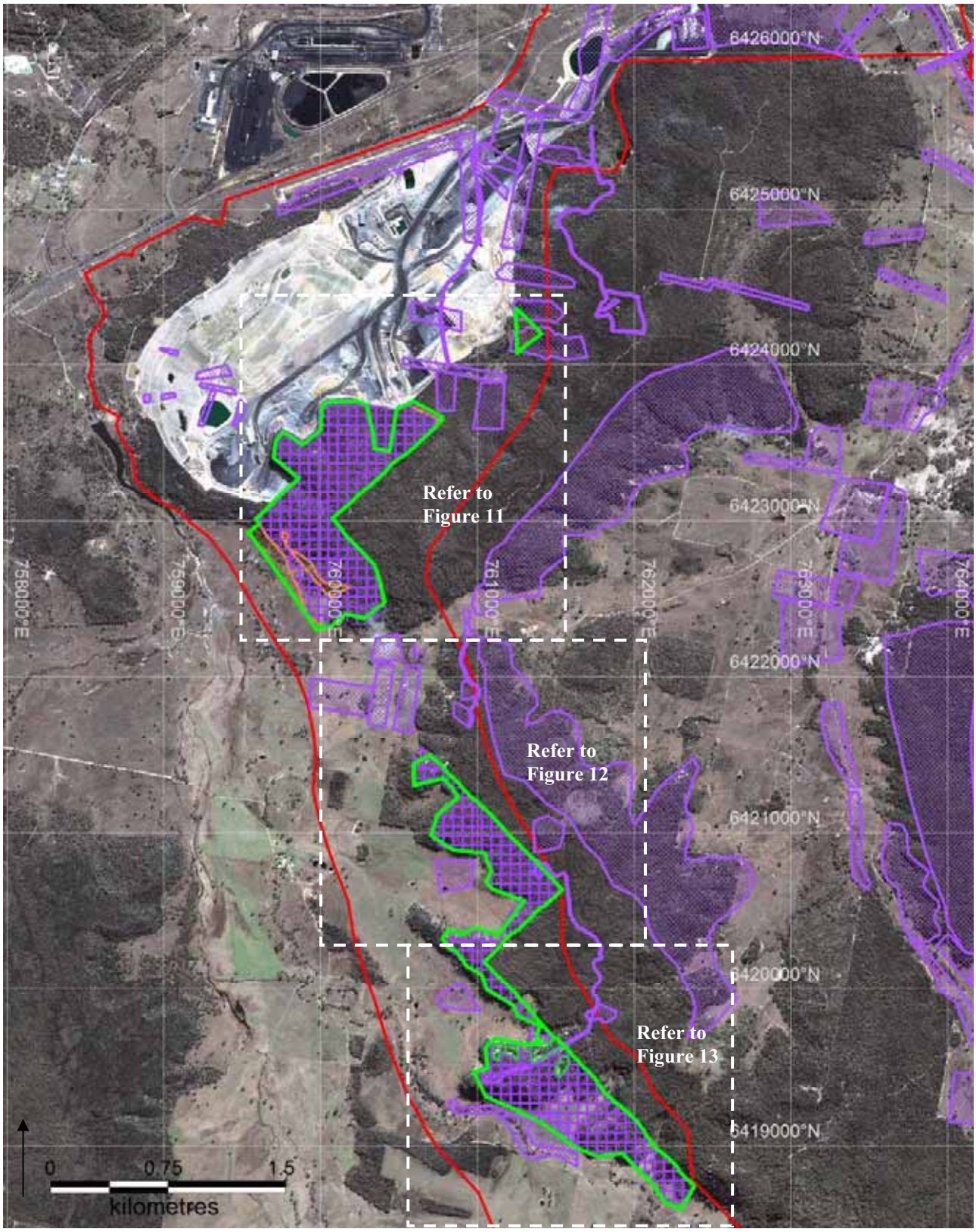

Figure 10: Overview of investigation area (green border), areas subject to systematic archaeological survey (purple cross-hatching - current survey; purple shading - Stage 1 and Stage 2 surveys), modified areas (green shading) and areas not subject to survey due to property access restrictions (orange shading) (aerial photograph courtesy MCO; one kilometre MGA grid; refer to Figures 11 - 13 for detailed plans of survey areas).

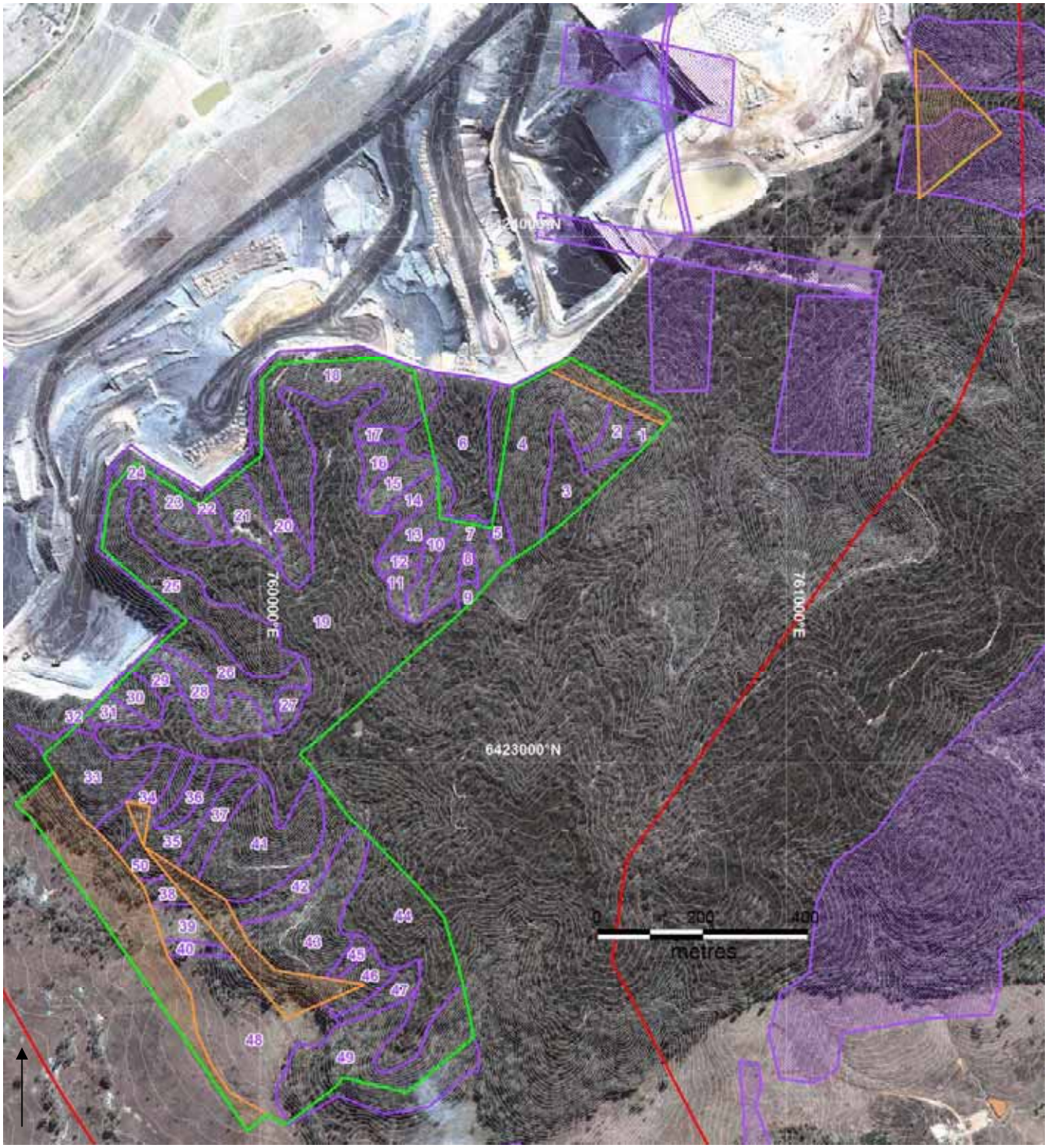

Figure 11: Northern portion of investigation area (Open Cut 1 Extension Area - green border), archaeological survey areas (purple shapes and numbers - current survey; purple shading - Stage 1 and Stage 2 surveys), modified areas (green shading) and areas not subject to survey due to property access restrictions (orange shading) (aerial photograph and two metre contours courtesy MCO; one kilometre MGA grid) (refer to Appendix 2 for full details of coverage).

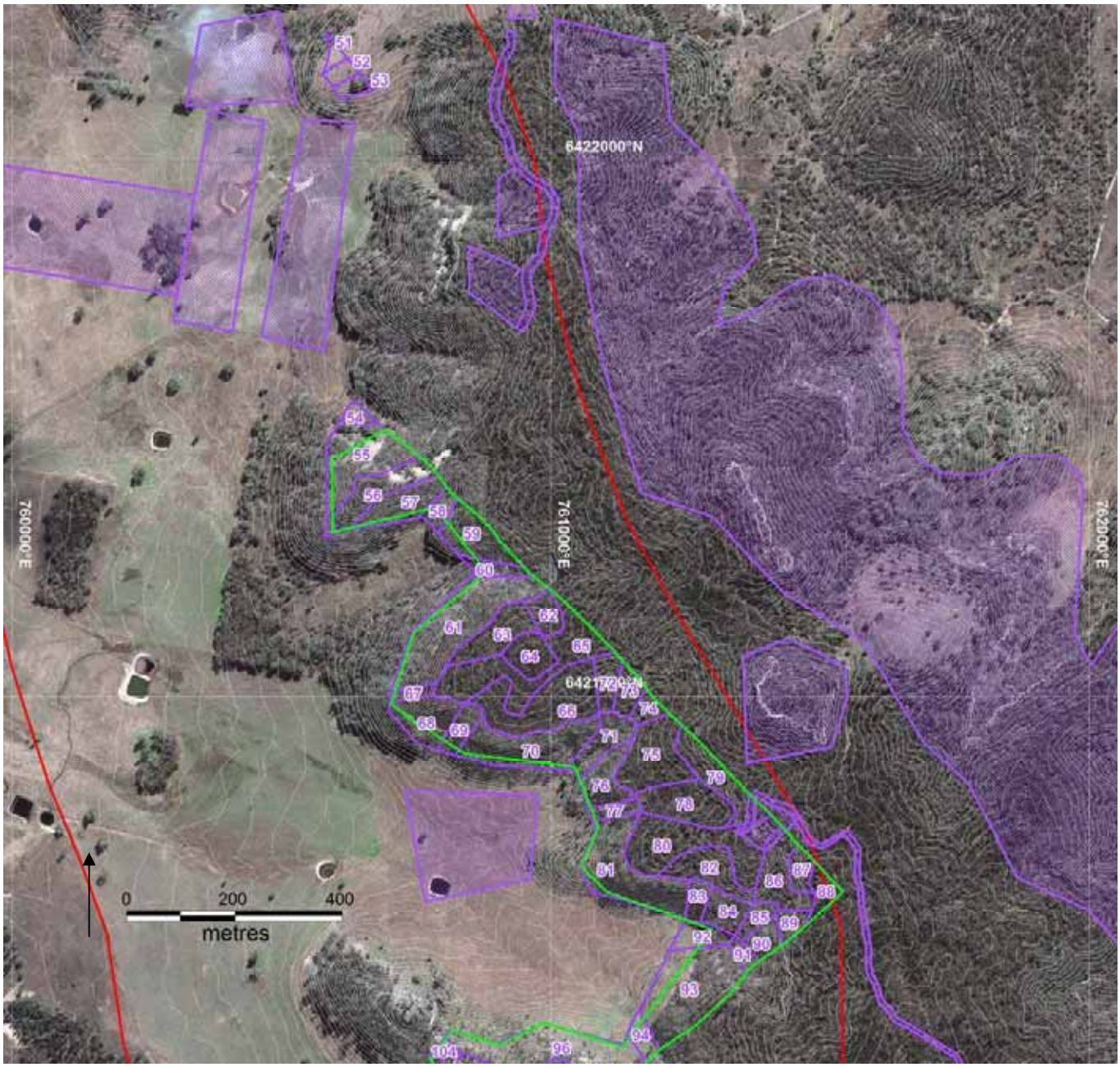

Figure 12: Southern portion of investigation area (northern section of Open Cut 2 Extension Area - green border), archaeological survey areas (purple shapes and numbers - current survey; purple shading - Stage 1 and Stage 2 surveys), modified areas (green shading) and areas not subject to survey due to property access restrictions (orange shading) (aerial photograph and two metre contours courtesy MCO; one kilometre MGA grid) (refer to Appendix 2 for full details of coverage).

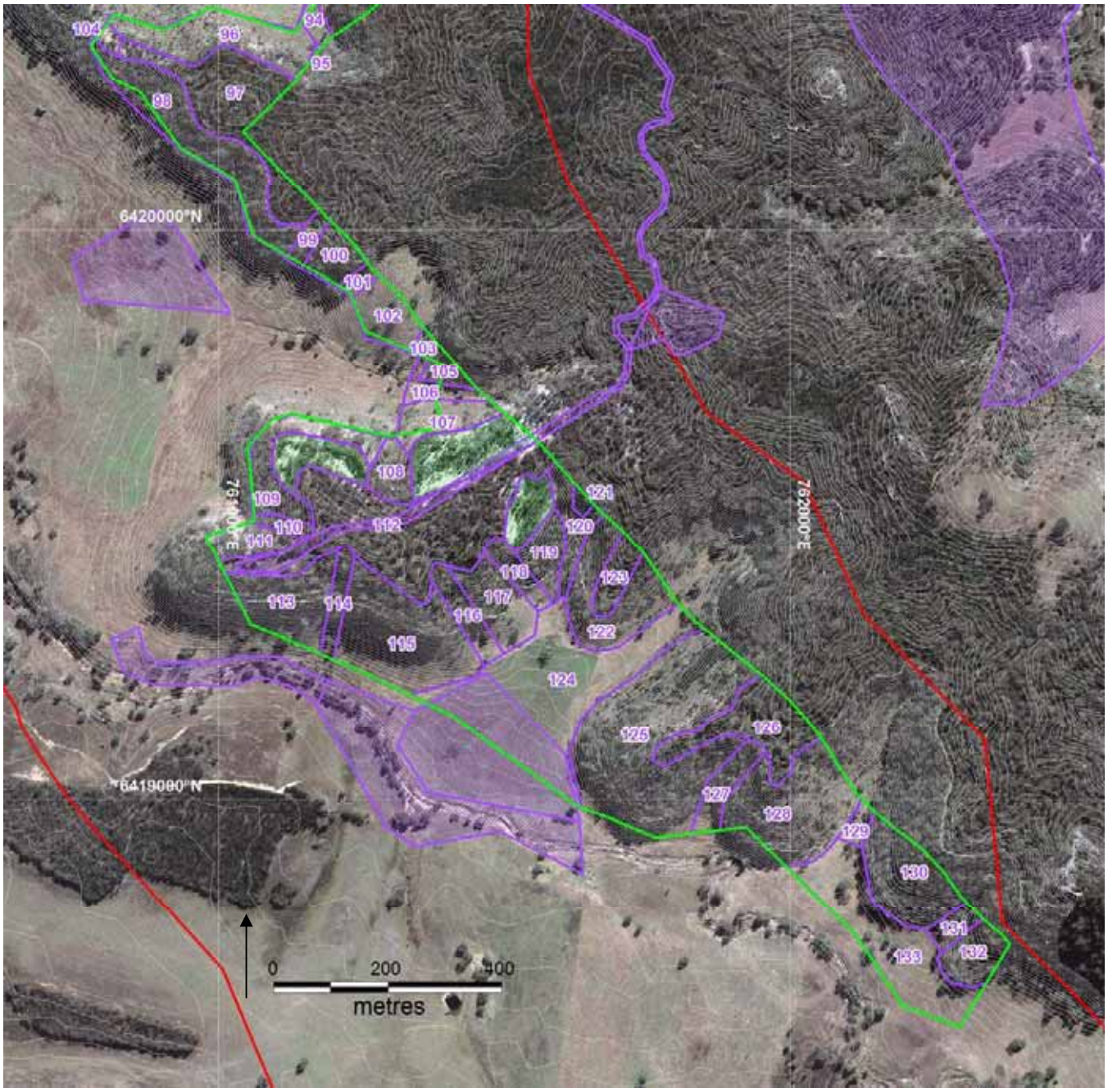

Figure 13: Southern portion of investigation area (southern section of Open Cut 2 Extension Area - green border), archaeological survey areas (purple shapes and numbers - current survey; purple shading - Stage 1 and Stage 2 surveys), modified areas (green shading) and areas not subject to survey due to property access restrictions (orange shading) (aerial photograph and two metre contours courtesy MCO; one kilometre MGA grid) (refer to Appendix 2 for full details of coverage).

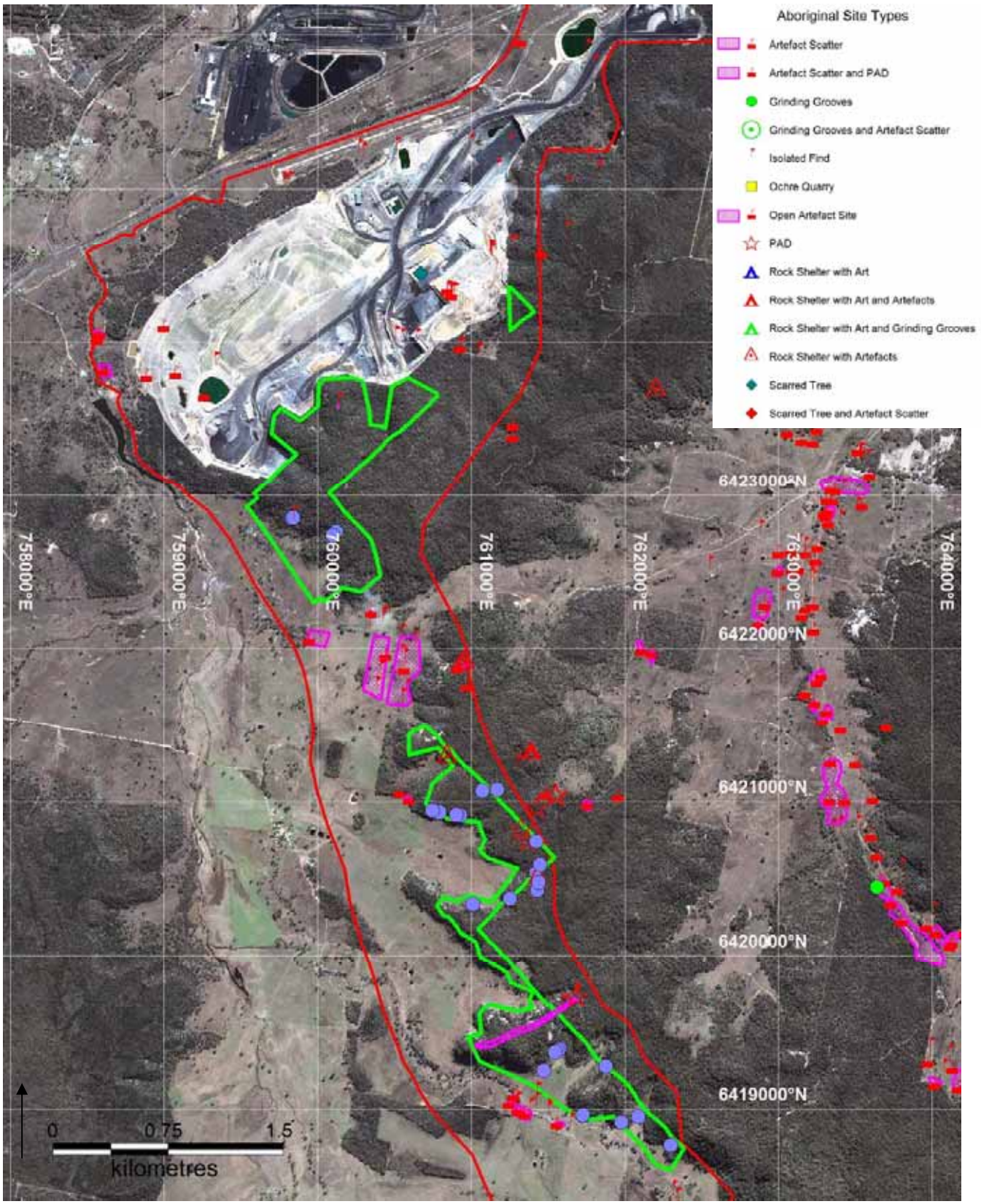

Figure 14: Location of Aboriginal heritage sites within or immediately adjacent to the investigation area (aerial photograph and two metre contours courtesy MCO; one kilometre MGA grid; investigation area - green border; Stage 1 approved project boundary - red) (refer to Appendix 3 for full details of sites and higher-resolution mapping of site locations).

5.2 Aboriginal Heritage Evidence

5.2.0 Overview

The conduct of the present survey has resulted in a substantial increase in the known heritage resource within the investigation area. Prior to this comprehensive survey, only one Aboriginal site was listed on the OEH AHIMS within this area, along with two rock shelters with PADs (refer to Section 3.1, Figure 6 and Appendix 1).

The present survey has resulted in the identification of another four Aboriginal heritage sites (two open artefact sites[7] and two rock shelters with artefacts), along with an additional 26 rock shelters with PADs[8].

In addition, during the course of the present survey, the two previously recorded rock shelters with PADs were relocated and re-recorded. The grid references and descriptions of these sites were revised (updated mapping of all site locations within the investigation area is presented in Figure 14, with detailed maps of site locations in Appendix 3).

Hence, a total of five sites and 28 rock shelters with PADs are known to occur directly within or immediately adjacent to the investigation area (refer to Table 4), comprising:

- Three open artefact sites[9];
- Two rock shelters with artefacts; and
- 28 rock shelters with PADs[10].

Full descriptions of the previously recorded sites are presented in Appendix 1. Where these sites were relocated and re-recorded, updated descriptions are also presented in Appendix 3. Full descriptions of all newly identified sites recorded during the current survey are presented in Appendix 3.

For the purposes of the significance assessment and impact assessment (refer to Sections 7 and 9), all sites directly within or immediately adjacent to the investigation area (as listed in Table 4) have been subject to consideration.

No Aboriginal heritage sites within the investigation area are listed on any other heritage registers or planning instruments (refer to Section 3.1).

While the above discussion focuses on Aboriginal objects and physical evidence of Aboriginal occupation, contemporary cultural values associated with the investigation area have been identified by the Aboriginal stakeholders. These include:

[7] For the purposes of this assessment, "artefact scatters" and "isolated finds" are typically assessed together in recognition that the occurrence of a single artefact often represents the only visible portion of a larger artefact resource within a broader site/survey area.
[8] Rock shelters with PADs are not technically "Aboriginal objects" as defined under the NPW Act.
[9] Including the previously recorded S1MC077.
[10] Including the two previously recorded PADs (PAD 6 and PAD 12).

- In general terms, the use of subsistence or other resources, with comments made about the presence of various native flora and fauna where observed. These comments were not of a historical nature (ie. did not relate to plant and animal resource use areas known from the post-contact period) but rather were general observations of the occurrence of particular species and their known traditional uses (eg. for food, medicine, tools, etc.);
- In general terms, the traditional use of the area by north-eastern Wiradjuri people, and an ongoing cultural and spiritual connection to the land and resources of the study area by the north-eastern Wiradjuri; and
- In relation to the Moolarben Ridge south of Carr's Gap, a portion of which is located within the Open Cut 2 Extension Area, the stakeholders have previously identified the contemporary cultural significance of this area (Hamm 2008a).

The possibility cannot be excluded that further Aboriginal values or associations may exist with the locality of the investigation area that were not divulged to South East Archaeology by the persons consulted.

In addition to these places, other archaeological sites (eg. rock shelters and artefact scatters) identified within the investigation area are of contemporary significance to the Aboriginal community, as they represent a tangible link with the traditional past and with the lifestyle and values of community ancestors (refer to Section 7).

5.2.1 Open Artefact Sites

Three open artefact sites (all isolated artefacts) are known to occur directly within or immediately adjacent to the investigation area (Table 4).

One previously recorded isolated artefact, S1MC077, was not relocated during the present inspection. The artefact itself is reported as being situated 45 metres outside of the present investigation area, but in combination with three other isolated artefacts (S1MC074 - S1MC076), a broader site area is mapped along the vehicle track extending across the gentle ridge crest in survey area 112 (refer to Appendix 1).

During the present survey, another isolated artefact (S1MC325) was located on a gentle ridge crest in the Open Cut 1 Extension Area, and another (S1MC328) was located on a moderate simple slope, 20 metres south of the rock shelter S1MC327 (refer to Table 5 and Appendix 3).

Typically "isolated finds" or "isolated artefacts" represent the only visible evidence of larger artefact scatters, in which low conditions of visibility have prevented the detection of further items. The terms "isolated artefact" and "artefact scatter" have been used interchangeably in previous studies. The term "open artefact site" encompasses those spatially discrete locations of visible artefact evidence in open contexts, that have been or can be referred to as "isolated artefacts" or "artefact scatters".

The identified artefacts probably only represent a small fraction of the entire artefact resource that is present within the investigation area, because the vast majority of evidence is likely to be currently obscured by vegetation and soil. Substantial portions of the investigation area were not directly sampled for artefacts, and where the sample was obtained, conditions of surface visibility were typically low (mean archaeological visibility across the entire survey sample was 7%). The survey sample has, however, served to refine the predictive model with respect to artefact distribution (refer to Section 5.3.7).

Table 4: Summary of Aboriginal sites located within or immediately adjacent to the investigation area.

Site Name	Survey Area	OEH AHIMS #	Site Type	MGA Grid Reference Eastings	MGA Grid Reference Northings
S1MC077	112	36-3-0882	Isolated artefact	761597	6419653
S1MC325	19	pending	Isolated artefact	760137	6423587
S1MC326	35	pending	Rock shelter with PAD	759832	6422848
S1MC327	35	pending	Rock shelter with PAD	759841	6422853
S1MC328	35	pending	Isolated artefact	759847	6422847
S1MC329	43	pending	Rock shelter with PAD	760119	6422761
S1MC330	43	pending	Rock shelter with PAD	760097	6422739
S1MC331	59	pending	Rock shelter with artefacts	760843	6421283
S1MC332	132	pending	Rock shelter with PAD	762299	6418767
S1MC333	128	pending	Rock shelter with PAD	762086	6418954
S1MC334	128	pending	Rock shelter with PAD	761975	6418915
S1MC335	125	pending	Rock shelter with PAD	761874	6419277
S1MC336	125	pending	Rock shelter with PAD	761725	6418961
S1MC337	119	pending	Rock shelter with PAD	761575	6419390
S1MC338	119	pending	Rock shelter with PAD	761564	6419379
S1MC339	119	pending	Rock shelter with PAD	761544	6419370
S1MC340	116	pending	Rock shelter with PAD	761472	6419251
S1MC341	96	pending	Rock shelter with PAD	761009	6420337
S1MC342	93	pending	Rock shelter with PAD	761252	6420370
S1MC343	91	pending	Rock shelter with PAD	761430	6420424
S1MC344	91	pending	Rock shelter with artefacts	761434	6420500
S1MC345	91	pending	Rock shelter with PAD	761438	6420476
S1MC346	90	pending	Rock shelter with PAD	761423	6420537
S1MC347	70	pending	Rock shelter with PAD	760928	6420913
S1MC348	70	pending	Rock shelter with PAD	760901	6420914
S1MC349	68	pending	Rock shelter with PAD	760793	6420933
S1MC350	68	pending	Rock shelter with PAD	760746	6420946
S1MC351	65	pending	Rock shelter with PAD	761070	6421070
S1MC352	73	pending	Rock shelter with PAD	761168	6421080
S1MC353	86	pending	Rock shelter with PAD	761421	6420743
S1MC354	89	pending	Rock shelter with PAD	761448	6420591
PAD 6 Moolarben Coal	80	36-3-0885	Rock shelter with PAD	761370	6420748
PAD 12 Moolarben Coal	79	36-3-0958	Rock shelter with PAD	761323	6420825

Table 5: Summary of open artefact sites recorded during the present survey.

Site Name	Survey Area	Landform Element	Slope	Distance to Water	Type of Water	Vegetation	Land Surface	Exposure Type	Ground Disturbance	Visible Extent of Surface Exposures: Length (m)	Visible Extent of Surface Exposures: Width (m)	Visible Extent of Evidence: Length (m)	Visible Extent of Evidence: Width (m)	Visible Locus Area (m^2)	Mean Surface Visibility of Locus (%)	Mean Archaeological Visibility of Locus (%)	Effective Locus Area (m^2)
S1MC325	19	ridge crest	gentle	>50	1st	2	4	A	high	50+	4	1	1	1	80	80	0.8
S1MC328	35	simple slope	moderate	<50	1st	2	4	A	low	varies	varies	1	1	1	50	50	0.5

Vegetation: 2 = forest/bush/regrowth.
Land Surface: 4 = vegetated.

Site Name	# of Artefacts	# of Artefacts/m^2 of Effective Locus Area	Sub-Surface Deposit	Comments	MGA Reference Easting	MGA Reference Northing
S1MC325	1	1.250	unlikely	low potential; disturbance from well formed vehicle track and mulched clearing	760137	6423587
S1MC328	1	2.000	unlikely	low potential; steep slope; 20m north of shelter S1MC327; open forest	759847	6422847

5.2.2 Rock Shelters with Artefacts and Potential Archaeological Deposits

A total of 28 rock shelters with PADs and two rock shelters with artefacts are known to occur directly within or immediately adjacent to the investigation area (Tables 4 and 6). The PADs are not technically "Aboriginal objects" as defined under the NP&W Act, however excavation of any of these shelters may reveal stone artefacts and other cultural deposits (for example, charcoal from camp fires).

The research potential of these deposits can be assessed in relation to various criteria (refer to Section 7.2).

Most of the PADs recorded are small, but the general threshold for inclusion was that there had to be sufficient room and shelter for at least one adult to sit and some deposit (ie. shelters with only bare rock floors and no deposit were not recorded, although it is highly probable such shelters would have been utilised by Aboriginal people on occasions).

The reasons for the absence of visible evidence in these shelters probably varies, but in many cases may relate to limited archaeological visibility. A number of shelters had a covering on the surface of recent sediment deposition, or for other reasons such as leaf litter, visibility was low. However, a genuine absence of occupation (specifically, the resulting evidence thereof) may also be the situation for a number of these shelters.

In terms of the gross shelter floor area (not the *habitable floor area* where the roof is higher than one metre above the floor), most of the shelters are relatively small (typically less than 40 m^2). Site S1MC330 has a large floor area at approximately 180 m^2, but occupation would have been constrained by the very low roof height throughout. Site S1MC343 is the next largest at approximately 64 m^2 and S1MC344 with three chambers is also relatively large, but both of these shelters occur marginally outside of the investigation area.

Most of the PADs have a potential depth of deposit of 0.4 metres or less (relatively shallow). This was estimated using a stake flag, a method that can be unreliable in compact soil or deposits with abundant gravel/rock (Kuskie, pers. obs.). Deeper deposits significantly enhance the potential for stratigraphy and identifying chronological changes in occupational evidence.

In general, the shelters tend to be small in size, have low roof heights, limited habitable floor areas, sloping floors and/or shallow potential deposits, which tends to limit their potential research value.

5.2.3 Cultural Values

Contemporary cultural values associated with the investigation area have been identified by the Aboriginal stakeholders. Some of these relate to physical objects, including items that qualify as *Aboriginal objects* as defined under the *National Parks and Wildlife Act 1974*. However, some relate to intangible values, associations or landscape features that do not qualify as *Aboriginal objects.* These include:

- In general terms, the use of subsistence or other resources, with comments made about the presence of various native flora and fauna where observed. These comments were not of a historical nature (ie. did not relate to plant and animal resource use areas known from the post-contact period) but rather were general observations of the occurrence of particular species and their known traditional uses (eg. for food, medicine, tools, etc.);
- In general terms, the traditional use of the area by north-eastern Wiradjuri people, and an ongoing cultural and spiritual connection to the land and resources of the study area by the north-eastern Wiradjuri; and
- In relation to the Moolarben Ridge south of Carr's Gap, a portion of which is located within the Open Cut 2 Extension Area, the stakeholders have previously identified the contemporary cultural significance of this area (Hamm 2008a).

In addition to these places, other archaeological sites (eg. rock shelters and artefact scatters) identified within the investigation area are of contemporary significance to the Aboriginal community, as they represent a tangible link with the traditional past and with the lifestyle and values of community ancestors (refer to Section 7).

In general terms, the attachment of the north-eastern Wiradjuri people to the landscape and continuing strong cultural connections with the locality of the study area was evident. As noted by Goulding (2002:63) land is a fundamental part of Aboriginal culture, and such cultural connections are integral to the health and wellbeing of Aboriginal people, although can be complex and are not always obvious to others. Representatives not of Wiradjuri descent also expressed or have expressed a strong spiritual and cultural connection with the locality.

Table 6: Summary of rock shelter sites/PADs recorded during the present survey.

Site Name	Landform Element	Slope	Distance to Water (m)	Type of Water	Rock Material	Outcrop Type	Outcrop Form	Aspect	Erosion	Surface Condition	Soils	DisturbanceToDeposit	Causes of Disturbance	# of Artefacts	# of Grinding Grooves	Mean Archaeological Visibility (%)	Shelter Floor Area (m^2)	Potential Depth of PAD (mm)	Comments
SIMC326	simple slope	moderate	<50	1st	sandstone	rock shelter	scarp	south	exfoliation	exfoliating, exposed/ weatherod	silt, sand, gravel	moderate	erosion, animal burrows	0	0	30	7.5	200	low potential; erosion, water run-off; shelter 1.5m deep x 5m long, 2.5m high at entrance; PAD 2 x 2m; large rocks at entrance; steep slope in front of shelter
SIMC327	simple slope	moderate	<50	1st	sandstone	rock shelter	scarp	south south east	exfoliation	exfoliating, exposed/ weatherod	silt, sand	moderate	animal burrows	0	0	50	32	100	shelter 4m deep, 8m long, 2m high at entrance decreasing to 1m at tunnel; tunnel begins 1.5m from entrance; PAD 1.5m x 1m at both tunnel entrances; 2 large rocks at entrance; steep slope in front of shelter
SIMC329	simple slope	moderate	<50	1st	sandstone	rock shelter	scarp	west	exfoliation	exfoliating, exposed/ weatherod	silt	moderate	erosion, animal burrows	0	0	50	2	<100	shelter 1m deep, 2m wide, 1.1m high; PAD 2m x 1.5m; low potential: very low, small shelter
SIMC330	simple slope	moderate	>50	1st	sandstone	rock shelter	scarp	west	exfoliation	exfoliating, exposed/ weatherod	rocky, sand, gravel	moderate	animal burrows	0	0	50	180	200	shelter 15m deep, 12m long, 1.2 m high at entrance, 1.5m high at back; PAD 2m x 2m; rock terrace and steep slope at entrance; narrow entrance that opens up to large cavern inside, but relatively low roof and very shallow deposit
SIMC331	simple slope	moderate	<50	1	sandstone	rock shelter	scarp	south	exfoliation, cavernous	exfoliating	clay, sand	low		4	0	80%	20	>300	shelter 5m deep, 4m wide and 2m high at entrance; this is also the potential extent of PAD; minor water seepage at back; animal seats; minor roof fall; moderate potential
SIMC332	spur crest	moderate	>50		sandstone	rock shelter		west	exfoliation, cavernous		sand	low	animal burrows	0	0		38	<50	shelter 2.5m across x 15m deep x 1.6m high; PAD 2m x 2m; lots of animal dung; steep entrance

Site Name	Landform Element	Slope	Distance to Water (m)	Type of Water	Rock Material	Outcrop Type	Outcrop Form	Aspect	Erosion	Surface Condition	Soils	DisturbancetoDeposit	Causes of Disturbance	# of Artefacts	# of Grinding Grooves	Mean Archaeological Visibility (%)	Shelter Floor Area (m^2)	Potential Depth of PAD (mm)	Comments
S1MC333	simple slope	steep	<50	1	sandstone	rock shelter	outcrop	east	exfoliation	stable	rocky, sand	low	animal burrows	0	0		49	<50	shelter 7m across x 7m deep x 1.8m high; PAD area 2mx1m; wasps; animal dung; large rock centre; front low
S1MC334	simple slope	steep	<50	1	sandstone	rock shelter	scarp	south	exfoliation	exfoliating, exposed/ weathered	sand	moderate	erosion, animal	0	0	80%	12	50	shelter 3.4m across x 3.6m deep x 1.25m high; PAD area 3.3m x 1.5m; undulating floor
S1MC335	simple slope	steep	<50		sandstone	rock shelter, overhang	scarp	west	exfoliation, cavernous	exfoliating, exposed/ weathered	silt, sand	moderate	erosion	0	0	60%	35	>150	shelter 23m across x 1.5m deep x 3m high; lower portion of moderate slope, start of drainage above; runoff probably frequent into shelter; black staining on walls; wasps; narrow, more of an overhang but some areas 3m wide; low to moderate potential due to erosion and narrow dimensions; hole in wall; no art, some good surfaces but weathering rates probably high; abundant animal seats
S1MC336	simple slope	steep	>50		sandstone	rock shelter	open surface	south	exfoliation, cavernous				erosion, animal burrows	0	0	80%	15	130	shelter 5.2m across x 2.8m deep x 1.4m high; PAD area 2.4m x 1.5m; small animal skeletons
S1MC337	simple slope	steep	<50	1	sandstone	rock shelter	scarp	west	cavernous	exfoliating, exposed/ weathered	rocky, sand	moderate	erosion	0	0	50%	3	<100	shelter 3m across x 1m deep x 1.9m high; PAD area 2m x 1m; small, low potential; several metres up from base of scarp/rock wall
S1MC338	simple slope	steep			sandstone	overhang	outcrop	southeast	exfoliation	exfoliating, exposed/ weathered	sand	low	animals	0	0		3	30	shelter 3m across x 1.1m deep x 1.95m high; PAD area 1mx1m; 10m from a rocky floor shelter (without PAD)

Site Name	Landform Element	Slope	Distance to Water (m)	Type of Water	Rock Material	Outcrop Type	Outcrop Form	Aspect	Erosion	Surface Condition	Soils	DisturbancetoDeposit	Causes of Disturbance	# of Artefacts	# of Grinding Grooves	Mean Archaeological Visibility (%)	Shelter Floor Area (m^2)	Potential Depth of PAD (mm)	Comments
S1MC339	simple slope	steep	>50		sandstone	overhang	scarp	south	exfoliation		silt	moderate	erosion	0	0	70%	12	<500	shelter 8m across x 1.5m deep x 3.2m high; PAD area 7m x 1.5m; very flakey, shale type walls; shallow deposit; affected by erosion
S1MC340	drainage depression	steep	>50		sandstone	overhang	boulder	south	exfoliation	exposed/ weathered	rocky, sand	low	erosion	0	0	30%	4	100	overhang 4m across x 1m deep x 3.2m high; PAD area 1m x 1m; fossil plants visible in shelter; huge tree at front occupying half of overhang; small; low potential; overlooks Moolarben valley
S1MC341	simple slope	moderate	>50		sandstone	overhang		north	exfoliation	exfoliating, exposed/ weathered	rocky, sand	moderate	erosion	0	0	40%	3	<50	shelter 2m across x 1.5m at deepest x 1.5m high; PAD area 1m x 1m; small, low roof, low potential; upper part of slope
S1MC342	simple slope	steep	<50		sandstone, tuffaceous	overhang	scarp	west	exfoliation	exfoliating, exposed/ weathered	rocky, silt	high	erosion	0	0	90%	4	<50	shelter 4m across x 1m at deepest x 2.1m high; PAD area is 1mx1m; small shelter, erosion/runoff impacts; low potential
S1MC343	drainage depression	moderate	<50	1	conglomerate	rock shelter	scarp	west	exfoliation, cavernous, honeycomb	exfoliating, exposed/ weathered, accretions	sand	moderate	erosion	0	0	80%	64		overhang extending along scarp face; 16m across x 4m deep x 1.3m high at centre; PAD area is similarly 12m x 4m; large shelter at head of drainage; located 80-100m east of study area; moderate potential; conglomerate; surfaces of walls unsuitable for art; another small shelter adjacent at 761428:6420453 but wasps prevented recording-low roof, high disturbance from large wombat burrow and also outside study area

Site Name	Landform Element	Slope	Distance to Water (m)	Type of Water	Rock Material	Outcrop Type	Outcrop Form	Aspect	Erosion	Surface Condition	Soils	DisturbancetoDeposit	Causes of Disturbance	# of Artefacts	# of Grinding Grooves	Mean Archaeological Visibility (%)	Shelter Floor Area (m^2)	Potential Depth of PAD (mm)	Comments
S1MC344	drainage depression	moderate	<50	1	sandstone, conglomerate	rock shelter	scarp	west	cavernous	exfoliating	sand	low	animals, roof fall	3	0	70%	(1) 27 (2) 13 (3) 11	100	large shelter outside of study area; shelter has 3 chambers (1) 5.8m across x 4.7m deep x 2.2m high; PAD area 2x2m; (2) 4.9m across x 2.7m deep x 2.2m high, PAD area 4m x 3m; (3) 4.6m across x 2.4m deep x 2.2m high, PAD area4m x 1m; charcoal present; rock and yellow ochre; eagles nest;
S1MC345	drainage depression	moderate	<50		sandstone, conglomerate	rock shelter	scarp	southwest	exfoliation, honeycomb	exfoliating, exposed/ weathered, accretions	sand	high	erosion, animal burrows	0	0	80%	28	>500	outside study area; complex of shelters in large conglomerate boulders and scarp; large wombat burrow, highly impacted deposit; some great surfaces for art but none present, only natural iron oxide staining; research potential reduced to low due to disturbance from wombat burrows; shelter 7m across x 4m deep x 3.5m high; PAD area 7mx4m;
S1MC346	simple slope	steep	>50		conglomerate	rock shelter	boulder	west	exfoliation, cavernous	exfoliating	sand, gravel	high	erosion	0	0	20%	18	>100	pagoda shelter 6m across x 3m deep x 1.3m high; PAD 1m x 2m; high disturbance from erosion and water runoff straight through; low potential, small, mostly low roof, high disturbance
S1MC347	simple slope	steep	>50	1	sandstone	rock shelter	scarp	south	exfoliation	exfoliating, exposed/ weathered	rocky, clay	moderate	erosion	0	0	30%	2	<100	shelter 2.5m across x 1m deep x 1.6m high; PAD area is 1.5m x 1m; small, low roof, runoff through shelter, low potential
S1MC348	simple slope	steep	>50	1	sandstone	rock shelter	scarp	south	exfoliation, cavernous	exfoliating	rocky, sand	moderate	erosion	0	0	70%	3	<100	shelter 3m across x 1m deep x 1.3m high; PAD area 1m x 1m; small, low shelter; low potential

Site Name	Landform Element	Slope	Distance to Water (m)	Type of Water	Rock Material	Outcrop Type	Outcrop Form	Aspect	Erosion	Surface Condition	Soils	DisturbancetoDeposit	Causes of Disturbance	# of Artefacts	# of Grinding Grooves	Mean Archaeological Visibility (%)	Shelter Floor Area (m^2)	Potential Depth of PAD (mm)	Comments
S1MC349	simple slope	steep	<50	1	sandstone	rock shelter	outcrop	south	exfoliation, cavernous	exfoliating, exposed/ weathered	sand	moderate	erosion, animal burrows	0	0		11	260	shelter 3.9m across x 2.9m deep x 2.6m high; PAD area is 2.9 x 2.7m; animal dung; roof fall
S1MC350	simple slope	steep	>50	1	sandstone	rock shelter	scarp	south	exfoliation	exfoliating, exposed/ weathered	sand	moderate	animal burrows	0	0	90%	3	>300	shelter 2m x 1.5m deep x 2.2m high at rear; PAD area 1.5m x 1.5m; location of rock shelter further to the north than gps indicated
S1MC351	ridge crest	gentle	>50		sandstone	overhang	boulder	south	exfoliation	exfoliating, exposed/ weathered	sand	low	erosion, rock fall	0	0		7	140	shelter 3.5m across x 1.9m deep x 2.4m high at entrance; PAD area is 1mx2m
S1MC352	ridge crest	gentle	<50		sandstone, conglomerate	overhang	boulder	north	exfoliation, cavernous		sand, leaf litter	moderate	erosion, animals, vegetation	0	0	40%	3	200	shelter 2m across x 1.5m deep x 3.1m high; PAD area is 1m x 1m; rock falls; outside study area
S1MC353	drainage depression	moderate	>50	1	sandstone	rock shelter	scarp, boulder	south	exfoliation, cavernous	exfoliating, exposed/ weathered, accretions	rocky, sand	moderate	erosion	0	0	90%	12	<100	shelter curves around scarp; roughly 11m across and 4m deep in centre x 2.7m high at entrance but closes in to 0.8m high; PAD area 3mx1m in front of shelter; mostly rocky floor, relatively small, runoff from side; low potential; could be Giles Hamm's 36-3-885
S1MC354	simple slope	moderate	<50	1	sandstone, conglomerate	overhang	boulder	southwest	exfoliation, cavernous	exfoliating, exposed/ weathered	sand	moderate	animal, dead trees	0	0	90%	18	440	shelter 6.5m across x 3.2m deep x 2.6m high; PAD area 2m x 4m; another small overhang 50m away
36-3-885	ridge crest	gentle	>50		sandstone, conglomerate	rock shelter	boulder, outcrop	west	cavernous	exposed/ weathered	sand	moderate	erosion, leaf litter, roof fall	0	0	90%	6	300	shelter 6m across but narrows to around 1.5m across a small way in; 1.5m across x 4.3m deep x 2.2m high; PAD 1m x 0.5m; leaf litter, roof fall, very low potential
36-3-958	simple slope	moderate	<50	1	conglomerate	rock shelter	scarp, boulder	west	exfoliation	exfoliating	rocky, sand	high	erosion, animal burrows	0	0	90%	30	<100	shelter 10m across x 3m deep x 2.8m at highest; PAD area 2m x 1m; mostly rocky floor, very small PAD; erosion and runoff from north side; wombats; very low potential

5.3 Discussion

The results of the investigation are discussed below, including the potential integrity of the evidence, nature of the evidence and interpretations of the evidence.

5.3.1 Integrity of Evidence

The integrity of the identified sites and the remainder of the investigation area can primarily be assessed for surface evidence only through examination of land use impacts. Controlled excavation enables integrity to be assessed through the horizontal and vertical distribution of artefacts and by conjoining items.

As discussed in Section 2, recent non-Aboriginal land-use practices have had generally low impacts on the investigation area. Some impacts have been caused by:

- Vegetation removal, particularly for timber harvesting, but also in small areas fringing the Moolarben Creek valley for pastoral use;
- Construction, maintenance and use of vehicle tracks; and
- Quarrying activities.

Approximately 3.6 hectares (2% of the investigation area) has been totally modified by previous land use, such that negligible potential for Aboriginal heritage evidence remains. These areas have been extensively impacted by quarrying activities. In the remainder of the investigation area, levels of ground disturbance were recorded during the survey, after McDonald *et al* (1984) (Appendix 2). The survey areas typically exhibited low levels of ground disturbance.

Two of the three open artefact sites are located on vehicle tracks, and as a result, exhibit high levels of ground disturbance. One site located in the forest exhibits low levels of disturbance. Of the 30 rock shelter sites/PADs, only seven exhibit low levels of disturbance, with the remainder either moderate or in some cases high levels, due to factors such as erosion and bioturbation (particularly animal burrows).

5.3.2 Lithic Assemblage

Only nine lithic items were recorded during the survey, seven in the rock shelter sites S1MC331 and S1MC334, and two as isolated artefacts (S1MC325 and S1MC328). These items are listed in Table 7.

The stone materials are entirely quartz. Local colluvial sources for the quartz used by Aboriginal people are inferred. Quartz and quartzose rich conglomerates are present in the Illawarra Coal Measures and quartz gravels were observed in numerous locations throughout the investigation area. Quartz is the dominant stone material in archaeological assemblages from the locality (refer to Kuskie 2009).

The artefact types all comprise items representing non-specific stone flaking, such as flake portions, lithic fragments and a flake and a core. These artefacts represent the fragmented debris of on-site knapping of primary flakes and/or microblades or other on-site fracture, such as accidental breakage, or accidental discard.

Table 7: Description of stone artefacts recorded during the heritage survey.

Site Name	Artefact #	Colour	Stone Material	Lithic Item Type	Length x Width x Thickness (mm)	Comments
S1MC325	1	white	quartz	flake - proximal	16x13x5	possible backing
S1MC328	1	white	quartz	flake	23x19x9	
S1MC331	1	white	quartz	core	30x22x11	1 metre in front of dripline
S1MC331	2	white	quartz	flake - proximal	24x13x7	at west corner of shelter
S1MC331	3	white	quartz	lithic fragment	24x22x11	1 metre from east corner
S1MC331	4	white	quartz	flake - distal	21x12x5	next to #1
S1MC344	1	white	quartz	flake - distal	30x20x5	chamber 2 near dripline
S1MC344	2	white	quartz	lithic fragment	20x10x10	chamber 2, 1 metre from artefact#1
S1MC344	3	white	quartz	lithic fragment	10x10x10	chamber 1 outside of dripline, 1 metre from artefact #1

5.3.3 Spatial Distribution, Site Interpretation and Reassessment of Occupation Model

The spatial distribution of evidence can be examined, particularly in relation to environmental variables such as slope and landform element. However, the inferences that can be made from this comparison are limited by the small nature of the sample.

Overall, artefacts in open contexts occur at a very low mean density of less than 0.0001 per square metre of effective survey coverage. The spatial distribution and nature of evidence is consistent with background discard, manuport and artefactual material which is insufficient either in number or in association with other material to suggest focused activity in a particular location (*cf*. Kuskie and Kamminga 2000). In general terms, the artefact densities identified are very low by south-eastern Australian standards and indicate a generally low-intensity utilisation of the investigation area.

Although the identified open artefact evidence probably only represents a fraction of the artefact resource that is present within the investigation area, because the majority of evidence is likely to be currently obscured by vegetation and soil (*cf.* Kuskie 2009), the investigation area is located in contexts that do not conform to primary or secondary resource zones under the model of occupation presented in Section 3.4. The area is generally of moderate to steep gradient, and distant from higher order watercourses (notwithstanding that the western margin of the Open Cut 2 Extension Area approaches to within 50 to 100 metres of Moolarben Creek, where more reliable potable water and subsistence resources would have been available). As such, rather than having represented focused occupation, Aboriginal use of the investigation area is therefore more likely to have related to hunting and gathering activities, along with transitory movement between locations and procurement of stone materials, and would have been of a generally low intensity. The survey results support these conclusions.

The distribution of rock shelter sites/PADs relates to the distribution of rock formations. However, numerous major outcrops of rock occur as straight-walled features, where overhangs or shelters have not formed.

Only four shelters occur in the Open Cut 1 Extension Area, all within the southern portion. The remaining 26 shelters (including two with artefacts) occur in the Open Cut 2 Extension Area. Despite fringing the eastern margin of the broad Moolarben Creek valley, many of these shelters are located some distance from the higher-order Moolarben Creek (over 500 metres). However, within the southern portion of this extension area, where Moolarben Creek approaches to within 50 metres, several rock shelters are located closer to the creek (S1MC336 at 50 metres, S1MC334 at 70 metres, S1MC333 at 180 metres, S1MC332 at 200 metres and S1MC340 at 230 metres). All of these shelters are very small and unsuitable for anything more than providing temporary respite from inclement weather for very low numbers of people. The only two shelters with artefacts are located further than 500 metres from Moolaren Creek (S1MC331 and S1MC344), where larger shelters have formed in the rock formations.

Many of the shelters have relatively small habitable floor areas, small/low entrances, sloping floors and/or low roof heights, which tend to limit their prospective use for overnight encampments, particularly by family groups (refer to detailed site descriptions in Appendix 3). A number of these shelters with PADs may not have been utilised at all by Aboriginal people. However, the shelters with artefacts provide evidence that at least several of the shelters were utilised.

Site S1MC331 (refer to Appendix 3) is a relatively small to moderate sized shelter and most artefacts were located at or in front of the dripline. It is inferred that this shelter may have provided temporary respite from inclement weather, but may also have served as an overnight camp for a small group of people. Site S1MC344 is a moderate sized shelter with three chambers, and is located in a cluster of shelters (most marginally to the east of the investigation area boundary). Although occupation by an extended family group is feasible, particularly in conjunction with use of the adjacent shelters, the site is located on headwater tributaries of Moolarben Creek, and occupation for more than an overnight camp is unlikely.

The evidence identified during the survey is consistent with the occupation model for the locality (refer to Section 3.4). No evidence was identified that would lead to revisions to the model.

The inferences that can be made about the nature of occupation at the identified sites or elsewhere in the investigation area are limited by the small nature of the sample. Consistent with certain elements of the overall Stage 1 project (Hamm 2006a) and adjacent Ulan Continued Operations Project (Kuskie 2009), it is inferred from the evidence obtained during the survey of the investigation area that:

- Aboriginal people used the investigation area, but at a very low intensity;
- The artefact and rock shelter evidence is consistent with transitory movement through the landscape and occasional and short-duration visits by small parties of hunters and/or gatherers;

- The very low density of artefacts within the investigation area, the distribution of these artefacts and the topography of the area (no higher order watercourses and absence of swamps/wetlands or other similar subsistence resource zones) indicates that in the broader locality focused occupation was more likely to have occurred outside of the direct investigation area in association with those such contexts where more preferential circumstances existed for water, level ground and subsistence resources (for example, in close proximity to Moolarben Creek);
- The stone material quartz was predominantly used for stone-working activities, largely because of its local availability, and it was probably procured from relatively local colluvial gravels in a casual, opportunistic manner; and
- Core reduction strategies are inferred to have been largely expedient, to produce flakes for immediate use (ie. largely casual and opportunistic, meeting requirements on an 'as needed' basis).

5.3.4 Regional Context

The nature of the evidence from the investigation area can be compared with other studies and sites in the region (refer to Section 3.2). The primary purpose is to identify similarities and differences with other reported evidence, in order to provide a framework for interpreting representativeness and assessing potential cumulative impacts.

Several primary similarities have been identified with other survey results in the locality including the:

- Occurrence of similar open artefact sites and rock shelters/PADs in similar topographical contexts;
- Similar stone material and artefact types;
- Generally low artefact numbers and densities; and
- Presence of evidence in similar environmental contexts, including landform elements and gradients.

The nature of the evidence from the investigation area is consistent with the results from the overall Stage 1 project (Hamm 2006a) and from the Stage 2 project (Hamm 2008a). No specific aspects of the heritage evidence located within the modification investigation area are rare or unique within a local or regional context.

5.3.5 Reassessment of Predictive Model

In view of the survey results, the predictive model of site location for the investigation area (refer to Section 3.5) can be reassessed. Although about 98% of the investigation area has been sampled during this study (including the modified area), the model can be reassessed in relation to the 2% that has not been sampled yet, along with areas within the sampled zone that were not directly inspected.

Visual inspection confirmed that negligible potential for heritage evidence exists within the modified areas, which has been extensively impacted by earthmoving works associated with existing stone quarries.

The potential for bora/ceremonial, carved tree, scarred tree, rock engraving and stone arrangement sites to occur within the portions of the investigation area that have not been directly sampled can be reassessed as very low or negligible.

No direct evidence of lithic procurement sites was identified, however the potential for casual, opportunistic procurement of stone, such as quartz, from colluvial gravels within the investigation area cannot be discounted.

No evidence was encountered of burial sites, and although the potential for skeletal remains to occur within the investigation area is considered to be very low, it cannot be discounted.

Sites of traditional cultural significance (such as mythological sites) were not identified by the Aboriginal representatives involved in the investigation. The Aboriginal stakeholders also did not disclose any specific knowledge of other cultural values/places (for example, historically known places or resource use areas). Although the possibility cannot be excluded that traditional or historical Aboriginal values or associations may exist that were not divulged by the persons consulted, this potential is reassessed as very low. The Aboriginal stakeholders did identify contemporary values/associations with the investigation area.

Extensive areas of exposed sandstone bedrock were identified within the investigation area and widely sampled for the presence of grinding grooves and rock shelters. The potential for open grinding groove sites to occur can be revised downward to very low, but cannot be discounted in areas that were not directly sampled or are currently obscured by sediment or vegetation/leaf litter.

A number of rock shelter sites/PADs were identified, but given the comprehensive nature of the survey for such obtrusive site types, the potential for additional sites can be reassessed as very low to negligible.

Several open artefact sites were identified within the investigation area. There remains potential for additional open artefact evidence to occur in the areas that were not directly sampled or are currently obscured by vegetation, albeit such evidence is likely to occur in a very low density consistent with background discard. The artefact evidence may involve a broad range of artefact and stone types, but will predominantly comprise evidence associated with non-specific stone flaking of quartz.

Environmental contexts in which a higher artefact density and potentially deposits of research significance may occur, in association with more focused and/or repeated Aboriginal occupation, are essentially absent from the investigation area. Although the southern margin of the Open Cut 2 Extension Area is located relatively closer to Moolarben Creek, the slopes tend to be of moderate to steep gradient and unsuitable for focused occupation (refer to Figure 13). Only survey areas 124 and 133 are of gentle gradient, but survey area 124 is generally further than 100 metres from the creek (and therefore avoids the zone of highest potential adjacent to the creek), and survey area 133 is almost of moderate gradient. More suitable contexts for focused occupation of lower gradient exist west of survey area 133 immediately adjacent to the creek. Hence, it is concluded that zones with a high potential for deposits of research value are essentially absent from the investigation area.

6. ABORIGINAL CONSULTATION

The investigation area lies within the boundaries of the Mudgee LALC and within an area of interest to other Aboriginal persons and organisations.

A comprehensive program of Aboriginal community consultation was undertaken for the Stage 1 and Stage 2 projects in compliance with the *Interim Community Consultation Requirements for Applicants* policy (DEC 2004; refer to Hamm 2006a, 2008a).

The registered Aboriginal stakeholders for the Stage 1 project comprised the Mudgee Local Aboriginal Land Council (Mudgee LALC), Warrabinga Native Title Claimants Aboriginal Corporation (WNTCAC), Murong Gialinga Aboriginal and Torres Strait Islanders Corporation (MGATSIC) and an individual, Mr Craig McConnell. The registered Aboriginal stakeholders for the Stage 2 project comprised the North-East Wiradjuri Company Ltd (NEWCO) and individuals Ms Aleisha Lonsdale and Ms Warranha Ngumbaay, with the Mudgee LALC, Warrabinga and MGATSIC also deemed to be registered.

MCO recognises that NEWCO, WNTCAC, Mudgee LALC and MGATSIC are the *registered Aboriginal stakeholder organisations* for the Stage 1 and/or Stage 2 projects and have been the primary parties consulted in relation to ongoing Aboriginal heritage issues associated with the project. MCO established Aboriginal Stakeholder Group Meetings in November 2010 to openly discuss the management of Aboriginal heritage issues at the MCP.

Through the operation of the *Native Title Act 1993*, a Native Title Agreement (NTA) is maintained between MCO and the North-Eastern Wiradjuri People of the Bathurst/Lithgow/Mudgee Area (Native Title Party) for Mining Lease Application (MLA) 318, MLA 319 and all other land within EL6288. The "Deed" (Government Party Deed) represents an agreement for the purposes of section 31(1)(b) of the NTA and was executed on 7 July 2008. The Native Title Agreement includes obligations for MCO and the Native Title Party, such as the funding of apprenticeships and scholarships, and the formation of an Aboriginal Cultural Liaison Sub-Committee and an Implementation Committee.

In relation to the present assessment of the modification to the Stage 1 approval, MCO's Lyn Syme (also a representative of the Native Title Party and North-East Wiradjuri Company Ltd) coordinated the participation of the registered Aboriginal stakeholder organisations.

The proposed methodology was provided to and discussed with the stakeholders prior to the survey. No objections or issues were raised in relation to the methodology.

Field inspection of the investigation area was undertaken over nine days between 12 November and 29 November 2012, by Peter Kuskie and Birgitta Stephenson of South East Archaeology, assisted by representatives of the registered Aboriginal stakeholders. Full details of the registered stakeholders involvement in the survey are presented in the consultation database in Appendix 5. During the course of the survey, assistance was provided by:

- North-East Wiradjuri - Coral Williams, Shaen Morgan, Donna Whillock and Kelsey Williams;
- Warrabinga - Kevin Williams, Donna Whillock and Wendy Lewis;
- MGATSIC - Larry Foley, Steven Flick and Shannon Foley; and
- Mudgee LALC - Christine Maynard, Larry Foley, Tammy Newton and John Newton.

The representatives expressed satisfaction with the level of survey coverage and the consultation process, as well as a strong interest in the findings.

The representatives did not disclose any specific knowledge of sites or places associated with ceremonies, spiritual/mythological beliefs or traditional knowledge, which date from the pre-contact period and have persisted until the present time, within the investigation area. The representatives also did not disclose any specific knowledge of sites or places associated with historical associations, which date from the post-contact period and are remembered by people today (for example, plant and animal resource use areas and known camp sites), within the investigation area.

The possibility cannot be excluded however, that traditional or historical Aboriginal values or associations may exist that were not divulged to South East Archaeology by the persons consulted. It was not feasible to contact every single knowledge holder in the north-eastern Wiradjuri community.

The representatives did however disclose a number of associations with the investigation area of contemporary significance, including:

- In general terms, the use of subsistence or other resources, with comments made about the presence of various native flora and fauna where observed. These comments were not of a historical nature (ie. did not relate to plant and animal resource use areas known from the post-contact period) but rather were general observations of the occurrence of particular species and their known traditional uses (eg. for food, medicine, tools, etc.);
- In general terms, the traditional use of the area by north-eastern Wiradjuri people, and an ongoing cultural and spiritual connection to the land and resources of the study area by the north-eastern Wiradjuri; and
- In relation to the Moolarben Ridge south of Carr's Gap, a portion of which is located within the Open Cut 2 Extension Area, the stakeholders have previously identified the contemporary cultural significance of this area (Hamm 2008a).

In addition to these places, other archaeological sites (eg. rock shelters and artefact scatters) identified within the investigation area are of contemporary significance to the Aboriginal community, as they represent a tangible link with the traditional past and with the lifestyle and values of community ancestors (refer to Section 7).

In general terms, the attachment of the north-eastern Wiradjuri people to the landscape and continuing strong cultural connections with the locality of the study area was evident. As noted by Goulding (2002:63) land is a fundamental part of Aboriginal culture, and such cultural connections are integral to the health and wellbeing of Aboriginal people, although can be complex and are not always obvious to others. Representatives not of Wiradjuri descent also expressed or have expressed a strong spiritual and cultural connection with the locality.

Copies of the draft heritage assessment report were provided to the Aboriginal stakeholders for their review and comment. Responses were provided by MGATSIC and NEWCO endorsing the assessment and recommendations of the draft report (refer to Appendix 5). Responses were not received from Warrabinga or the Mudgee LALC. If any are received, these will be addressed and forwarded to the DP&I.

Copies of the final report will be forwarded to the Aboriginal stakeholders. The ongoing involvement of the registered Aboriginal stakeholder organisations in the management and investigation of Aboriginal heritage at the Moolarben Coal Project will continue.

7. SIGNIFICANCE ASSESSMENT

7.1 Criteria

The information contained within this report, along with an assessment of the significance of the Aboriginal heritage evidence, provides the basis for informed decisions to be made regarding the management and degree of protection which should be afforded to specific Aboriginal heritage sites.

The significance of Aboriginal heritage evidence can be assessed along the following criteria, widely used in Aboriginal heritage management, derived from the relevant aspects of the International Council on Monuments and Sites (ICOMOS) *Burra Charter*:

I. Scientific (Archaeological) value;

II. Importance to Aboriginal people (Cultural value);

III. Educational value;

IV. Historic value; and

V. Aesthetic value.

Greater emphasis is generally placed on scientific and cultural criteria when assessing the significance of Aboriginal heritage evidence in Australia.

Scientific (Archaeological) Value:

Scientific value refers to the potential usefulness of heritage evidence to address further research questions, the representativeness of the evidence, the nature of the evidence and its state of preservation.

Research Potential:

Research potential refers to the potential for information derived from further investigation of the evidence to be used for answering current or future research questions. Research questions may relate to any number of issues concerning past human culture, human behaviour generally or the environment. Numerous locations of heritage evidence have research potential. The critical issue is the threshold level, at which the identification of research potential translates to significance/importance at a local, regional or national level.

Several key questions can be posed for each location of heritage evidence:

- Can the evidence contribute knowledge not available from any other resource?
- Can the evidence contribute knowledge, which no other such location of evidence can?
- Is this knowledge relevant to general questions about human history, past environment or other subjects?

Assessing research potential therefore relies on comparison with other evidence in local and regional contexts. The criteria used for assessing research potential include the:

a) Potential to address locally specific research questions;

b) Potential to address regional research questions;

c) Potential to address general methodological or theoretical questions;

d) Potential deposits; and

e) Potential to address future research questions.

In terms of meeting a threshold level to have significant research potential, the particular questions asked of the evidence should be able to contribute knowledge that is not available from other resources or evidence (either on a local or regional scale) and are relevant to general questions about human history, past environment or other subjects.

Representativeness:

Representativeness is generally assessed at local, regional and national levels. It is an important criterion, because the primary goal of cultural resource management is to afford greatest protection to a representative sample of Aboriginal heritage evidence throughout a region. The more unique or rare evidence is, the greater its value as being representative within a regional context.

The main criteria used for assessing representativeness include:

a) The extent to which the evidence occurs elsewhere in the region;

b) The extent to which this type of evidence is subject to existing or potential future impacts in the region;

c) The integrity of the evidence compared to that at other localities in the region;

d) Whether the evidence represents a prime example of its type within the region; and

e) Whether the evidence has greater potential for educational or demonstrative purposes than at other similar localities in the region.

Nature of Evidence:

The nature of the heritage evidence is related to representativeness and research potential. The less common the type of evidence is, the more likely it will have representative value. The nature of the evidence is directly related to its potential to be used in addressing present or future research questions. Criteria used in assessing the nature of the evidence include the:

a) Presence, range and frequency of stone materials;

b) Presence, range and frequency of artefact types; and

c) Presence and types of other features.

A broader range of stone and artefact types generally equates to the potential for information to address a broader range of research questions. The presence of non-microlith and microlith tool types also equates to higher potential to address relevant research questions. The presence and frequency of particular stone or artefact types or other features also has relevance to the issue of representativeness (for example, a rare type may be present).

Integrity:

The state of preservation of the evidence (integrity) is also related to representativeness and research potential. The higher the integrity of evidence, the greater the level of scientific information likely to be obtained from its further study. This translates to greater importance for the evidence within a local or regional context, as it may be a suitable example for preservation within a sample representative of the entire cultural resources of a region.

The criteria used in assessing integrity include:

a) Horizontal and vertical spatial distribution of artefacts;

b) Preservation of intact features such as midden deposits, hearths or knapping floors;

c) Preservation of site contents such as charcoal and shell which may enable accurate direct dating or other analysis; and

d) Preservation of artefacts which may enable use-wear/residue analysis.

Generally, many of these criteria can only be applied to evidence obtained by controlled excavation. High levels of ground disturbance limit the possibility that the evidence would surpass the threshold of significance on the basis of integrity (ie. the area would be unlikely to possess intact spatial distributions, intact features, *in situ* charcoal or shell, etc).

Aboriginal (Cultural) Significance:

Aboriginal (cultural) significance refers to the value placed upon Aboriginal heritage evidence by the local Aboriginal community.

All heritage evidence tends to have some contemporary significance to Aboriginal people, because it represents an important tangible link to their past and to the landscape. Heritage evidence may be part of contemporary Aboriginal culture or be significant because of its connection to spiritual beliefs or as a part of recent Aboriginal history.

Consultation with the local Aboriginal community is essential to identify the level of Aboriginal significance.

Educational Value:

Educational value refers to the potential of heritage evidence to be used as an educational resource for groups within the community.

Historic Value:

Historic value refers to the importance of heritage evidence in relation to the location of an historic event, phase, figure or activity.

Aesthetic Value:

Aesthetic value includes all aspects of sensory perception. This criterion is mainly applied to art sites or mythological sites.

7.2 Significance of Heritage Evidence Within the Investigation Area

The significance of the Aboriginal heritage sites, cultural areas/values and potential deposits within or immediately adjacent to the investigation area has been assessed in relation to the criteria presented in Section 7.1. The significance assessment is presented for each site in Table 8. The significance assessment involves rating categories of 'low', 'low-moderate', 'moderate', 'moderate-high' and 'high'. Key criteria are included in Table 8 where relevant. The assessment has been conducted within both local (abbreviated as 'L') and regional ('R') contexts.

It is noted that all Aboriginal heritage is of interest and contemporary value to the Aboriginal community. Aboriginal heritage evidence represents a tangible link with the traditional past and with the lifestyle and values of community ancestors. The Aboriginal community themselves are in the best position to identify the levels of cultural significance and the stakeholders have been invited throughout the course of the project, the field investigation and meetings to provide input into the cultural significance of the specific sites and areas.

The key conclusions of the significance assessment are presented below for each site type. In overall terms for the sites that comprise physical objects under the NP&W Act or potential deposits (ie. the artefact scatters and rock shelters with artefacts and/or PADs), three (9%) are assessed as being of moderate significance within a local context (all rock shelters with artefacts and/or PADs) and 30 (91%) as being of low significance within a local context. No sites or PADs are assessed as being of significance within a regional context.

Open Artefact Sites

The three open artefact occurrences, all isolated artefacts, are assessed as being of low significance (refer to Table 8).

Artefact scatters and isolated artefacts are common occurrences throughout the region and are therefore generally of low representative value. The levels of ground disturbance were high (and therefore the integrity of any evidence low) at two of the sites. There was a limited range and nature of artefact evidence, and the potential for deposits of research value was low.

Rock Shelters with Artefacts and/or PADs

The two rock shelters with artefacts (S1MC331 and S1MC344) and one of the rock shelters with PADs (S1MC343) are assessed as being of moderate significance within a local context (refer to Table 8).

The research potential of rock shelters was one of the primary criteria used in assessing their significance, as there can be stratified deposits with datable cultural evidence (potentially extending back many thousands or even tens of thousands of years) and typically, due to sedimentation processes or other visibility constraints, any evidence visible on the surface of the shelter floor does not necessarily provide an accurate indication of the nature of the buried deposits.

The research potential and significance of the rock shelter PADs was assessed with reference to various criteria, including:

1) Size of the habitable floor area: A larger habitable floor area (the floor area of a rock shelter where the ceiling height is about one metre or more) equates to higher potential, as family groups may have been accommodated, a broader range of activities performed, and overnight camps and stays of longer duration been more feasible. Conversely, a small floor area limits the potential to short-duration/low-intensity activities such as people having sought temporary shelter from adverse weather;

2) Internal roof height: A low internal roof height (eg. less than standing height) is inferred to have reduced the attractiveness of a shelter for occupation of any more intensity than temporary shelter from adverse weather;

3) Depth of deposit: The deeper the deposit within a rock shelter, the higher the potential for stratification and spatially (vertically) separate evidence of discrete episodes of occupation from different time periods. Hence, a deeper deposit equates to higher potential and a shallower deposit equates to lower potential;

4) Extent of potential deposit: A larger PAD, including often in areas marginally forward of the dripline, equates to higher potential, whereas a smaller PAD equates to lower potential;

5) Complexity (presence of grooves and/or art, association with other sites): The presence of grooves and/or art adds to the range of activities performed in a shelter and equates to higher significance and possibly research potential;

6) Proximity to potable water: The topographic context of each shelter was considered, particularly proximity to potable water, especially higher order watercourses (refer to the detailed model of occupation presented in Section 3.4, which assumes that deposits of higher research potential will generally be located where more focused occupation has occurred, such as in the primary and secondary resource zones); and

7) Potential integrity: Although problematic to assess in the absence of controlled hand excavation, where low integrity was inferred (typically due to shallow deposits and clear evidence of extensive animal activity, such as animal burrows, and/or erosion) this typically negates most other criteria and equates to low research potential and low significance.

The 27 rock shelters with PADs of low significance typically had small or very small habitable floor areas and potential deposits, and often shallow deposits and/or low internal roof heights. Consequently they had low research potential. Such shelters may not even have been used by Aboriginal people, or if occupied, may only have been for short-duration/low-intensity activities, such as the seeking of temporary shelter from adverse weather. However, without excavation of a sample from a shelter, where artefacts are not visible it cannot be stated that the shelter was not occupied by Aboriginal people, nor can the nature and resulting evidence of any occupation be known.

The two rock shelters with artefacts (S1MC331 and S1MC344) and one of the rock shelters with PADs (S1MC343) assessed as being of moderate significance within a local context had moderate to large habitable floor areas and PADs, moderate research potential and generally a moderate depth of deposit.

However as noted above, in any shelter irrespective of the assessed level of potential, this factor can only be adequately assessed through controlled excavation. Without excavation, the nature of any evidence present in sub-surface deposits cannot be adequately identified. Controlled excavation of any shelter may lead to a revision of the assessment of significance, either upward (in the case of a shelter where deposits of higher research value than anticipated are revealed) or downward (in the case of a shelter where anticipated deposits of research value do not exist or are in a state of low integrity).

Cultural Places/Values

The cultural places/values are assessed as being of relatively low significance within a regional context (refer to Table 8). Notwithstanding the cultural value to the Aboriginal stakeholders of the investigation area, Moolarben Ridge south of Carr's Gap, flora/fauna resources and the identified Aboriginal objects, the size of the impact area is relatively small within a regional context and no places/values exist that are unique or rare within the region. Substantial areas of similar environmental contexts occur nearby (for example, within Munghorn Gap Nature Reserve and Goulburn River National Park) which are inferred to host similar cultural values.

Table 8: Significance assessment of Aboriginal sites, cultural areas/values and potential deposits within or immediately adjacent to the investigation area.

Site Name	OEH AHIMS #	Site Type	Significance					
			Overall[11]	Archaeological / Scientific	Aboriginal / Cultural	Aesthetic	Educational	Historic
S1MC077	36-3-0882	isolated find	low L, low R	low (common, low research potential, low integrity)	refer to footnote 11	low	low	low
S1MC325	pending	isolated artefact	low L, low R	low (common, low research potential, low integrity)	refer to footnote 11	low	low	low
S1MC326	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC327	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, low roof, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC328	pending	isolated artefact	low L, low R	low (common, low research potential)	refer to footnote 11	low	low	low
S1MC329	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, low roof, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC330	pending	rock shelter with PAD	low L, low R	low (small PAD, low roof, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC331	pending	rock shelter with artefacts	mod L, low R	mod (moderate habitable floor area and PAD, moderate depth of deposit, moderate research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC332	pending	rock shelter with PAD	low L, low R	low (small PAD, low roof, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC333	pending	rock shelter with PAD	low L, low R	low (small PAD, low roof, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC334	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC335	pending	rock shelter with PAD	low L, low R	low (small to moderate habitable floor area and PAD, but narrow, relatively low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC336	pending	rock shelter with PAD	low L, low R	low (small habitable floor area and PAD, low roof, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC337	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, low roof, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC338	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low

[11] A number of Aboriginal stakeholders have expressed the view that all of the sites/places are of high cultural significance (ie. high importance) and make no differentiation on the comparative level of value between any site or place. This is acknowledged and respected.

Site Name	OEH AHIMS #	Site Type	Significance					
			Overall[11]	Archaeological / Scientific	Aboriginal / Cultural	Aesthetic	Educational	Historic
S1MC339	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC340	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC341	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC342	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC343	pending	rock shelter with PAD	mod L, low R	mod (moderate to large habitable floor area and PAD, moderate depth of deposit, moderate research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC344	pending	rock shelter with artefacts	mod L, low R	mod (moderate to large habitable floor area and PAD, moderate research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC345	pending	rock shelter with PAD	low L, low R	low (moderate habitable floor area and PAD, low integrity, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC346	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, low roof, shallow deposit, low integrity, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC347	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC348	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC349	pending	rock shelter with PAD	low L, low R	low (small habitable floor area and PAD, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC350	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC351	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC352	pending	rock shelter with PAD	low L, low R	low (very small habitable floor area and PAD, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC353	pending	rock shelter with PAD	low L, low R	low (small PAD, shallow deposit, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
S1MC354	pending	rock shelter with PAD	low L, low R	low (relatively small PAD, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low

Site Name	OEH AHIMS #	Site Type	Significance					
			Overall[11]	Archaeological / Scientific	Aboriginal / Cultural	Aesthetic	Educational	Historic
PAD 6 Moolarben Coal	36-3-0885	rock shelter with PAD	low L, low R	low (very small PAD, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
PAD 12 Moolarben Coal	36-3-0958	rock shelter with PAD	low L, low R	low (very small PAD, low research potential)	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
Modification Investigation Area	n/a	cultural area/value	low L, low R	n/a	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
Use of subsistence and other resources	n/a	cultural area/value	low L, low R	n/a	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
Moolarben Ridge south of Carr's Gap	n/a	cultural area/value	low L, low R	n/a	refer to footnote 11	low - mod (natural landscape, limited recent impact)	low	low
Contemporary significance of Aboriginal objects	n/a	cultural area/value	Refer above for each site					

L = Local context, R = Regional context. 'mod' = moderate.

8. STATUTORY OBLIGATIONS

Commonwealth, State and local legislation relevant to the protection and management of Aboriginal heritage is outlined in the sections below. The investigation area does not contain any heritage items listed for indigenous values under the *Environment Protection and Biodiversity Conservation Act 1999*, *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* or NSW *Heritage Act 1977*, but it does contain Aboriginal objects protected under the NSW *National Parks and Wildlife Act 1974*.

8.1 Commonwealth

While the primary legislation offering protection to Aboriginal heritage in NSW is enacted by the State (refer to Section 8.2), several Acts administered by the Commonwealth may also be relevant.

Environment Protection and Biodiversity Conservation Act 1999:

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary Commonwealth legislation for the protection and management of matters of national environmental significance, which includes heritage places. The primary features of the EPBC Act relating to heritage include:

- A National Heritage List of natural, indigenous and historic places of national heritage significance;
- A Commonwealth Heritage List of heritage places owned or managed by the Commonwealth; and
- Consideration of heritage in the planning and development approvals process.

Commonwealth Heritage places are protected in that:

- Actions taken on Commonwealth land which are likely to have a significant impact on the environment will require the approval of the Minister;
- Actions taken outside Commonwealth land which are likely to have a significant impact on the environment on Commonwealth land, will require the approval of the Minister; and
- Actions taken by the Commonwealth Government or its agencies that are likely to have a significant impact on the environment anywhere will require approval by the Minister.

Australian Government agencies that own or lease heritage places are required to assist the Minister and the Australian Heritage Council to identify and assess the heritage values of these places. They are required to:

- Develop heritage strategies;
- Produce a register of the heritage places under their control;
- Develop a management plan to manage these places consistent with the Commonwealth Heritage Management Principles prescribed in regulations to the Act;
- Ensure the ongoing protection of the Commonwealth heritage values of the place when selling or leasing a Commonwealth heritage place; and

- Ask the Minister for advice about taking an action, if the action has, will have, or is likely to have, a significant impact on a Commonwealth heritage place.

The environmental assessment process of the EPBC Act protects matters of national environmental significance (including national heritage places), along with the environment where actions proposed are on, or will affect, Commonwealth land and/or where Commonwealth agencies are proposing to take an action. When a proposal is identified as having the potential to have a significant impact on a matter of national environmental significance, the proponent must refer the project to the Department of Sustainability, Environment, Water, Population and Communities. The matter is made public and referred to the relevant state, territory and Commonwealth ministers for comment. The Minister then decides whether the likely environmental impacts of the project are such that it should be assessed under the EPBC Act. State governments may, under agreement with the Commonwealth, assess actions that may have an impact on matters of national environmental significance. Following assessment, the Minister or their delegate may approve the action (with or without conditions) or not approve the action.

Australian Heritage Council Act 2003:

The *Australian Heritage Council Act 2003* established the Australian Heritage Council, an independent expert body to advise the Minister on the listing and protection of heritage places and other matters relating to heritage. This Act also enabled until 19 February 2012 the continued management of the Register of the National Estate, a list of more than 13,000 heritage places around Australia that had been compiled by the former Australian Heritage Commission since 1976. The Register of the National Estate has now ceased to be a statutory list and is retained only as an archive of information. References to the Register of the National Estate have now been removed from the EPBC Act and *Australian Heritage Council Act 2003*.

Aboriginal and Torres Strait Islander Heritage Protection Act 1984:

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* provides for the protection of areas and objects which are of significance to Aboriginal people in accordance with Aboriginal tradition. The Act allows Aboriginal people to apply to the Minister to seek protection for significant Aboriginal areas and objects. The Minister has broad powers to make such a declaration should the Minister be satisfied that the area or object is a significant Aboriginal area or object and is under immediate threat of injury or desecration. An 'emergency declaration' can remain in force for up to 30 days.

8.2 State

National Parks and Wildlife Act 1974:

The *National Parks and Wildlife Act 1974* (NP&W Act) provides the primary basis for the legal protection and management of Aboriginal heritage in NSW. With respect to development proposals and planning approvals, the *Environmental Planning and Assessment Act 1979* (EP&A Act) is the primary legislation.

Implementation of the Aboriginal heritage provisions of the NP&W Act is the responsibility of the Office of Environment and Heritage (OEH). The rationale behind the NP&W Act is to prevent the unnecessary or unwarranted destruction of Aboriginal objects and to protect and conserve objects where such action is considered warranted (DECCW 2009a, 2009b).

Section 2A of the Act, defines its objects to include 'the conservation of nature, including …

(b) 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, and
(ii) places of social value to the people of New South Wales.

Section 2A also identifies that the objects of the Act are to be achieved by applying the principles of ecologically sustainable development, defined in Section 6 of the *Protection of the Environment Administration Act 1991* as requiring the integration of *economic* and *environmental* considerations (including cultural heritage) in the decision-making process.

In regard to Aboriginal cultural heritage, ecologically sustainable development can be achieved by applying the principle of intergenerational equity and the precautionary principle (DECCW 2009b).

Intergenerational equity is the principle whereby the present generation should ensure the health, diversity and productivity of the environment for the benefit of future generations. In terms of Aboriginal heritage, intergenerational equity can be considered in terms of the cumulative impacts to Aboriginal objects and places in a region. If few Aboriginal objects and places remain in a region, fewer opportunities remain for future generations of Aboriginal people to enjoy the cultural benefits of those Aboriginal objects and places. Information about the integrity, rarity or representativeness of the Aboriginal objects and places proposed to be impacted, and how they illustrate the occupation and use of land by Aboriginal people across the region, are therefore relevant to the consideration of intergenerational equity and the understanding of the cumulative impacts of a proposal (DECCW 2009b:26).

The precautionary principle states that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation. In applying the precautionary principle, decisions should be guided by (DECCW 2009b:26):

- A careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and
- An assessment of the risk-weighted consequences of various options.

The precautionary principle is relevant to the OEH's consideration of potential impacts to Aboriginal cultural heritage where:

- The proposal involves a risk of serious or irreversible damage to Aboriginal objects or places or to the value of those objects or places; and
- There is uncertainty about the Aboriginal cultural heritage values or scientific or archaeological values, including in relation to the integrity, rarity or representativeness of the Aboriginal objects or places proposed to be impacted (DECCW 2009b:26).

Where this is the case, the OEH instructs that a precautionary approach should be taken and all cost-effective measures implemented to prevent or reduce damage to the objects/place (DECCW 2009b).

With the exception of some artefacts in collections, the NP&W Act generally defines all Aboriginal objects to be the property of the Crown. The Act then provides various controls for the protection, management of and impacts to these objects. An 'Aboriginal object' is defined under Section 5(1) as:

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

In practice, archaeologists generally subdivide the legal category of 'object' into different site types, which relate to the way Aboriginal heritage evidence is found within the landscape. The archaeological definition of a 'site' may vary according to survey objectives, however it should be noted that even single and isolated artefacts are protected as Aboriginal objects under the NP&W Act.

Under Section 89A of the NP&W Act, a person who is aware of the location of an Aboriginal object that is the property of the Crown or, not being the property of the Crown, is real property, and does not, in the prescribed manner, notify the Director-General thereof within a reasonable time after the person first becomes aware of that location is guilty of an offence against the Act unless the person believes on reasonable grounds that the Director-General is aware of the location of that Aboriginal object. The 'prescribed manner' is currently taken to be written notice in a form approved by the Director-General, being the Aboriginal Site Recording Forms available on the OEH website. Failure to comply with the requirements may result in a maximum penalty of 100 penalty units and, in the case of a continuing offence, a further 10 penalty units for each day the offence continues, for an individual, with double the fines for a corporation.

Aboriginal places are defined as any place declared to be an Aboriginal place under Section 84 of the Act. Typically these are locations of 'special significance with respect to Aboriginal culture' (for example, traditional or historical cultural value to Aboriginal people), for which identified Aboriginal objects may not be present.

Section 86 of the NP&W Act specifies the offences and penalties relating to harming or desecrating Aboriginal objects and Aboriginal places:

1) A person must not harm or desecrate an object that the person knows is an Aboriginal object.

Maximum Penalty:
(a) in the case of an individual - 2,500 penalty units or imprisonment for one year, or both, or (in circumstances of aggravation) 5,000 penalty units or imprisonment for two years, or both, or
(b) in the case of a corporation - 10,000 penalty units (currently $1,100,000).

2) A person must not harm an Aboriginal object ('strict liability offence').

Maximum Penalty:
(a) in the case of an individual - 500 penalty units or (in circumstances of aggravation) 1,000 penalty units, or
(b) in the case of a corporation - 2,000 penalty units (currently $220,000).

Under Section 86(4) it is an offence for a person to harm or desecrate an Aboriginal place, with maximum penalties of 5,000 penalty units or imprisonment for two years, or both, for individuals and 10,000 penalty units for corporations.

Harm to an Aboriginal object or place is defined under Section 5(1) as any act or omission that:

(a) destroys, defaces or damages the object or place, or
(b) in relation to an object—moves the object from the land on which it had been situated, or
(c) is specified by the regulations, or
(d) causes or permits the object or place to be harmed in a manner referred to in paragraph (a), (b) or (c), but does not include any act or omission that:
(e) desecrates the object or place, or
(f) is trivial or negligible, or
(g) is excluded from this definition by the regulations.

There are various exemptions and defences to offences under Section 86 of the Act, including:

- Of most relevance to development proposals generally, the offences under Section 86(1), (2) and (4) have a defence to prosecution under Section 87(1) if the harm or desecration was authorised by an Aboriginal Heritage Impact Permit (AHIP) and the conditions to which that AHIP were subject have not been contravened;

- The strict liability offence under Section 86(2) has a defence to prosecution under Section 87(2) if the person exercised *due diligence* to determine whether the act or omission constituting the alleged offence would harm an Aboriginal object and reasonably determined that no Aboriginal object would be harmed. Section 87(3) and the regulations associated with the Act (National Parks and Wildlife Regulation 2009) enable due diligence to be achieved through compliance with industry-specific Codes of Practice approved by the Minister. These include the DECCW (2010a) *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* and other approved codes such as the *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects* (NSW Minerals Council 2010).

  The 'due diligence' process is essentially intended to provide a defence to the strict liability offence under Section 86(2) of the NP&W Act, if an activity were subsequently to unknowingly harm an Aboriginal object in the absence of an AHIP. If Aboriginal objects are present or are likely to be present and an activity will harm those objects, then an AHIP application is required (excluding Part 3A projects). While the DECCW (2010a) *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* sets out procedures to determine whether or not Aboriginal objects are, or are likely to be present, identify whether the activity may harm objects and whether an AHIP is necessary, it does not constitute a level of Aboriginal heritage impact assessment that is typically required to satisfy the assessment requirements for projects under Part 4 and Part 5 of the EP&A Act. However, the conduct of an environmental impact assessment for a Part 4 or Part 5 project that satisfies the requirements of the Code of Practice will satisfy the 'due diligence' defence to Section 86(2) of the NP&W Act;

- The strict liability offence under Section 86(2) has a defence to prosecution under Section 87(4) if the person shows that the act or omission constituting the alleged offence is prescribed by the regulations as a low impact act or omission.

  Clause 80B of the National Parks and Wildlife Regulation 2009 describes low impact acts or omissions as including:

  - Maintenance work on land already disturbed (such as maintenance of existing roads, tracks or utilities);

- Farming and land management works on land already disturbed (such as cropping or leaving paddocks fallow, or construction of farm dams, fences, irrigation infrastructure, ground water bores, flood mitigation works, erosion control or soil conservation works, or maintenance of various existing infrastructure);
- Grazing of animals;
- Activity on already disturbed land that comprises exempt development or was the subject of a complying development certificate issued under the EP&A Act;
- Mining exploration work (such as costeaning, bulk sampling or drilling) on land already disturbed;
- Geological mapping, surface geophysical surveys and sub-surface surveys involving downhole logging, sampling or coring using hand-held equipment except where conducted as part of an archaeological investigation (exempted where the DECCW 2010 *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* is followed);
- Removal of isolated dead or dying vegetation if there is minimal ground disturbance;
- On already disturbed land seismic surveying or groundwater monitoring bores;
- Environmental rehabilitation work (such as silt fencing, tree planting, bush regeneration and weed removal, but not erosion control or soil conservation works).

For the purposes of Clause 80B, land is considered to be 'already disturbed' if it 'has been the subject of a human activity that has changed the land's surface, being changes that remain clear and observable' (for example, soil ploughing, construction of rural infrastructure such as dams and fences, construction of roads, tracks and trails, clearing of vegetation, construction of buildings, installation of utilities, substantial grazing involving the construction of rural infrastructure, or construction of earthworks related to the above);

- The defence of honest and reasonable mistake of fact applies under Section 86(5) to the strict liability offence of Section 86(2) and to offences against Aboriginal places under Section 86(4);

- The offences under Section 86(1) and (2) do not apply under Section 86(6), with respect to an Aboriginal object that is dealt with in accordance with section 85A (refer below);

- Exemptions are available under Section 87A to Section 86(1)-(4) for various emergency situations, conservation works and conservation agreements; and

- Exemptions are available under Section 87B to Section 86(1), (2) and (4) for Aboriginal people in relation to the carrying out of traditional cultural activities.

Consents regarding impacts to Aboriginal objects or areas with potential for Aboriginal objects are managed through the OEH Aboriginal Heritage Impact Permit system, as outlined in Section 90 of the NP&W Act and clauses 80D and 80E of the Regulations. The issuing of an AHIP is dependent upon adequate archaeological assessment and review (cultural heritage assessment report), together with an appropriate level of Aboriginal community liaison and involvement.

Typically, to support an AHIP, an Aboriginal cultural heritage assessment must be undertaken in accordance with the OEH (2011a) *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*, which effectively involves an assessment following the DECCW (2010b) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* and Aboriginal community consultation in accordance with the DECCW (2010c) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* policy (refer to Section 6).

The DECCW (2010b) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* contains detailed requirements for heritage assessments. Key features include:

- Investigations must be undertaken by people with appropriate skills and experience, specified in Section 1.6 as:

    1) A minimum of a Bachelor's degree with honours in archaeology or relevant experience in the field of Aboriginal cultural heritage management, and

    2) The equivalent of two years full-time experience in Aboriginal archaeological investigation, including involvement in a project of similar scope, and

    3) A demonstrated ability to conduct a project of the scope required through inclusion as an attributed author on a report of similar scope.

- Archaeological test excavation will be necessary when (regardless of whether or not there are objects present on the ground surface) it can be demonstrated through Requirements 1, 2, 3, 4, and 5 of the Code that sub-surface Aboriginal objects with potential conservation value have a high probability of being present in an area, and the area cannot be substantially avoided by the proposed activity; and

- A Section 90 AHIP is not required for test excavations undertaken in compliance with the Code (implementation of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* policy is required however).

Under clause 80D of the National Parks and Wildlife Regulation 2009, the cultural heritage assessment report that accompanies the AHIP application must address:

- The significance of the Aboriginal objects or Aboriginal places that are the subject of the application;

- The actual or likely harm to those Aboriginal objects or Aboriginal places from the proposed activity that is the subject of the application;

- Any practical measures that may be taken to protect and conserve those Aboriginal objects or Aboriginal places;

- Any practical measures that may be taken to avoid or mitigate any actual or likely harm to those Aboriginal objects or Aboriginal places; and

- Include any submission received from a registered Aboriginal party under clause 80C and the applicant's response to that submission.

The OEH determination of AHIP applications is guided by the OEH (2011a) *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*, OEH (2011b) *Applying for an Aboriginal Heritage Impact Permit: Guide for Applicants*, and OEH (2011c) *Guide to Aboriginal Heritage Impact Permit Processes and Decision-Making* policy.

AHIPs may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons. AHIPs may be transferred or varied (subject to conditions and approval of the Director-General). AHIPs may be refused. An application is taken to be refused (unless otherwise granted or refused earlier), 60 days after the date on which the application was received by the Director-General (not including any period during which an applicant is required to supply to the Director-General further information under Section 90F).

The Director-General may attach any conditions seen fit to any AHIP granted. Failure to comply with a condition is deemed under Section 90J to be a contravention of the Act. Such offences may result in a maximum penalty of 1,000 penalty units and/or imprisonment for six months, and, in the case of a continuing offence, a further 100 penalty units for each day the offence continues, for an individual, with double the fines for a corporation.

Under Section 90K of the NP&W Act, in making a decision in relation to an AHIP, the Director-General must consider the following matters (but only these matters):

a) The objects of the Act;

b) Actual or likely harm to the Aboriginal objects or Aboriginal place that are the subject of the permit;

c) Practical measures that may be taken to protect and conserve the Aboriginal objects or Aboriginal place that are the subject of the permit;

d) Practical measures that may be taken to avoid or mitigate any actual or likely harm to the Aboriginal objects or Aboriginal place that are the subject of the permit;

e) The significance of the Aboriginal objects or Aboriginal place that are the subject of the permit;

f) The results of any consultation by the applicant with Aboriginal people regarding the Aboriginal objects or Aboriginal place that are the subject of the permit (including any submissions made by Aboriginal people as part of a consultation required by the regulations);

g) Whether any such consultation substantially complied with any requirements for consultation set out in the regulations (specified in Section 90N of the NP&W Act and clause 80C of the National Parks and Wildlife Regulation 2009 and in the DECCW *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*);

h) The social and economic consequences of making the decision;

i) Any documents accompanying the application and any public submission that has been made under the EP&A Act in connection with the activity to which the permit application relates and that has been received by the Director-General; and

j) Any other matter prescribed by the regulations.

An appeals process is available under Section 90L of the NP&W Act whereby an applicant, dissatisfied with the refusal of the Director-General to grant a Section 90 AHIP, or with any conditions attached to the AHIP, may appeal to the Land and Environment Court. The appeal must be made within 21 days after notice of the decision that is being appealed. The decision of the Land and Environment Court on the appeal is final and is binding on the Director-General and the appellant.

Under Section 85A of the NP&W Act, the Director-General may 'dispose' of Aboriginal objects that are the property of the crown:

a) By returning the Aboriginal objects to an Aboriginal owner or Aboriginal owners entitled to, and willing to accept possession, custody or control of the Aboriginal objects in accordance with Aboriginal tradition, or

b) By otherwise dealing with the Aboriginal objects in accordance with any reasonable directions of an Aboriginal owner or Aboriginal owners referred to in paragraph (a), or

c) If there is or are no such Aboriginal owner or Aboriginal owners - by transferring the Aboriginal objects to a person, or a person of a class, prescribed by the regulations for safekeeping (typically implemented by way of a Care Agreement between the OEH and the Aboriginal person or organisation).

Under Section 85A(3) of the NP&W Act, the regulations may make provision as to the manner in which any dispute concerning the entitlement of an Aboriginal owner or Aboriginal owners to possession, custody or control of Aboriginal objects for the purposes of this section is to be resolved.

Under Section 91AA of the NP&W Act, if the Director-General is of the opinion that any action is being, or is about to be carried out that is likely to significantly affect an Aboriginal object or Aboriginal place or any other item of cultural heritage situated on land reserved under the Act, the Director-General may make a stop-work order for a period of 40 days. Various exemptions exist, such as for emergency situations and for approved developments under the EP&A Act. A person that contravenes a stop-work order may be penalised up to 1,000 penalty units and an additional 100 units for every day the offence continues (10,000 units and 1,000 units respectively in the case of a corporation). Under Section 91A, the Director-General may also make recommendations to the Minister for an Interim Protection Order in respect of land which has cultural significance, including Aboriginal objects, for a duration of up to two years. The existence of an AHIP does not prevent the making of a stop-work order or an interim protection order (Section 90O).

Under Section 91L of the NP&W Act the Director-General may direct a person to carry out remediation work to Aboriginal objects or places, if they have been harmed as a result of an offence under the Act. The remediation work may involve protection, conservation, maintenance, remediation or restoration of the harmed Aboriginal object or place. The maximum penalties under Section 91Q for contravening a remediation direction are 2,000 penalty units and 200 penalty units for each day the offence continues for a corporation.

Environmental Planning and Assessment Act 1979:

The EP&A Act requires that environmental impacts (including those to cultural heritage) be considered in land use planning and decision-making. The Minister administering the EP&A Act may make various planning instruments such as Local Environmental Plans (LEPs) or Development Control Plans (DCPs). These planning instruments may identify places and features of cultural heritage significance and define statutory requirements regarding the potential development, modification and conservation of these items. In general, places of identified significance, or places requiring further assessment, are listed in heritage schedules that form part of an LEP. Listed heritage items are then protected from certain defined activities, unless consent has been gained from an identified consent authority (typically the local government authority).

In determining a Development Application (DA) under Part 4 of the EP&A Act, a consent authority, such as a local government authority, must take into consideration matters such as the provisions of environmental planning instruments (for example, LEPs), DCPs, the likely impacts of that development, including environmental impacts on the natural and built environments, and social and economic impacts on the locality (Section 79C{1}).

If Aboriginal objects are known to exist on the land to which the development application applies prior to the application being made, under Part 4 of the EP&A Act an 'Integrated Development Application' (IDA) must be submitted to the consent authority. Any Development Approval issued for development of this kind must be consistent with the General Terms of Approval (GTA's) or requirements provided by the relevant State Government agency (for example, the OEH).

Under Part 5 of the EP&A Act, public authorities and government agencies that carry out activities have a duty to take into account to the fullest extent possible all matters affecting or likely to affect the environment (including cultural heritage) by reason of that activity. This typically takes the form of a Review of Environmental Factors (REF) or Environmental Impact Statement (EIS), with the agency (proponent) acting as the determining authority.

Part 3A of the EP&A Act has been repealed, but under Division 4.1 of Part 4, 'State Significant Development' is treated in a similar manner to the former Part 3A. The Minister is the Consent authority for State Significant Development applications, although for staged developments, the Minister may determine the local Council as the Consent authority for subsequent stages. As for other development applications under Part 4, the environmental impacts of the proposal need to be considered, including those on heritage.

Similar to the previous Part 3A legislation, under Section 89J of Part 4 of the EP&A Act, a Section 90 AHIP to impact Aboriginal objects is not required for an approved State Significant Development or for any investigative or other activities required to be carried out for the purpose of complying with environmental assessment requirements issued in connection with a development application for any such development. *In lieu* of a Section 90 AHIP, Aboriginal heritage needs to be managed post-approval under an Aboriginal Heritage Management Plan subject to the approval of the DP&I.

The MCP Stage 1 and Stage 2 projects are Part 3A Major Projects (notwithstanding that this Part of the Act has now been repealed). This modification to the Stage 1 approval is being assessed under Section 75W of the EP&A Act.

The interplay of the NP&W Act and Regulation and the planning system is complex. For proposed developments, the specific level of Aboriginal heritage impact assessment and Aboriginal community consultation required, and any requirement for an AHIP, is highly dependent upon not just the NP&W Act and Regulation, but the nature of the proposal, the Part and Division of the EP&A Act under which planning approval is required, any specific project approval requirements issued by DP&I and/or the OEH, the presence or otherwise of Aboriginal objects, and the potential for Aboriginal objects to occur.

8.3 Local

Under the *Environmental Planning and Assessment Act 1979* the Minister may make various planning instruments such as Local Environment Plans (LEPs), that are administered at a local government level. These plans set out objectives and controls for the development of land in the local government areas.

The *Mid-Western Regional Local Environmental Plan 2012* applies to the investigation area, although is not relevant to this modification as it is defined as an activity under Part 3A of the EP&A Act.

9. POTENTIAL IMPACTS

The proposed works associated with the Stage 1 Optimisation Modification have been outlined in Section 1.2 and are shown on Figure 2. Principally they comprise an extension of mining within Open Cuts 1 and 2 and the construction and operation of additional water management infrastructure, along with a minor change to the rehabilitation sequencing and final landform.

The impacts of the proposed modification on Aboriginal heritage (comprising both the identified Aboriginal objects, the potential resource and cultural areas/values) can potentially manifest itself in two distinct ways (refer to Section 9.1):

- Direct impacts from surface works; and
- Indirect impacts associated with surface works (for example, from blasting).

The potential impacts of the proposed modification on each of the Aboriginal sites and cultural areas/values within or immediately adjacent to the investigation area are presented in Table 9. The level of impacts will be reduced by the implementation of various mitigation measures and management strategies, as outlined in Sections 10 and 11 and demonstrated in Table 10. The 'type of harm', 'degree of harm' and 'consequence of harm' are as specified in the OEH (DECCW 2010b) guidelines.

In the absence of appropriate management and mitigation measures, it is concluded that the impacts of the proposed modification on Aboriginal heritage would be relatively low within a local context and very low within a regional context. With the implementation of mitigation measures, the impacts will be low within a local context and very low within a regional context.

9.1 Potential Surface Impacts

The nature and level of potential impacts of relevance to Aboriginal heritage from the modification can be categorised as follows:

- Broad-scale high level impacts, associated with the extended open cut pits, water management infrastructure and other areas of earthworks. As shown on Figure 3, broad-scale high level impacts are anticipated to be widespread across virtually the entire investigation area; and
- Indirect impacts, which may arise to Aboriginal sites on the margin or outside of the investigation area, for example from vibrations and dust associated with blasting.

Broad-scale high level impacts

The investigation area contains three isolated artefacts, 25 rock shelters with PADs and one rock shelter with artefacts, that may be subject to direct impacts. As discussed in Section 5.3.5, there is generally a low potential for other forms of heritage evidence to occur within the investigation area. Although there remains potential for additional stone artefacts to occur, this evidence is expected to comprise a very low density of artefacts consistent with background discard. The potential for sub-surface deposits of artefacts in open contexts that may be of high research value to occur is low.

Table 9: Potential surface impacts to Aboriginal sites, cultural areas/values and potential deposits within or immediately adjacent to the investigation area from the modification prior to the implementation of mitigation measures.

Site Name	Site Type	Significance	Potential Impacts			
			Surface	Type of Harm	Degree of Harm	Consequence of Harm
S1MC077	isolated find	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC325	isolated artefact	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC326	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC327	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC328	isolated artefact	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC329	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC330	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC331	rock shelter with artefacts	mod L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC332	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC333	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC334	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC335	rock shelter with PAD	low L, low R	broad-scale high level	possibly direct	possibly total or none	possibly total or partial loss of value
S1MC336	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC337	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC338	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC339	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC340	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC341	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC342	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC343	rock shelter with PAD	mod L, low R	nil proposed (marginally outside investigation area)	possibly indirect (blasting) or none	possibly partial or none	possibly partial or no loss of value
S1MC344	rock shelter with artefacts	mod L, low R	nil proposed (marginally outside investigation area)	possibly indirect (blasting) or none	possibly partial or none	possibly partial or no loss of value
S1MC345	rock shelter with PAD	low L, low R	nil proposed (marginally outside investigation area)	possibly indirect (blasting) or none	possibly partial or none	possibly partial or no loss of value

Site Name	Site Type	Significance	Potential Impacts			
			Surface	Type of Harm	Degree of Harm	Consequence of Harm
S1MC346	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC347	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC348	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC349	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC350	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC351	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC352	rock shelter with PAD	low L, low R	nil proposed (marginally outside investigation area)	possibly indirect (blasting) or none	possibly partial or none	possibly partial or no loss of value
S1MC353	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
S1MC354	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
PAD 6 Moolarben Coal	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
PAD 12 Moolarben Coal	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
Modification Investigation Area	cultural area/value	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
Use of subsistence and other resources	cultural area/value	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
Moolarben Ridge south of Carr's Gap	cultural area/value	low L, low R	broad-scale high level	probably direct	probably total	probably total loss of value
Contemporary significance of Aboriginal objects	cultural area/value (refer above for each site)					

L = Local; R = Regional.

The proposed works may also result in impacts to the cultural areas/values identified by the Aboriginal stakeholders, including the cultural value of the investigation area, Moolarben Ridge south of Carr's Gap, flora/fauna resources and the identified Aboriginal objects. The proposed works may result in some loss of these values, albeit the size of the impact area is relatively small within a regional context and substantial areas of similar environmental contexts occur nearby (for example, within Munghorn Gap Nature Reserve and Goulburn River National Park) which are inferred to host similar cultural values.

Indirect impacts

Three rock shelters with PADs and one rock shelter with artefacts were identified during the survey marginally outside of the investigation area. In addition, other previously recorded Aboriginal rock shelter sites and PADs have been reported outside of the investigation area (for example, PAD 2 Moolarben Coal, PAD 3 Moolarben Coal, PAD 5 Moolarben Coal, PAD 8 Moolarben Coal, PAD 9 Moolarben Coal, PAD 10 Moolarben Coal, PAD 11 Moolarben Coal, S2MC236 and S1MC055) and further sites could be identified during future archaeological surveys. Much of the area within say 500 metres east of the proposed extension areas (ie. away from the existing approved open cut pits) has not been subject to any systematic archaeological survey (refer to Figure 7). There is a high potential for additional rock shelter sites to be identified within this area.

The effects of vibration and overpressure from blasting activities on Aboriginal sites, such as rock shelters, has been subject to minimal empirical research, but cannot be discounted (Kuskie 2011). The potential effects of blasting on rock shelters is likely to relate to numerous variables, including the size and location and nature of the blast, direction of the blast, distance from the shelter, morphology of the shelter (eg. size, shape, level of exfoliation, pre-existing cracks or structural weaknesses, and presence of susceptible features such as protruding ledges and overhangs) and type of rock (eg. conglomerate or sandstone).

9.2 Regional Context and Cumulative Impacts

An objective of the NP&W Act (Section 2A) is the "conservation of objects, places or features … of cultural value within the landscape, including, but not limited to … places, objects and features of significance to Aboriginal people …". This objective is to be achieved by applying the principles of ecologically sustainable development (Section 2A), defined in Section 6 of the *Protection of the Environment Administration Act 1991* as requiring the integration of *economic* and *environmental* considerations (including cultural heritage) in the decision-making process. In regard to Aboriginal cultural heritage, ecologically sustainable development can be achieved by applying the principle of intergenerational equity and the precautionary principle (DECCW 2009b), which are discussed in Section 8.2.

Hence, the extent to which the heritage resource present within the investigation area may exist elsewhere in the region is therefore highly relevant to an assessment of the potential impacts of the modification with respect to the principles of ecologically sustainable development, intergenerational equity and the precautionary principle, along with the significance assessment of the sites (representative value) and an assessment of the cumulative impacts of the proposed modification.

An analysis of the evidence from the investigation area within a regional context has been undertaken (refer to Section 5.3.4). However, there are various problems and constraints that limit comparison of the evidence within a regional context. Notable constraints to the assessment are the absence of quantitative baseline data from the region, along with the limited extent of the region that has been subject to systematic archaeological sampling, and the problems inherent with the quality and suitability of the information from some existing studies. No regional heritage assessments have been undertaken to any level of detail sufficient to provide suitable quantitative or baseline data for comparison.

Two avenues of inquiry can be pursued, as to whether similar heritage resources to those identified within the investigation area exist elsewhere within the region:

1) By comparison of the *identified resource* with other heritage studies in the region and known site databases; and

2) By examination of topographic mapping and aerial photographs to identify if comparable environmental contexts exists elsewhere in the region, in which a similar *potential resource* may occur.

Identified Resource

The identified heritage resource and cultural values of the investigation area have been analysed in a regional context in Section 5.3. The nature of the evidence from the investigation area is consistent with the results from the overall Stage 1 project (Hamm 2006a) and from the Stage 2 project (Hamm 2008a). No specific aspects of the heritage evidence located within the modification investigation area are rare or unique within a local or regional context.

Similar heritage evidence is known to occur within nearby areas (eg. Hamm 2006a, Hamm 2008a, Kuskie 2009) and in conserved areas, including Munghorn Gap Nature Reserve and Goulburn River National Park. Within these nearby conserved areas, many comparable environmental contexts to the current investigation area also exist. In particular, sandstone terrain, in which rock shelter sites typically occur, are common in these conserved areas. The studies of Haglund (1980b, 1981c, refer also to DECC 2003) confirm the presence of numerous rock shelters with deposits and/or art, artefact scatters and grinding grooves within these conserved areas. Hence, although detailed quantitative comparison is not possible, it is inferred that similar heritage evidence to that identified within the current investigation area will frequently occur in these conserved areas. The Goulburn River National Park covers an area of 70,161 hectares, with the adjoining Munghorn Gap Nature Reserve covering a further 5,935 hectares (DECC 2003).

Hence, analysis of the potential resource in the region supports the conclusions above that the impacts of the proposed modification on Aboriginal heritage will be very low within a regional context.

Cumulative Impact with Ulan and Wilpinjong

Following a conclusion that the impacts of the proposed modification will be relatively low within a local context and very low within a regional context, it logically follows that the cumulative impact of the modification within a regional context (in combination with other mining projects in the region such as Ulan and Wilpinjong) will be very low.

Conclusion

It is concluded that the impacts of the proposed modification on Aboriginal heritage would be low within a local context and very low within a regional context. By extension, the cumulative impacts of the proposed modification within a regional context will also be very low.

The proposed modification is not inconsistent with the principle of intergenerational equity as outlined in Section 8.2. With the implementation of the mitigation measures as outlined in Sections 10 and 11, the proposed modification will not cause, within a regional context, a loss of heritage resources that could be viewed as being very rare or unique or unlikely to exist elsewhere.

In relation to the precautionary principle (refer to Section 8.2), the comprehensive nature of the archaeological survey and assessment and consultation process substantially reduces the risk of lack of scientific certainty.

The present study sampled virtually the geographic extent of the investigation area, consistent with the DEC (2005) *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation*. Measures are proposed in Sections 10 and 11 to obtain survey coverage of the 3% portion of the investigation area that could not be sampled during the current assessment.

Nevertheless, as identified in Section 7.2, in the absence of excavation of deposits, the nature and significance of evidence within the rock shelters cannot be known for certain. Controlled excavation of any shelter may lead to a revision of the assessment of significance, either upward (in the case of a shelter where deposits of higher research value than anticipated are revealed) or downward (in the case of a shelter where anticipated deposits of research value do not exist or are in a state of low integrity). If occupation deposits were to be identified in rock shelters that relate to human burials, spiritual/ceremonial use and/or occupation earlier than the mid-late Holocene period (older than say 5,000 years Before Present), these may rate as being of regional significance. Measures are proposed in Sections 10 and 11 to satisfactorily address this issue, with respect to consideration of the principles of ecologically sustainable development.

10. POTENTIAL MITIGATION AND MANAGEMENT STRATEGIES

10.1 General Strategies

General strategies for the management of the identified and potential Aboriginal heritage resources and cultural areas/values within the investigation area and immediately adjacent area are presented below. Specific options for the proposed modification are discussed in Section 10.2 and the recommended strategies are presented in Section 11.

A key consideration in selecting a suitable strategy is the recognition that Aboriginal heritage is of primary importance to the local Aboriginal community, and that decisions about the management of the sites should be made in consultation with the Aboriginal stakeholders.

10.1.1 Strategy A (Further Investigation)

In circumstances where an Aboriginal heritage site is identified (particularly an open artefact site or rock shelter), but the extent of the site, the nature of its contents, its level of integrity and/or its level of significance cannot be adequately assessed solely through surface survey (generally because of conditions of low surface visibility or sediment deposition), sub-surface testing may be an appropriate strategy to further assess the site. Sub-surface testing may also be appropriate in locations where artefact or midden deposits are predicted to occur (for example, in rock shelters or in open contexts) through application of a predictive model, in order to identify whether such deposits exist and their nature, extent, integrity and significance.

Test excavations can take the form of auger holes, shovel pits, mechanically excavated trenches or surface scrapes. The selection of a methodology (including a sampling strategy) is a process that involves (*cf*. Boismier 1991):

1) Identification of the specific environmental/cultural characteristics of the investigation area;

2) Construction of a model of Aboriginal occupation for the locality;

3) Definition of the expected nature and distribution of evidence (predictive model);

4) Formation of research questions and a methodology to retrieve the required data/evidence, in consideration of the expected nature and distribution of evidence; and

5) Analytical techniques for the evidence recovered that are appropriate to address the research questions and project objectives.

A Section 90 AHIP is not required for test excavations undertaken in compliance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b), although implementation of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* policy (DECCW 2010c) is required.

However, under the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*, archaeological test excavation is necessary when (regardless of whether or not there are objects present on the ground surface) it can be demonstrated through Requirements 1, 2, 3, 4, and 5 of the Code that sub-surface Aboriginal objects with potential conservation value have a high probability of being present in an area, and the area cannot be substantially avoided by the proposed activity.

A Section 90 AHIP is also not required under Section 89J of Part 4 of the EP&A Act, for any investigative or other activities required to be carried out for the purpose of complying with environmental assessment requirements issued in connection with a development application for State Significant Development. Comparable arrangements exist for former Part 3A Major Projects under Section 75U of the EP&A Act.

In all other circumstances a Section 90 AHIP is normally required from the OEH to undertake sub-surface testing. The OEH determination of AHIP applications is guided by the OEH (2011c) *Guide to Aboriginal Heritage Impact Permit Processes and Decision-Making* policy. Typically, approval of an AHIP can take up to 60 days, following receipt by the OEH of all necessary information.

This is a pro-active strategy, which should result in the identification, assessment and management of the Aboriginal heritage resource prior to any development activity occurring. Following assessment of each Aboriginal site, management strategies as outlined in Sections 10.1.2 - 10.1.5 can be applied.

Several other aspects of the potential heritage resource may require consideration as to whether further investigation is necessary as part of the Environmental Assessment stage or post-approval stage. These include areas that were not sampled during the assessment (for example, due to property access restrictions) or for which subsequent design changes may occur (outside of the currently known 'investigation area'). Typically, small areas or modifications can satisfactorily be addressed in a post-approval management plan.

10.1.2 Strategy B (Conservation)

Conservation is a suitable strategy for all heritage sites, but particularly those of high archaeological significance and/or high cultural significance. Conservation is also appropriate for specific archaeological resources and environmental/cultural contexts, as part of a regional strategy aimed at conserving a representative sample of identified and potential heritage resources.

Options exist within development proposals that can be utilised for the conservation of identified or potential Aboriginal heritage resources, including exclusion of development from zones of high heritage significance or potential, preservation of areas within formal conservation zones, or the re-design of works to avoid specific areas.

10.1.3 Strategy C (Mitigated Impact)

In circumstances where an Aboriginal site may be of archaeological and/or cultural significance, but the options for conservation are limited and the surface collection of artefacts or excavation of deposits could yield benefits to the Aboriginal community and/or the archaeological study of Aboriginal occupation, mitigation measures (salvage) may be warranted.

Salvage in these circumstances may include the collection of surface artefacts and/or systematic excavation of artefact or midden deposits. Salvage of other site types may also be warranted, for example scarred trees or grinding grooves. Salvage of a scarred tree may involve cutting and removing the tree or the portion of the tree containing the scar. Similarly, grinding grooves may be salvaged by removal of the freestanding rock they are situated on, or in the case of grooves on open bedrock, cutting and removing the section of bedrock with the grooves.

The imperative for salvage measures can be assessed in relation to:

- The nature of the identified and expected evidence, its significance and its research potential (ie. the potential for salvage to provide additional, useful evidence that will enhance the overall understanding of the nature of human occupation in the locality);
- The views of the Aboriginal stakeholders, as salvage may be warranted to minimise the impacts of development on the cultural values of the evidence; and
- The extent of potential development impacts on particular sites or potential resources.

Under the terms of the NP&W Act it is an offence to harm or desecrate an object that the person knows is an Aboriginal object, or to harm an Aboriginal object. As such, a Section 90 AHIP must normally be obtained from the OEH prior to impacting any Aboriginal objects, including through mitigation activities. The OEH determination of AHIP applications is guided by the OEH (2011c) *Guide to Aboriginal Heritage Impact Permit Processes and Decision-Making* policy. Typically, approval of an AHIP can take up to 60 days, following receipt by the OEH of all necessary information.

A Section 90 AHIP is generally not required for impacts to Aboriginal objects where the project is for State Significant Development under Part 4 of the EP&A Act (or as is the current modification, for a Part 3A approved Major Project), wherein commitments relating to the management of and mitigation of impacts to Aboriginal heritage *in lieu* of a Section 90 AHIP (typically in the form of an Aboriginal Heritage Management Plan) are approved by the DP&I and implemented.

Salvage typically involves the development of a detailed research design (including the nature of the methodology and sampling strategy, as discussed in Section 10.1.1). Where an AHIP is required, an Aboriginal heritage impact assessment must be undertaken in accordance with the DECCW (2010b) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* and Aboriginal community consultation in accordance with the DECCW (2010c) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* policy.

10.1.4 Strategy D (Unmitigated Impact)

The strategy of unmitigated impact involves the proponent causing impacts to the heritage evidence without any mitigation measures. This strategy is typically suitable when the heritage evidence is of low scientific and cultural significance, the registered Aboriginal parties hold no objections, and it is unfeasible to implement any other strategy.

Under the terms of the NP&W Act it is an offence to harm or desecrate an object that the person knows is an Aboriginal object, or to harm an Aboriginal object. As such, a Section 90 AHIP must normally be obtained from the OEH prior to impacting any Aboriginal objects. The OEH determination of AHIP applications is guided by the OEH (2011c) *Guide to Aboriginal Heritage Impact Permit Processes and Decision-Making* policy. Typically, approval of an AHIP can take up to 60 days, following receipt by the OEH of all necessary information.

A Section 90 AHIP is generally not required for impacts to Aboriginal objects where the project is for State Significant Development under Part 4 of the EP&A Act (or as is the current modification, for a Part 3A approved Major Project), wherein commitments relating to the management of and mitigation of impacts to Aboriginal heritage *in lieu* of a Section 90 AHIP (typically in the form of an Aboriginal Heritage Management Plan) are approved by the DP&I and implemented.

Where an AHIP is required, an Aboriginal heritage impact assessment must be undertaken in accordance with the DECCW (2010b) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* and Aboriginal community consultation in accordance with the DECCW (2010c) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* policy.

10.1.5 Strategy E (Monitoring)

An alternative strategy for zones where archaeological deposits are predicted to occur is to monitor construction, particularly any initial earthmoving and soil removal works, for the presence of artefacts, shell or skeletal remains.

Monitoring is one of the primary strategies for managing the possible occurrence of Aboriginal skeletal remains. Monitoring for the presence of shell and stone artefacts is also often of value to the Aboriginal community, who may be seeking to identify and salvage material that was not visible on the surface during a preliminary study. The sieving of graded deposits is also a practical measure that enhances the benefits of monitoring for artefacts. However, the nature of construction methods (eg. the use of earthmoving machinery to rapidly excavate large quantities of soil) tends to limit the potential for successful identification of heritage evidence during monitoring.

Monitoring for artefacts (in preference to controlled excavation) is not a widely accepted method within the context of a scientific investigation, because it could result in substantial and costly delays to construction (particularly if a Section 90 AHIP or Part 4 State Significant Development or Part 3A Major Project approval is not in force), late revisions to development plans, and/or cause undesirable impacts to sites of significance. However, monitoring for the presence of artefacts and other features during initial earthworks can be of scientific benefit and benefit to the Aboriginal community, by enabling the identification and retrieval of cultural evidence that may not otherwise have been recorded or salvaged.

In relation to potential blasting impacts, monitoring is primarily associated with inspecting and recording the condition of identified rock shelter sites before and after blasting has taken place, often in association with measurements of vibration, overpressure and/or dust levels, in order to identify if any related impacts have occurred. Such information can be used to refine the modelling involved in assessing impacts and guide future assessments within a locality. It can also guide the implementation of suitable management strategies for particular sites that may be susceptible to impacts.

10.2 Assessment of Specific Management Options for Aboriginal Sites and Cultural Areas/Values

The assessment of specific strategies for the management of the identified and potential Aboriginal heritage resources and cultural values within the investigation area can be considered in relation to various criteria such as the nature of the heritage evidence, its significance, the nature of the potential impacts, and the views of the Aboriginal stakeholders. Consideration of management options can be discussed within general categories, based on the nature and level of potential impacts (refer to Sections 10.2.1-10.2.4):

- Broad-scale high level impacts, associated with the extended open cut pits, water management infrastructure and other areas of earthworks. As shown on Figure 3, broad-scale high level impacts are anticipated to be widespread across virtually the entire investigation area; and
- Indirect impacts, which may arise to Aboriginal sites on the margin or outside of the investigation area, for example from vibrations and dust associated with blasting.

The recommended management strategies and the primary rationale for each strategy for each Aboriginal site or cultural area/value within the modification area are presented in Section 11 and Table 10.

South East Archaeology has prepared a draft ACHMP for the entire Moolarben Coal Complex (including the approved Stage 1 project and the Stage 2 project currently pending approval). The draft ACHMP has been reviewed and approved by the registered Aboriginal stakeholder organisations, but finalisation of the plan is pending receipt of the Stage 2 project approval. Implementation of the plan will not occur until after DP&I approval is granted.

In the interim, an ACHMP (*Aboriginal Cultural Heritage Management Plan: Moolarben Coal Project Stage 1*) applying to the entire Stage 1 project has been prepared by South East Archaeology, to permit the continued operation of the approved Stage 1 project outside of the existing approved AHMP area (which only comprises the MIA and OC1). Referred to as the 'Stage 1 ACHMP', it has been prepared in accordance with the requirements of the Part 3A Project Approval 05_0117 for Stage 1 (as modified), to manage all interactions of the project within the Stage 1 approved project area with Aboriginal heritage, *in lieu* of a Section 90 AHIP.

The Stage 1 ACHMP has been endorsed by the Aboriginal stakeholders and was lodged on 11 March 2013 with the DP&I for approval. The Stage 1 ACHMP, when approved, will replace the previously approved AHMP that applies to portions of Stage 1.

It is anticipated that the management of Aboriginal heritage in relation to this Stage 1 modification will occur in a manner consistent with the ACHMP for Stage 1 (DP&I approval pending). This assessment has also been undertaken in accordance with the relevant procedures specified in the Stage 1 ACHMP, particularly Section 4.6 relating to additional Aboriginal heritage investigation required.

10.2.1 Management of Broad-Scale High Level Impacts

As identified in Section 9.1 and Table 9, three isolated artefacts, 25 rock shelters with PADs and one rock shelter with artefacts are likely to be subject to direct impacts. The proposed works may also result in some loss of the cultural values identified by the Aboriginal stakeholders. However, as discussed in Section 5.3.5, there is generally a low potential for other forms of heritage evidence to occur within the investigation area. Although there remains potential for additional stone artefacts to occur, this evidence is expected to comprise a very low density of artefacts consistent with background discard. The potential for sub-surface deposits of artefacts in open contexts that may be of high research value to occur is low.

The 25 rock shelters with PADs that may be subject to direct impacts from surface works are assessed as being of low heritage significance and low research potential. Unmitigated impact is an appropriate management strategy for these PADs, particularly in view of the offsetting salvage measures outlined below for site S1MC331. This strategy is consistent with Section 4.5.1 (*Management of Previously Unrecorded Aboriginal Heritage Evidence - Surface Impacts*) of the Stage 1 ACHMP, which specifies in relation to rock shelter sites:

- Where broad-scale impacts are proposed (for example, open cut mining), and avoidance of impacts is not feasible:
    - Where the site is assessed as being of low significance and impacts cannot be avoided, following detailed recording of the evidence, impacts will be permitted to occur without further action.

Further investigation (for example, sub-surface testing) or implementation of conservation measures for these PADs are not warranted in view of the absence of identified evidence, the low potential for sub-surface deposits that may be of research value (supported by a robust occupation and predictive model, combined with the individual features of each shelter such as the limited habitable floor area), their low potential heritage significance and the adoption of other offsetting measures (refer below).

The one rock shelter with artefacts (S1MC331) that may be subject to direct impacts from surface works is assessed as being of moderate heritage significance within a local context (but of low regional significance) and moderate research potential. Test excavation to adequately assess the nature and significance of the deposits, followed by consideration of further mitigation measures (salvage excavation), represents an appropriate management strategy. This strategy is consistent with Section 4.5.1 (*Management of Previously Unrecorded Aboriginal Heritage Evidence - Surface Impacts*) of the Stage 1 ACHMP, which specifies in relation to rock shelter sites:

- Where broad-scale impacts are proposed (for example, open cut mining), and avoidance of impacts is not feasible:
    - Where the site is assessed as being of low to moderate, or moderate significance, following detailed recording of the evidence, where the consensus agreement of MCO and the registered Aboriginal stakeholder organisations is reached, the site will be subject to test excavation and consideration of further mitigation measures (salvage excavation) as per the procedures established in Section 4.4.4 of this Plan. In the event that consensus agreement cannot be reached between MCO and the registered Aboriginal stakeholder organisations about the mitigation strategy, the ECRM[12] will determine that strategy in consultation with a heritage expert.

[12] MCO's Environment and Community Relations Manager

Procedures for test and salvage excavation are outlined here in Section 10.2.4 (as per Section 4.4.4 of the Stage 1 ACHMP). Conservation of site S1MC331 is not feasible in view of its location within the extended open cut pit and is not warranted in view of its potential heritage significance (moderate in a local context and low in a regional context, as compared to high in a local context and moderate or high in a regional context). The investigation of the shelter through test excavation, with potentially salvage excavation, will adequately offset the direct impacts to this site and other rock shelters with PADs within the modification area.

The three open artefact sites (all isolated artefacts) that may be subject to direct impacts from surface works are assessed as being of low heritage significance and low research potential. Unmitigated impact is an appropriate management strategy for these sites, particularly given that isolated artefacts can be problematic to relocate and collect. This strategy is consistent with Section 4.5.1 (*Management of Previously Unrecorded Aboriginal Heritage Evidence - Surface Impacts*) of the Stage 1 ACHMP, which specifies in relation to open artefact sites:

- Where broad-scale impacts are proposed (for example, open cut mining), and avoidance of impacts is not feasible:
    - Where the site is assessed as being of low significance, following detailed recording of the evidence, impacts will be permitted to occur without further action.

Further investigation (for example, sub-surface testing) or implementation of conservation measures are not warranted, either at these sites or elsewhere in open contexts in the modification area, in view of the low potential for sub-surface deposits that may be of research value (supported by a robust occupation and predictive model) and the low potential heritage significance of the evidence. The existence of similar environmental contexts and potential heritage resources to those of the impact area elsewhere in the region, including in nearby National Parks and Conservation Areas, that will not be subject to impacts, along with the very low cumulative impact of the works within a regional context also limit the need for any further investigation or mitigation measures for open artefact evidence within the modification area.

The proposed works may result in some impacts to the cultural values identified by the Aboriginal stakeholders. Further specific conservation or mitigation measures are not warranted in consideration of the:

- Implementation of the mitigation measures proposed above and in Section 10.2.2, which will assist in offsetting the impacts of the modification on cultural values;
- Existence of similar environmental contexts and potential cultural values to those of the impact area elsewhere in the region, including in nearby National Parks and Conservation Areas that will not be subject to impacts;
- Relatively small size of the impact area within a regional context; and
- Relatively low significance within a regional context of the cultural places/values.

10.2.2 Management of Indirect Impacts

As identified in Section 9.1 and Table 9, at least three rock shelters with PADs (S1MC343 of potentially moderate local significance, along with two PADs of low significance) and one rock shelter with artefacts (S1MC344) will potentially be subject to indirect impacts associated with blasting.

In addition, other previously recorded Aboriginal rock shelter sites and PADs have been reported outside of the investigation area (for example, PAD 2 Moolarben Coal, PAD 3 Moolarben Coal, PAD 5 Moolarben Coal, PAD 8 Moolarben Coal, PAD 9 Moolarben Coal, PAD 10 Moolarben Coal, PAD 11 Moolarben Coal, S2MC236 and S1MC055) and further sites could be identified during future archaeological surveys. Much of the area within say 500 metres east of the proposed extension areas (ie. away from the existing approved open cut pits) has not been subject to any systematic archaeological survey (refer to Figure 7) and there is a high potential for additional rock shelter sites to be identified within this area.

Further investigation is warranted in relation to the potential impacts of blasting:

1) As detailed mine planning progresses, assessment by an appropriate expert of the potential effects of blasting on rock shelter sites/PADs, and in particular, identification of the potential zone of impact associated with blasting in the modification area;

2) Systematic archaeological survey of those portions of the potential zone of impact that have not already been subject to sampling (refer to Figure 7) to facilitate identification of those sites that may be subject to impacts, and assessment by an appropriate expert of the potential effects of blasting on those sites/PADs; and

3) Where rock shelter sites/PADs are identified as being subject to potentially substantial impacts from blasting (ie. involving major cracking and/or rock fall, such that human entry to the shelter is considered to be an unacceptable safety risk and/or total collapse of the shelter is anticipated to occur as a direct consequence), management of those sites/PADs occurs in accordance with Section 4.5.1 of the Stage 1 ACHMP.

Section 4.5.1 of the Stage 1 ACHMP specifies in relation to rock shelter sites/PADs, that where broad-scale impacts are proposed (for example, open cut mining), and avoidance of impacts is not feasible:

> - Where the site is assessed as being of low significance, following detailed recording of the evidence, impacts will be permitted to occur without further action;
> - Where the site is assessed as being of low to moderate, or moderate significance[13], following detailed recording of the evidence, where the consensus agreement of MCO and the registered Aboriginal stakeholder organisations is reached, the site will be subject to test excavation and consideration of further mitigation measures (salvage excavation) as per the procedures established in Section 4.4.4 of this Plan. In the event that consensus agreement cannot be reached between MCO and the registered Aboriginal stakeholder organisations about the mitigation strategy, the ECRM will determine that strategy in consultation with a heritage expert;

[13] As is the case for at least S1MC343 and S1MC344 immediately adjacent to the modification investigation area, and potentially other previously recorded sites and currently unidentified sites in the potential zone of impact from blasting.

- Where the site is assessed as being of moderate to high, or high significance, it will be subject to test excavation and any other mitigation measures, such as salvage excavation by hand, as determined by the consensus agreement of MCO and the registered Aboriginal stakeholder organisations (refer to procedures Section 4.4.4 of this Plan) before impacts are permitted to occur. In the event that consensus agreement cannot be reached between MCO and the registered Aboriginal stakeholder organisations about the mitigation strategy, the ECRM will determine that strategy in consultation with a heritage expert, but it will as a minimum involve test excavation of the shelter (refer to procedures in Section 4.4.4 of this Plan).

10.2.3 Further Investigation Required

Procedures are included in Section 4.6.4 of the Stage 1 ACHMP in relation to the survey of areas not sampled during the current study. In relation to this modification assessment, this applies to:

- The 10 hectares of land not subject to survey due to property access constraints at the time of the survey or revisions to the investigation area boundary that occurred after completion of the field survey (refer to Figure 10); and
- Potentially, areas adjacent to the investigation area that may lie within the potential zone of impact from blasting (refer to Section 10.2.2).

Section 4.6.4 of the Stage 1 ACHMP specifies that MCO will engage an appropriately qualified and experienced archaeologist to conduct a detailed archaeological survey and recording, in consultation with the registered Aboriginal stakeholder organisations, of the following locations:

- All impact areas that were not sampled during the EA investigation, prior to impacts occurring in those specific areas. With respect to areas of broad-scale surface impacts, the assessment will also address the possible impacts on PADs in open contexts. This may involve the conduct of test excavations by an appropriately qualified and experienced archaeologist, in consultation with the registered Aboriginal stakeholder organisations, within areas of high heritage potential for sub-surface deposits of research value (refer to excavation procedures in Section 4.4 of this Plan);
- In locations where impacts are proposed and existing identified Aboriginal sites listed in Appendix 2 may be subject to impacts, management strategies will be applied as set out in Appendix 2 of this Plan;
- In locations where impacts are proposed and newly identified Aboriginal sites, or previously recorded sites not listed in Appendix 2 of this Plan, may be subject to impacts, management strategies will be applied as set out in Section 4.5 of this Plan;
- In locations where the proposed works will occur in close proximity to an identified Aboriginal site, but impacts to the site can be avoided, MCO will implement measures considered necessary by the ECRM to minimise the risk that inadvertent impacts occur to the relevant heritage evidence (refer to Section 4.3 of this Plan);

- Where required, the Aboriginal Site Database will be updated as soon as practical (refer to Section 5.1 of this Plan);
- Where required, updated site records will be lodged with the OEH (refer to Section 5.1 of this Plan); and
- A report will be prepared with reference to the *Aboriginal Heritage Standards and Guidelines Kit* (DEC 1997) and the requirements of this Plan, documenting the results of any additional archaeological survey and management outcomes, and copies will be distributed to the registered Aboriginal stakeholder organisations, DP&I and the OEH within 30 working days of completion (refer to Section 5.6 of this Plan).

Further investigation of the rock shelter sites/PADs is addressed in Sections 10.2.1 and 10.2.4.

10.2.4 Mitigation and Monitoring Required

Mitigation measures have been identified in Section 10.2.1 as being warranted for the one rock shelter with artefacts (site S1MC331) that is of moderate heritage significance and may be subject to direct impacts. Depending on the outcomes of further assessment of the potential impact zone from blasting, test excavations may also be warranted in several other rock shelter sites/PADs (for example, S1MC343 and S1MC344) (refer to Section 10.2.2).

Where test excavation of rock shelters is required, the procedures are outlined in Section 4.4.4 of the Stage 1 ACHMP and comprise:

- The process will be undertaken by appropriately qualified and experienced archaeologists, in consultation with the registered Aboriginal stakeholder organisations;
- The process will be undertaken prior to any subsidence or direct impacts occurring to any of those specific areas or sites;
- Where test excavation is required:
    - The aim is to identify the nature of deposits, site integrity and research potential, and enable a reassessment of significance and determination in consultation with the registered Aboriginal stakeholder organisations as to whether more detailed salvage excavation is required to mitigate impacts;
    - A baseline will be established in the shelter and an accurate plan prepared;
    - A trench typically measuring 2 metre x 0.5 metres in area will be pegged out in the central portion of the main habitable floor area of the shelter, extending from near or at the rear of the shelter towards or across the dripline;
    - The test excavation will be dug by trowel within 0.5 x 0.5 metre units to the depth of the visible or predicted cultural deposits or to bedrock. Each unit will be labelled using an alphanumerical grid. Major rock will be excavated around and not removed;
    - Excavation units will be dug in successive levels ('spits') of five centimetres depth, within individual soil units. Where pits or lenses are identified, these will also be excavated and sieved separately as a sub-unit. Where genuine stratigraphical/soil profile changes occur, a new spit will be commenced;
    - Vertical control (depth below surface) will be established using levels off a datum point;

- Data will be recorded for each excavation unit on an 'Excavation Unit Recording Form', including the position of any features or key evidence and soil descriptions;
- Soil from each level within an excavation unit will be placed into separate buckets and separately dry-sieved through 2-3 millimetre mesh. Material (both natural and cultural) remaining in the sieve will be sorted by a qualified archaeologist to retain all probable and potential cultural items and dispose of the natural items;
- Samples of soil will be retained;
- Charcoal samples will be retained where identified and where suitable for radiocarbon or other methods of direct dating, submitted to an accredited laboratory for dating;
- At the completion of excavation the trench will be lined with plastic and backfilled with the excavated/sieved sediment;
- The excavation and location will be photographed;
- Retrieved artefacts will be washed and dried if necessary and recorded by a qualified archaeologist. A minimal level of information will be recorded for every artefact collected (provenance, stone material type, lithic item type, size, weight, nature and quantity of cortex, and presence and nature of any use-wear or residues) with additional attributes recorded where necessary. Individual artefacts of significance may be photographed and/or illustrated. Analysis of use-wear and/or residues may be undertaken;
- Any shell and bone material retrieved will be recorded, with identification to genus or species level where possible and counts of minimum numbers undertaken. Similar shell and bone items will be bagged together for each unit spit;
- Retrieved artefacts will be curated as set out in Section 4.7 of this Plan. Following recording of artefacts into a computer database, individual objects will be bagged separately in resealable, labelled plastic bags, with provenance information recorded on waterproof ink on the plastic bag label strips. Artefact bags will be grouped together for each excavation area or site and further provenance information included on metal tags;
- A report will be prepared by a qualified archaeologist with reference to the *Aboriginal Heritage Standards and Guidelines Kit* (DEC 1997) and the requirements of this Plan, documenting the methods, results (including a plan of the site and excavation area, artefact databases and analysis with respect to relevant research questions) and Aboriginal involvement. Copies will be distributed to the registered Aboriginal stakeholder organisations, DP&I and the OEH within 30 working days of completion (refer to Section 5.6 of this Plan);
- Updated site records will be lodged with the OEH (refer to Section 5.1 of this Plan);

Where it is determined under Section 4.4.4 of the Stage 1 ACHMP in consultation with the registered Aboriginal stakeholder organisations that more detailed salvage excavation is required:

- The sample will be selected by an appropriately qualified and experienced archaeologist, in consultation with the registered Aboriginal stakeholder organisations;

- The aim of salvage excavation would be to mitigate the impacts of the Project on heritage values, through the retrieval and analysis of evidence and contribution to an improved understanding of Aboriginal occupation of the locality. This can be achieved through the analysis of the data obtained to address relevant research questions, particularly those relating to occupation models, stone working technology, stone material procurement and use, and the chronology of occupation within the locality;
- The excavation area and location will be determined by an appropriately qualified and experienced archaeologist, in consultation with the registered Aboriginal stakeholder organisations, with consideration of the potential subsidence or direct impacts, extent of the habitable floor area and PAD, nature of the evidence, and the spatial area and quantity of data required to address relevant research questions and thereby successfully mitigate the impacts of the Project;
- A baseline will be established in the shelter, the excavation area pegged out, and an accurate plan prepared;
- The excavation will be dug by trowel within 0.5 x 0.5 metre units to the depth of the visible or predicted cultural deposits or to bedrock. Each unit will be labelled using an alphanumerical grid. Major rock will be excavated around and not removed;
- Excavation units will be dug in successive levels ('spits') of five centimetres depth, within individual soil units. Where pits or lenses are identified, these will also be excavated and sieved separately as a sub-unit. Where genuine stratigraphical/soil profile changes occur, a new spit will be commenced;
- Vertical control (depth below surface) will be established using levels off a datum point;
- Data will be recorded for each excavation unit on an 'Excavation Unit Recording Form', including the position of any features or key evidence and soil descriptions;
- Soil from each level within an excavation unit will be placed into separate buckets and separately dry-sieved through 2-3 millimetre mesh. Material (both natural and cultural) remaining in the sieve will be sorted by a qualified archaeologist to retain all probable and potential cultural items and dispose of the natural items;
- Samples of soil will be retained;
- Charcoal samples will be retained where identified and where suitable for radiocarbon or other methods of direct dating, submitted to an accredited laboratory for dating;
- At the completion of excavation the trench will be lined with plastic and backfilled with the excavated/sieved sediment;
- The excavation and location will be photographed;
- Retrieved artefacts will be washed and dried if necessary and recorded by a qualified archaeologist. A minimal level of information will be recorded for every artefact collected (provenance, stone material type, lithic item type, size, weight, nature and quantity of cortex, and presence and nature of any use-wear or residues) with additional attributes recorded where necessary. Individual artefacts of significance may be photographed and/or illustrated. Analysis of use-wear and/or residues may be undertaken;

- Any shell and bone material inferred to be of cultural origin retrieved will be recorded, with identification to genus or species level where possible and counts of minimum numbers undertaken. Similar shell and bone items will be bagged together for each unit spit;
- Retrieved artefacts will be curated as set out in Section 4.7 of this Plan. Following recording of artefacts into a computer database, individual objects will be bagged separately in resealable, labelled plastic bags, with provenance information recorded on waterproof ink on the plastic bag label strips. Artefact bags will be grouped together for each excavation area or site and further provenance information included on metal tags;
- A report will be prepared by a qualified archaeologist with reference to the *Aboriginal Heritage Standards and Guidelines Kit* (DEC 1997) and the requirements of this Plan, documenting the methods, results (including a plan of the site and excavation area, artefact databases and analysis with respect to relevant research questions) and Aboriginal involvement. Copies will be distributed to the registered Aboriginal stakeholder organisations, DP&I and the OEH within 30 working days of completion (refer to Section 5.6 of this Plan);
- Updated site records will be lodged with the OEH (refer to Section 5.1 of this Plan).

The Stage 1 ACHMP also contains a number of other provisions of relevance to the modification, including:

- Heritage awareness training (Section 4.8); and
- Provisions to guide the management of any previously unrecorded sites that may be identified during future investigations or works (Section 4.5).

11. RECOMMENDATIONS

This Aboriginal cultural heritage assessment of the Moolarben Coal Project Stage 1 Optimisation Modification has been prepared by South East Archaeology for MCO in relation to an approval being sought from the DP&I for the modification under Section 75W of Part 3A of the EP&A Act.

The modification principally comprises an extension of mining within Open Cuts 1 and 2 and the construction and operation of additional water management infrastructure, along with a minor change to the rehabilitation sequencing and final landform.

Five Aboriginal sites, comprising three open artefact sites and two rock shelters with artefacts, along with 28 rock shelters with PADs, are known to occur directly within or immediately adjacent to the modification investigation area. Cultural areas and values have also been identified by the Aboriginal stakeholders, including the cultural value of the investigation area itself, Moolarben Ridge south of Carr's Gap, flora/fauna resources and the identified Aboriginal objects.

The potential impacts of the modification include:

- Broad-scale high level impacts, associated with the extended open cut pits, water management infrastructure and other areas of earthworks. These impacts are anticipated to be widespread across virtually the entire investigation area and will probably result in impacts to three open artefact sites, 25 rock shelters with PADs and one rock shelter with artefacts; and
- Indirect impacts, which may arise to Aboriginal sites on the margin or outside of the investigation area, from vibrations associated with blasting. This may affect three rock shelters with PADs and one rock shelter with artefacts identified during the survey marginally outside of the investigation area, but other previously reported sites and further sites that could be identified during future archaeological surveys may also be subject to impacts.

The proposed works may also result in impacts to the cultural areas/values identified by the Aboriginal stakeholders. However, there is generally a low potential for other forms of heritage evidence to occur within the investigation area.

It is concluded that the impacts of the proposed modification on Aboriginal heritage would be low within a local context and very low within a regional context. By extension, the cumulative impacts of the proposed modification within a regional context would also be very low.

The following recommendations are made on the basis of legal requirements under the EP&A Act and NP&W Act, the results of the investigation and consultation with the registered Aboriginal stakeholder organisations:

1) Approval should be obtained from the DP&I for the *Aboriginal Cultural Heritage Management Plan: Moolarben Coal Project Stage 1* (Stage 1 ACHMP) to manage all interactions of the project with Aboriginal heritage within Stage 1 (including those that relate to this modification), *in lieu* of a Section 90 Aboriginal Heritage Impact Permit. After DP&I approval of the Stage 1 ACHMP and the Stage 1 Optimisation Modification, the provisions relating to the modification area will be implemented. The primary elements of the ACHMP relevant to the modification are outlined below and in Table 10:

a) Further investigation will occur for specific heritage sites or areas, including:

   i) As detailed mine planning progresses, assessment will be undertaken by an appropriate expert of the potential effects of blasting on rock shelter sites/PADs, and in particular, identification of the potential zone of impact associated with blasting in the modification area. Systematic archaeological survey of those portions of the potential zone of impact that have not already been subject to sampling (refer to Figure 7) will occur in accordance with the Stage 1 ACHMP to facilitate identification of those sites that may be subject to impacts, and assessment by an appropriate expert of the potential effects of blasting on those sites/PADs. Where rock shelter sites/PADs are identified as being subject to potentially substantial impacts from blasting[14], management of those sites/PADs will occur in accordance with the Stage 1 ACHMP;

   ii) Archaeological survey will occur for all potential impact areas that could not be sampled during the present investigation, currently totalling 10 hectares within the investigation area boundary (refer to Figure 10), and potentially including areas adjacent to the investigation area that may lie within the potential zone of impact from blasting. The survey will be conducted by a qualified archaeologist in consultation with the registered Aboriginal stakeholder organisations using the same methodology as for the present investigation, prior to any impacts occurring, in accordance with the Stage 1 ACHMP. Subsequent to the survey, management strategies can be implemented as outlined in the ACHMP for previously unrecorded sites;

b) In order to mitigate the impacts of the proposed modification on scientific and cultural values and/or to retrieve and conserve samples of the heritage evidence, mitigation measures will be implemented prior to any impacts occurring to specified sites and areas, including:

   i) Site S1MC331, a rock shelter with artefacts, will be subject to test excavation, in accordance with the procedures outlined in the Stage 1 ACHMP. Where it is determined under the Stage 1 ACHMP that more detailed salvage excavation is required, this will occur in accordance with the provisions in that section;

c) All heritage investigation and mitigation measures undertaken will be adequately documented and distributed to relevant stakeholders (such as the DP&I and the OEH and the registered Aboriginal stakeholder organisations) within appropriate timeframes, in accordance with the procedures outlined in the Stage 1 ACHMP;

d) All heritage evidence salvaged will be curated in an appropriate manner, in accordance with the procedures outlined in the Stage 1 ACHMP;

e) Where impacts from surface works will be avoided to identified heritage evidence, appropriate site-specific precautionary measures will be implemented for those sites within close proximity of the area of works, in accordance with the procedures outlined in the Stage 1 ACHMP;

f) Within 18 months of approval of the Stage 1 ACHMP, relevant contractors and employees (as identified by MCO through a risk-based assessment), will receive an Aboriginal Heritage Awareness Training Program to broaden general awareness and understanding of Aboriginal culture and heritage;

[14] Substantial impacts are defined as those involving major cracking and/or rock fall, such that human entry to the shelter is considered to be an unacceptable safety risk and/or total collapse of the shelter is anticipated to occur as a direct consequence.

g) The Aboriginal Site Database that lists known Aboriginal sites within the project area will continue to be maintained and regularly updated, in accordance with the Stage 1 ACHMP;

h) Site records will be lodged in a timely manner with the OEH for any previously unrecorded Aboriginal heritage evidence that is identified within the investigation area during the course of operations and/or further heritage assessments, or that is subject to salvage, in accordance with the Stage 1 ACHMP;

i) Any future alterations that may be proposed to the mine plan will be assessed in accordance with the Stage 1 ACHMP;

j) Any previously unrecorded Aboriginal heritage evidence within the area of potential impacts from the modification, that may be identified during future investigations or works, will be managed in accordance with the procedures outlined in the Stage 1 ACHMP;

k) Should any skeletal remains be detected during the course of the project, work in that location will cease immediately and the finds will be reported to the appropriate authorities, including the Police, the OEH and the registered Aboriginal stakeholder organisations. Subject to the Police requiring no further involvement, the management of any Aboriginal skeletal remains will be determined in consultation with the DP&I and the Aboriginal stakeholders, in accordance with the procedures outlined in the Stage 1 ACHMP;

l) Archaeological investigations will only be undertaken by archaeologists qualified and experienced in Aboriginal heritage, in consultation with the registered Aboriginal stakeholder organisations, and occur prior to any development impacts occurring to those specific areas or sites, in accordance with the procedures outlined in the Stage 1 ACHMP;

m) The ACHMP will be verified to establish that it is functioning as designed (ie. policies adhered to and actions implemented to the standard required);

2) Under the terms of the NP&W Act it is an offence to harm or desecrate an object that the person knows is an Aboriginal object, or to harm an Aboriginal object ('strict liability offence'). Therefore, no activities or work should be undertaken within the Aboriginal site areas as described in this report and marked on Figure 14 without a valid Section 90 AHIP or until Section 75W approval of this modification is granted, the Stage 1 ACHMP is approved, and all relevant heritage management measures have been implemented;

3) Copies of this final report should be forwarded to each registered Aboriginal stakeholder organisation and the DP&I and the OEH within 30 working days of completion.

Table 10: Summary of recommended management strategies and consequent potential impacts to Aboriginal sites, cultural areas/values and potential deposits within or immediately adjacent to the investigation area after the implementation of mitigation measures.

Site Name	Site Type	Overall Significance[15]	Potential Impacts	Type of Harm	Management Strategy		Consequent Impacts
					Rationale	Recommended Strategy	
S1MC077	isolated find	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; problematic to relocate	unmitigated impact	probably total loss of value
S1MC325	isolated artefact	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; problematic to relocate	unmitigated impact	probably total loss of value
S1MC326	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC327	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC328	isolated artefact	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; problematic to relocate	unmitigated impact	probably total loss of value
S1MC329	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC330	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC331	rock shelter with artefacts	mod L, low R	broad-scale high level	probably direct	surface impacts likely; moderate significance; moderate research potential; testing and potential salvage to adequately assess significance, mitigate impacts for representative sample across modification area	test excavation and potential salvage	possibly partial loss of value
S1MC332	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC333	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value

[15] A number of Aboriginal stakeholders have expressed the view that all of the sites/places are of high cultural significance (ie. high importance) and make no differentiation on the comparative level of value between any site or place. This is acknowledged and respected.

Site Name	Site Type	Overall Significance[15]	Potential Impacts	Type of Harm	Management Strategy		Consequent Impacts
					Rationale	Recommended Strategy	
S1MC334	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC335	rock shelter with PAD	low L, low R	broad-scale high level	possibly direct	surface impacts possible (on margin of extension area); low significance; relatively low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	possibly total or partial loss of value
S1MC336	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC337	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC338	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC339	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC340	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC341	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC342	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC343	rock shelter with PAD	mod L, low R	nil proposed (marginally outside investigation area)	possibly indirect (blasting) or none	no direct surface impacts proposed; potentially indirect impacts from blasting; moderate significance; moderate research potential; assessment of potential blasting impacts required; if substantial impacts probable, testing and potential salvage to adequately assess significance and mitigate impacts	assess potential blasting impacts; if substantial impacts probable, test excavation and potential salvage	possibly partial or no loss of value

Site Name	Site Type	Overall Significance[15]	Potential Impacts	Type of Harm	Management Strategy		Consequent Impacts
					Rationale	Recommended Strategy	
S1MC344	rock shelter with artefacts	mod L, low R	nil proposed (marginally outside investigation area)	possibly indirect (blasting) or none	no direct surface impacts proposed; potentially indirect impacts from blasting; moderate significance; moderate research potential; assessment of potential blasting impacts required; if substantial impacts probable, testing and potential salvage to adequately assess significance and mitigate impacts	assess potential blasting impacts; if substantial impacts probable, test excavation and potential salvage	possibly partial or no loss of value
S1MC345	rock shelter with PAD	low L, low R	nil proposed (marginally outside investigation area)	possibly indirect (blasting) or none	no direct surface impacts proposed; potentially indirect impacts from blasting; low significance; low research potential; offset by blasting assessment and potential testing and salvage of sites S1MC343 and S1MC344	unmitigated impact	possibly partial or no loss of value
S1MC346	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC347	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC348	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC349	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC350	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC351	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
S1MC352	rock shelter with PAD	low L, low R	nil proposed (marginally outside investigation area)	possibly indirect (blasting) or none	no direct surface impacts proposed; potentially indirect impacts from blasting; low significance; low research potential; offset by blasting assessment and potential testing and salvage of sites S1MC343 and S1MC344	unmitigated impact	possibly partial or no loss of value
S1MC353	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value

Site Name	Site Type	Overall Significance[15]	Potential Impacts	Type of Harm	Management Strategy		Consequent Impacts
					Rationale	Recommended Strategy	
S1MC354	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
PAD 6 Moolarben Coal	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
PAD 12 Moolarben Coal	rock shelter with PAD	low L, low R	broad-scale high level	probably direct	surface impacts likely; low significance; low research potential; offset by testing and potential salvage of site S1MC331	unmitigated impact	probably total loss of value
Modification Investigation Area	cultural area/value	low L, low R	broad-scale high level	probably direct	overall impacts of Modification very low within regional context; substantial conservation areas/offsets nearby	unmitigated impact	possibly partial or no loss of value
Use of subsistence and other resources	cultural area/value	low L, low R	broad-scale high level	probably direct	overall impacts of Modification very low within regional context; substantial conservation areas/offsets nearby	unmitigated impact	possibly partial or no loss of value
Moolarben Ridge south of Carr's Gap	cultural area/value	low L, low R	broad-scale high level	probably direct	overall impacts of Modification very low within regional context; substantial conservation areas/offsets nearby	unmitigated impact	possibly partial or no loss of value
Contemporary significance of Aboriginal objects	cultural area/value (refer above to individual sites)						

L = Local; R = Regional.

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DISCLAIMER

The information contained within this report is based on sources believed to be reliable. Every effort has been made to ensure accuracy by using the best possible data and standards available. The accuracy of information generated during the course of this field investigation is the responsibility of the consultant.

However, as no independent verification is necessarily available, South East Archaeology provides no guarantee that the base data (eg. the OEH AHIMS) or information from informants (obtained in previous studies or during the course of this investigation) is necessarily correct, and accepts no responsibility for any resultant errors contained therein and any damage or loss which may follow to any person or party. Nevertheless this study has been completed to the highest professional standards.