Moolarben Coal UG1 Longwalls 101-103 Extraction Plan

Aboriginal Cultural Heritage Technical Report

Prepared for Moolarben Coal Operations Pty Ltd

3 May 2017
Executive summary

This technical report presents the results of an Aboriginal cultural heritage and archaeological assessment to inform the Longwalls 101-103 Extraction Plan for the Moolarben Coal Complex, in the Western Coalfields of New South Wales.

The Longwalls 101-103 study area lies within hilly terrain comprised of simple slopes, ridge crests and first order drainage paths with low to steep slope gradients. On the margins of the Longwalls 101-103 study area the hilly terrain gives way to footslopes and flat to undulating country that has been cleared for pasture.

The Longwalls 101-103 study area has been subject to previous Aboriginal cultural heritage assessment and archaeological investigation during environmental assessment of major project approvals, exploration and due diligence activities and subsequently through modifications to project approvals. Overall the Longwalls 101-103 study area has been subject to sufficient survey and investigation to adequately characterise the Aboriginal cultural heritage sites that may be expected to be present within it.

There are 20 previously recorded sites within the Longwalls 101-103 study area, comprising of 9 isolated finds, three artefact scatters, five rock shelters with potential archaeological deposit and three rock shelters with artefacts and potential archaeological deposit. Of these sites, three isolated finds have been salvaged under existing approvals and are no longer present in the mine area. All of the remaining 17 Aboriginal cultural heritage sites have been previously assessed to be of low archaeological significance.

Open sites containing artefact scatters and isolated finds can be potentially affected by cracking of the surface soils associated with mine subsidence movements. MSEC (2017) has concluded that it is unlikely that the artefact scatters or isolated finds themselves would be impacted by mine subsidence, however it is possible that these sites could be potentially impacted if remediation works to the surface areas around the archaeological sites was required.

MSEC (2017) also assessed potential subsidence impacts to Aboriginal rock shelters, and concluded that there is potential for fracturing of sandstone and subsequent rock falls which have the potential to affect the artefacts and/or PADs associated with the rock shelters. Sites PAD 2 Moolarben Coal and PAD 3 Moolarben Coal are at isolated rock outcrops, which are generally considered to be at lower risk of impact from subsidence than continuous lengths of rock outcrop. Site PAD 3 Moolarben Coal was assessed to have the highest risk that a subsidence impact will likely occur resulting from the extraction of Longwalls 101-103. Site PAD 1 Moolarben Coal is a small isolated feature and subsidence impacts to this site were considered unlikely to occur.

On the basis of the likely subsidence impacts as a result of secondary extraction of Longwalls 101-103 (MSEC, 2017), it is recommended that PAD 3 Moolarben Coal (a rock shelter with one artefact) is subject to a subsidence monitoring program consistent with the monitoring requirements outlined in the currently approved Moolarben Coal Complex Heritage Management Plan.
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1. Introduction

The Moolarben Coal Complex is located approximately 40 kilometres (km) north of Mudgee in the Western Coalfields of New South Wales (NSW) in the Mid-Western Regional Council Local Government Area (Figure 1).

Moolarben Coal Operations Pty Ltd (MCO) is the operator of the Moolarben Coal Complex on behalf of the Moolarben Joint Venture (Moolarben Coal Mines Pty Ltd, Sojitz Moolarben Resources Pty Ltd and a consortium of Korean power companies). MCO and Moolarben Coal Mines Pty Ltd are wholly owned subsidiaries of Yancoal Australia Limited.

Stage 1 at the Moolarben Coal Complex has been operating for several years and at full development will comprise three open cut mines (OC1, OC2 and OC3), a longwall underground mine (UG4), and mining related infrastructure (including coal processing and transport facilities). An Aboriginal Heritage Management Plan for Stage 1 has been approved and is currently implemented.

Stage 2 at the Moolarben Coal Complex has commenced and at full development will comprise one open cut mine (OC4), two longwall underground mines (UG1 and UG2) and associated mining infrastructure.

The UG1 Underground Mine is a component of the approved Moolarben Coal Complex (Figure 2). The UG1 Underground Mine commenced first workings in May 2016 and is scheduled to commence secondary workings (longwall extraction) in October 2017 by longwall mining methods from the Ulan Seam within Mining Lease (ML) 1605, ML 1606, ML 1628, ML 1691 and ML 1715 (Figure 2).

Mining operations at the Moolarben Coal Complex are currently approved until 31 December 2038 and would continue to be carried out in accordance with NSW Project Approval (05_117) (Moolarben Coal Project Stage 1) as modified and NSW Project Approval (08_0135) (Moolarben Coal Project Stage 2) as modified.

Niche Environment and Heritage Pty Ltd (Niche) has been commissioned by MCO to prepare an Aboriginal Cultural Heritage technical report to inform the Extraction Plan for the UG1 Longwalls 101-103 study area (herein referred to as the UG1 study area) at the Moolarben Coal Complex.

This technical report has been prepared by Jamie Reeves, archaeologist at Niche, in accordance with the Moolarben Coal Complex Heritage Management Plan and with consideration for the following guidelines:

- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (NSW Department of Environment, Climate Change and Water [DECCW] 2010); and

The objectives of this technical report were to assess the potential impacts to Aboriginal heritage values from the approved underground mine layout for the UG1 study area and to inform the UG1 Longwalls 101-103 Extraction Plan accordingly, by providing appropriate mitigation and management recommendations, where required, in accordance with the currently approved Moolarben Coal Complex Heritage Management Plan.
Regional location of the UG 1 study area

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Longwall 101-103 layout and UG1 study area

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FIGURE 2

Imagery: (c) YanCoal 2013-08-12
2. Previous archaeological work

The coal mining areas around Ulan have been subject to continuous Aboriginal cultural heritage assessment and archaeological study since the 1980s (South East Archaeology 2009, Niche 2015a, 2015b, 2015c, 2016). The predictive model that has resulted from this previous work is discussed fully in Section 4. This section of the report looks more closely at the previous archaeological work relevant only to the UG1 study area.

The UG1 study area has been subject to previous Aboriginal cultural heritage assessment and archaeological investigation during environmental assessment of major project approvals, exploration and due diligence activities and subsequently through modifications to project approvals (Table 1). The previously surveyed areas in relation to the UG1 study area are shown in Figure 3.

Table 1: Previous surveys within or adjacent to the UG1 study area

<table>
<thead>
<tr>
<th>Surveyor</th>
<th>Year</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archaeological Risk Assessment and Surveys</td>
<td>2006</td>
<td>Stage 1 Project Approval</td>
</tr>
<tr>
<td>Archaeological Risk Assessment and Surveys</td>
<td>2008</td>
<td>Stage 2 Project Approval</td>
</tr>
<tr>
<td>AECOM</td>
<td>2011a</td>
<td>Stage 2 Project Approval</td>
</tr>
<tr>
<td>AECOM</td>
<td>2012</td>
<td>Exploration Work</td>
</tr>
<tr>
<td>AECOM</td>
<td>2011b</td>
<td>Exploration Work</td>
</tr>
<tr>
<td>South East Archaeology</td>
<td>2012a</td>
<td>Stage 2 Infrastructure Relocation</td>
</tr>
<tr>
<td>South East Archaeology</td>
<td>2012b</td>
<td>Stage 2 Ancillary Infrastructure Works</td>
</tr>
<tr>
<td>South East Archaeology</td>
<td>2013</td>
<td>Stage 1 Optimisation Works</td>
</tr>
<tr>
<td>Niche Environment and Heritage</td>
<td>2014</td>
<td>Exploration Work</td>
</tr>
<tr>
<td>Niche Environment and Heritage</td>
<td>2015a</td>
<td>Modification to OC4 Haul Road</td>
</tr>
<tr>
<td>Niche Environment and Heritage</td>
<td>2015b</td>
<td>Modification to UG1 Optimisation Project</td>
</tr>
<tr>
<td>Niche Environment and Heritage</td>
<td>2015c</td>
<td>Exploration Work</td>
</tr>
<tr>
<td>Niche Environment and Heritage</td>
<td>2016</td>
<td>UG1 Infill surveys</td>
</tr>
</tbody>
</table>

For the most part the UG1 study area has been subject to survey for reasons not directly related to the assessment of underground mining such as major project approvals sampling surveys, approval modification surveys, exploration due diligence surveys and infrastructure area surveys (Table 1). The exception to this is the two recent surveys by Niche which specifically inspected areas above the longwall layout to assess the presence or absence of sites and understand the archaeological potential of the UG1 study area (Niche 2015b, 2016).

In summary the western parts of the UG1 study area have been intensively archaeologically surveyed previously, with virtually the entire area having been covered by previous, systematic survey. The eastern part of the UG1 study area has not been as well surveyed as the west, but has nevertheless been subject to previous survey that provides a characterisation of the archaeological landscapes above the longwalls in this area, and a sample of the sites that occur in this area.
The comparatively lesser survey in the eastern area compared to the west is not considered a constraint to assessment as the current survey and previous surveys have concluded the local area is of low archaeological potential and cultural value and is unlikely to contain sites that may be susceptible to subsidence impacts. The surveys undertaken to date achieved a good level of effective survey coverage, and inspected all features such as potential rock shelters, boulders and tor like structures that were present within the subject area, for evidence of past Aboriginal land use.

Moolarben Coal maintains an Aboriginal Sites Database which provides an up-to-date database of all known Aboriginal cultural heritage sites at the Moolarben Coal Complex. The database was interrogated to provide a list of all known Aboriginal heritage sites within the UG1 study area. In addition to this, an extensive Aboriginal Heritage Information Management System (AHIMS) Search (#263696) was conducted on 24 January 2017. The Aboriginal Sites Database and AHIMS results were combined to provide the site list presented in Table 2. For consistency, the site classifications used for “Site Type” in Table 2 are the same as those used in the currently approved Moolarben Coal Complex Heritage Management Plan. The location of the previously recorded Aboriginal heritage sites within the UG1 study area is shown in Figure 4.

There are 20 previously recorded sites within or adjacent to the UG1 study area, comprising:

- 9 Isolated Finds
- 3 Artefact Scatters
- 5 Rock Shelters with Potential Archaeological Deposit (PAD)
- 3 Rock Shelters with Artefacts

Of the 20 previously recorded sites, three have been salvaged under existing approvals and are no longer present within or adjacent to the UG1 study area. For completeness, the salvaged sites are also presented in Table 2. The salvaged sites are all located in areas within or adjacent to the UG1 study area that have already been developed as part of the UG1 Optimisation Modification.

Table 2: Sites within the UG1 study area (derived from Moolarben Aboriginal Sites Database January 2017)

<table>
<thead>
<tr>
<th>Site Name</th>
<th>AHIMS No.</th>
<th>Site Type</th>
<th>Archaeological Significance/Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1MC029</td>
<td>36-3-0826</td>
<td>Isolated Find</td>
<td>Low</td>
</tr>
<tr>
<td>PAD 01 Moolarben Coal</td>
<td>36-3-0837</td>
<td>Rock Shelter with PAD</td>
<td>Low</td>
</tr>
<tr>
<td>PAD 02 Moolarben Coal</td>
<td>36-3-0838</td>
<td>Rock Shelter with PAD</td>
<td>Low</td>
</tr>
<tr>
<td>PAD 03 Moolarben Coal</td>
<td>36-3-0839</td>
<td>Rock Shelter with Artefacts (1 artefact) and PAD</td>
<td>Low</td>
</tr>
<tr>
<td>S2MC008</td>
<td>36-3-1157</td>
<td>Isolated Find</td>
<td>Low</td>
</tr>
<tr>
<td>S2MC009</td>
<td>36-3-1158</td>
<td>Isolated Find</td>
<td>Low</td>
</tr>
<tr>
<td>S2MC010</td>
<td>36-3-1159</td>
<td>Artefact Scatter (3 artefacts)</td>
<td>Low</td>
</tr>
<tr>
<td>S2MC011</td>
<td>36-3-1161</td>
<td>Isolated Find</td>
<td>Low</td>
</tr>
<tr>
<td>S2MC012</td>
<td>36-3-1162</td>
<td>Isolated Find</td>
<td>Low</td>
</tr>
<tr>
<td>S2MC324</td>
<td>36-3-3041</td>
<td>Isolated Find</td>
<td>Low</td>
</tr>
<tr>
<td>S2MC347</td>
<td>36-3-3027</td>
<td>Rock Shelter with Artefacts (2 artefacts) and PAD</td>
<td>Low</td>
</tr>
<tr>
<td>S2MC348</td>
<td>36-3-3028</td>
<td>Rock Shelter with PAD</td>
<td>Low</td>
</tr>
<tr>
<td>S2MC349</td>
<td>36-3-3029</td>
<td>Rock Shelter with PAD</td>
<td>Low</td>
</tr>
<tr>
<td>S2MC350</td>
<td>36-3-3030</td>
<td>Rock Shelter with PAD</td>
<td>Low</td>
</tr>
<tr>
<td>S2MC351</td>
<td>36-3-3031</td>
<td>Rock Shelter with Artefacts (1 artefact)</td>
<td>Low</td>
</tr>
</tbody>
</table>
The three previously salvaged sites were isolated finds, meaning the remaining 17 sites comprise:

- 6 Isolated Finds
- 3 Artefact Scatters
- 5 Rock Shelters with PAD
- 3 Rock Shelters with Artefacts

The open sites present within the UG1 study area are made up of small sites with only a single artefact or with a low frequency and low density of artefacts (with even the largest sites only having three artefacts visible when they were recorded). All of these sites have been previously assessed to be of low significance.

There are eight rock shelter sites within the UG1 study area including three rock shelters that contain artefacts, and five that contain PADs. The characteristics of each of the rock shelter sites are summarised in Table 3.

Table 3: Characteristics of rock shelter sites in the UG1 study area

<table>
<thead>
<tr>
<th>Site Name</th>
<th>AHIMS No.</th>
<th>Features</th>
<th>Size (Length x height x depth) (m)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moolarben Coal PAD 01</td>
<td>36-3-0837</td>
<td>PAD</td>
<td>5.0 x 2.5 x 3.0</td>
<td>Detached boulder</td>
</tr>
<tr>
<td>Moolarben Coal PAD 02</td>
<td>36-3-0838</td>
<td>PAD</td>
<td>12.0 x 3.0 x 2.0</td>
<td>Very small area of deposit</td>
</tr>
<tr>
<td>Moolarben Coal PAD 03</td>
<td>36-3-0839</td>
<td>Artefacts (1)</td>
<td>28.0 x 5.0 x 6.0</td>
<td>Sloping floor, small area of deposit</td>
</tr>
<tr>
<td>S2MC347</td>
<td>36-3-3027</td>
<td>Artefacts (2)</td>
<td>5.4 x 1.4 x 2.5</td>
<td>Shallow deposit</td>
</tr>
<tr>
<td>S2MC348</td>
<td>36-3-3028</td>
<td>PAD</td>
<td>15.0 x 1.2 m x 3.0</td>
<td>Shallow, disturbed deposit</td>
</tr>
<tr>
<td>S2MC349</td>
<td>36-3-3029</td>
<td>PAD</td>
<td>10.0 x 3.4 x 2.0</td>
<td>Intact deposit</td>
</tr>
<tr>
<td>S2MC350</td>
<td>36-3-3030</td>
<td>PAD</td>
<td>20.0 x 5.0 x 2.0</td>
<td>Shallow, disturbed deposit</td>
</tr>
<tr>
<td>S2MC351</td>
<td>36-3-3031</td>
<td>Artefacts (1)</td>
<td>6.0 x 1.5 x 2.0</td>
<td>Shallow, disturbed deposit</td>
</tr>
</tbody>
</table>

None of the rock shelter sites present contain art, or large surfaces particularly suitable for rock art. As shown in Table 3 the rock shelters in the UG1 study area range in size from very large, to quite small shelters. There are no shelters present with large overhang areas combined with large, flat floors which are the usual characteristics of rock shelters that have contained high numbers of surface artefacts, and sub-surface artefacts at the Moolarben Coal Complex (for example, S2MC231). As such, the rock shelters described in Table 3 have been classified as being of low archaeological significance.

There are likely to be previously unrecorded open sites in the UG1 study area. Targeted surveys conducted in 2015 and 2016 focussed on the only remaining landscapes that may contain rock shelters (or other site types that may be susceptible to subsidence) that had not been surveyed, so it is unlikely there are unknown rock shelters remaining in the UG1 study area. The risks to unknown sites on the ground surface from subsidence are predicted to be minimal and further survey is therefore not considered necessary.
Aboriginal heritage sites within the UG1 study area (Source: AHIMS and MCO)

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FIGURE 4

Imagery: (c) YanCoal 2013-08-12
3. Landscape context and regional character

Situated within the Central Tablelands region of NSW the UG1 study area lies within hilly terrain comprised of simple slopes, ridge crests and first order drainage paths with low to steep slope gradients. The hilly terrain gives way to footslopes and flat to undulating country that has been cleared for pasture. Generally speaking, the western portion of the UG1 study area consists of a relatively steep sided but broad ridge, with steep sided gullies. The eastern area consists of a narrower ridge top, with more frequent steep sided gullies on its margins, and low undulating country and footslopes in the eastern most portions, some of which has already been developed for approved infrastructure.

There are three soil landscapes within the UG1 study area: the Ulan, Lees Pinch and Munghorn Plateau Soil Landscapes (Murphy and Lawrie 1998) (Figure 5). All these landscapes have been subject to previous survey. The summaries below are derived from the soil landscape descriptions provided by Murphy and Lawrie (1998), and provide a ready characterisation of the nature of the landscape in the UG1 study area.

The lower elevations of the subject area are situated within the Ulan Soil Landscape, which is typically found in association with low undulating rises and creek flats on slopes between 2% and 10% gradients. The soils here have moderate to high levels of erosion. This soil landscape accounts for a small part of the UG1 study area, mostly in the eastern part of the UG1 study area.

The Lees Pinch Soil Landscape, situated on the lower to mid-slopes of the UG1 study area, is typically found in association with sandstone plateau and hillslopes with boulder debris and rock outcrops with slope gradients between 15% and 40%. Soils in the landscape are shallow siliceous sands, and the landscape is subject to high levels of downslope erosion. Approximately half of the UG1 study area is located on this landscape, and this steep, rugged landscape is where rock shelters occur.

The upper ridgelines within the UG1 study area are characterised by the Munghorn Plateau Soil Landscape which is typically characterised by low undulating hills forming plateaux with slopes between 3% and 10% gradient. Like the Lees Pinch Soil Landscape, soils in the Munghorn Plateau Soil Landscape include shallow siliceous sands. Rock outcrops are often present, but the relatively more flat country means rock shelters are less likely to occur here. Approximately half of the UG1 study area is situated on this landscape.

For the most part the UG1 study area has not been cleared of native vegetation, which consists of eucalypt and pine woodlands. There has been previous localised clearing for agricultural/pastoral use historically, and the ongoing development of localised works and infrastructure for the mine (such as roads, tracks and the coal conveyor). There is no permanent water within the UG1 study area, which falls within the upper reaches of the Murragamba Creek Catchment. The nearest permanent water sources are the Moolarben and Murragamba Creeks, which are at their closest points further than a kilometre from the UG1 study area. Drainage depressions in proximity to the UG1 study area can be considered first or second order drainage lines and are unlikely to act as temporary sources of potable water (i.e. after rain, water may have temporarily collected in depressions in sandstone outcrops within the UG1 study area).
Soil landscapes of the UG1 study area

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FIGURE 5

Imagery: (c) YanCoal 2013-08-12
4. Predictions and sampling strategy

As a whole the previous archaeological work at the Ulan, Moolarben and Wilpinjong Coal Mines represents a very intensive amount of study for a relatively small area. As such a good model of past Aboriginal land use and its archaeological traces has been developed by Kuskie (South East Archaeology 2009).

The model states that most evidence of occupation will date within the last 5,000 years though may have extended 30,000 – 40,000 years Before Present. The model determines three zones of resources: primary resource zones, secondary resource zones and a third zone that encompasses the land beyond primary and secondary resource zones (South East Archaeology 2009: 79-87).

**Primary resource zones**: areas of more abundant and diverse resource rich zones in north-east Wiradjuri territory including the junction of the higher order watercourses such as Goulburn and Talbragar Rivers would most likely be a focus of occupation. These zones may have supported nuclear and extended family base camps, community base camps and congregations of larger groups. This zone may have been subject to longer stays and more frequent occupation than other areas, such as, secondary resource zones. The model states that these zones would contain substantially higher counts and densities of artefacts, a greater range of stone materials and artefact types and a higher number of activity areas would be present.

**Secondary resource zones**: these are areas where resources such as watercourses, swamps and wetlands occur in close proximity of higher order watercourses and associated flats and terraces. Examples of secondary resource zones in the Ulan area include higher order parts of Moolarben Creek. In the model these zones were utilised for regular but sporadic seasonal encampments of small parties, but occupations of the encampments would typically have been for short periods. Compared to the surrounding areas this resource zone will host moderately higher counts and densities of artefacts, a number of activity areas, and a relatively broad range of raw materials and artefact types (but much lesser range than sites in primary resource zones).

**Outside primary and secondary zones**: occupation is anticipated to be hunter gatherer activities with small parties of men, women or children. Movement across the landscape would be transitory between resource locations and may include special purpose journeys for ceremonial purpose or the procurement of stone. Utilisation of landforms such as simple slopes, ridge crests, spur crests and lower order watercourses would be far less intense than that found in primary and secondary resource zones. The evidence of this occupation would be low to very low artefact counts and densities, little range in the number of activity areas, and dates of sporadic occupation rather than continuous occupation. Evidence of stone quarries at sources may also be present.

In this model, activities that may have occurred in the landscape include food procurement and processing, food consumption, maintenance and production of tools, the building of shelter, children’s play, ceremonial activity, spiritual activity, burials and social and political activity by Aboriginal people.

The bulk of these activities would be evidenced through the presence of material evidence; in particular through the stone artefact assemblage. For instance, food procurement and processing might be evident through the presence of usewear residue on stone tools. Ceremonial activities may be evident by the presence of carved trees, bora grounds and stone arrangements.
The archaeological model predicts that most stone artefacts will be made of quartz due to its ease of access and availability in the local landscape. The model hypothesises that the relative intensity of use of each of the materials will be dependent on the proximity of the original source of the stone. Most stone procurement is hypothesised to have occurred during normal daily and seasonal movement without the need for special purpose visits. As a result of the abundance of available local stone, the stone is less likely to exhibit intensive reduction as evidence of conservation of material.

Most stone technology will be basic and non-specific (e.g. complete and broken flakes) with low frequencies of microblade or microlithic technologies, bipolar knapping, backing and usewear.

Grinding grooves for the sharpening of ground edge axes may occur on exposed sandstone bedrock, but are unlikely to occur in high numbers. Where they occur in areas of hills and ridges these occurrences would most likely represent occasional activity and short term activities rather than special purpose visits.

In summary the UG1 study area is situated in a landscape location which the predictive model describes as outside primary and secondary resource zones. The predicted use of this area by Aboriginal people in the past is of transitory utilisation when moving between primary and secondary resource zones. Accordingly the past traces of Aboriginal land use are predicted to reflect this, with relatively low numbers and diversity of sites, and sites that contain low numbers of artefacts and features.
5. Field methods and results

Because the UG1 study area has been subject to previous survey and approval, additional survey was not required (Section 2, Figure 3).

There were three sites recorded as open site PAD (PAD 1 Moolarben Coal, PAD 2 Moolarben Coal, PAD 3 Moolarben Coal) in the UG1 study area on the Moolarben Aboriginal Sites Database and AHIMS register. However the review of available information concluded that the sites were unlikely to be open PADs and more likely to be rock shelters with PAD given the known landscape context of steep slopes and rock outcrops. In this regard, a site inspection was conducted to confirm whether or not the three sites were indeed rock shelters.

The site inspection of each of the three sites was conducted on 20 December 2016. The site inspection activities involved navigating to each of the sites, and taking notes, drawings and photographs of each site in accordance with the relevant requirements of the Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010). The site inspection did not include any further survey activities.

The three sites PAD 1 Moolarben Coal, PAD 2 Moolarben Coal, PAD 3 Moolarben Coal were all found and inspected. All three sites were confirmed to be rock shelters (Table 4). At the site PAD 3 Moolarben Coal (36-3-0839) a single artefact was found in the drip line and the site records for this site will be updated accordingly (Plate 1, Plate 2, Plate 3, Plate 4).

### Table 4: Site inspection findings

<table>
<thead>
<tr>
<th>Site Name</th>
<th>AHIMS</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAD 1 Moolarben Coal</td>
<td>36-3-0837</td>
<td>Rock Shelter with PAD</td>
</tr>
<tr>
<td>PAD 2 Moolarben Coal</td>
<td>36-3-0838</td>
<td>Rock Shelter with PAD</td>
</tr>
<tr>
<td>PAD 3 Moolarben Coal</td>
<td>36-3-0839</td>
<td>Rock Shelter with Artefacts, PAD</td>
</tr>
</tbody>
</table>

Plate 1: PAD 1 Moolarben Coal

Plate 2: PAD 2 Moolarben Coal
As discussed in Section 2 the rock shelters present in the UG1 study area vary in terms of their size and characteristics. Brief site descriptions based on the site inspections are provided below.

PAD 1 Moolarben Coal is a small shelter with a sandy deposit. The shelter has been formed by the shallow cavernous weathering of the vertical surface of a large boulder that has detached from the larger sandstone structure that forms the ridge crest in this area. The shelter measures 5 m x 2.5 m x 3 m. The shelter floor and area beyond form a flat, sandy surface and the PAD would extend beyond the overhang. No artefacts or art were found to be present.

PAD 2 Moolarben Coal is a small shelter immediately below the top of the ridge plateau. The shelter measures 12 m x 3 m x 2 m, and has only a small area of PAD immediately under the overhang. The slope drops steeply away in front of the shelter. No artefacts or art were found to be present.

PAD 3 Moolarben Coal is a large shelter immediately below the ridge top plateau, and consists of two cavernously weathered areas. The shelter measures 28 m x 5 m x 6 m, and has large block fall and a steep slope immediately out the front of the shelter. While it is a big shelter, the site has a sloping floor with small areas of flat PAD in each cavern. A single artefact (a tuff blade core) was found in the drip line, and in this location the small area of PAD was observed to be a noticeably darker colour and more consolidated than the sediment further back in the shelter. No art was present.
6. Scientific values and significance assessment

6.1 Assessment framework

The Burra Charter (Australia ICOMOS 2013) defines the basic principles and procedures to be observed in the conservation of important places. It provides the primary framework within which decisions about the management of heritage sites in Australia should be made. The Burra Charter defines cultural significance as being derived from a number of values, each of which are discussed further below.

6.1.1 Social value

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

6.1.2 Historic value

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

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

6.1.3 Scientific (archaeological) value

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

6.1.4 Aesthetic value

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

6.2 Assessment of archaeological significance

6.2.1 PAD 3 Moolarben Coal

Only one site - PAD 3 Moolarben Coal – requires significance assessment, as the information recorded during the site inspection means the site has gone from being a PAD to being a site that definitely contains Aboriginal objects.
PAD 3 Moolarben Coal is a large rock shelter with artefacts and PAD. While recognising that all archaeological sites are important to the Aboriginal community the site has no specific identified social values. The site has no identified historic values. The site is a visually impressive shelter in a relatively unmodified landscape, and as such has some aesthetic value. The site has low archaeological value, as it contains relatively small areas of PAD and only a single artefact was visible in the drip line. In comparison, large sites with artefacts and PADs at the Moolarben Coal Complex which have been assessed as moderately or highly archaeologically significant have contained multiple features (art, grinding grooves, artefacts, PAD) or tens of artefacts visible in drip lines or the PAD surface. In summary the site PAD 3 Moolarben Coal is determined to be of low archaeological significance.

There is no change to the archaeological significance of the remaining known Aboriginal heritage sites in the UG1 study area. The significance of these sites is recorded in the complex-wide Moolarben Coal Complex Heritage Management Plan.

6.2.2 UG1 study area – statement of significance
The UG1 study area contains 20 known Aboriginal heritage sites, comprising open artefact sites and rock shelters with PAD and/or artefacts, individually all these sites have been assessed to be of low archaeological significance. The UG1 study area exists in a landscape location that has been predicted to have been an area not intensively used by Aboriginal people in the past, and survey results have shown that generally the traces of past Aboriginal land use are indicative of transient or short term repeated use, rather than long term camping or gathering. It could be reasonably assumed, and is somewhat borne out by known data, that all similar regional landscapes in areas with little resources (rocky ridges long distances from water) would have similar archaeological site assemblages. There have been no identified specific social or cultural values shown to exist in the UG1 study area. For these reasons as a whole the UG1 study area is assessed to have low archaeological value.
7. Discussion and impact assessment

The UG1 study area is situated on a rocky ridge that has been historically partially cleared, and has seen some development for mining infrastructure. The area has been subject to systematic archaeological and cultural heritage survey—including salvage collection of three sites—and there are 17 known Aboriginal cultural heritage sites remaining within the UG1 study area. The sites comprise nine open stone artefact sites with less than three artefacts each, five rock shelters with PAD and three rock shelter sites with artefacts and PAD. All the sites, and the UG1 study area as a whole, have been assessed to be of low archaeological significance. There are no identified sites of social/cultural value. In summary, the identified archaeological sites contain no art and only small assemblages of artefacts, or small areas of PAD.

The proposed extraction of Longwalls 101-103 has the potential to harm the Aboriginal sites within the UG1 study area through subsidence induced changes to the ground surface. These changes may include:

- Opening of cracks at the ground surface in soil
- Buckling and deformation of soils at the ground surface
- Slumping or mass movement of soil and rocks on steep slopes
- Cracking of rock formations
- Rock fall

Because the open artefact sites and isolated finds occur in open contexts it is unlikely they would be impacted or harmed by changes at the ground surface due to mine subsidence. However, it is possible that these sites may be harmed by any local remediation works to any subsidence effected areas.

The rock shelter sites are at risk of change from subsidence effects such as cracking or movement of rock strata, block fall or rock fall and mass movement on steep slopes. Because the rock shelter sites are all sites that contain PAD and/or artefacts, change that would be considered harm would need to be change that effects either the artefact or PAD, which would be changes like mass movement, rather than cracking or differential movement of strata.

MSEC (2017) has calculated the potential subsidence impacts at each of the Aboriginal heritage sites, as summarised in Table 5.

Table 5: MSEC subsidence predictions for Aboriginal heritage sites in UG1 study area

<table>
<thead>
<tr>
<th>Site</th>
<th>Description</th>
<th>Maximum Predicted Subsidence (mm)</th>
<th>Maximum Predicted Tilt (mm/m)</th>
<th>Maximum Predicted Hogging Curvature (1/km)</th>
<th>Maximum Predicted Sagging Curvature (1/km)</th>
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<tr>
<td>S1MC029</td>
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<td>&gt;3</td>
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<td>Rock Shelter with PAD</td>
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<td>65.0</td>
<td>&gt;3</td>
<td>&gt;3</td>
</tr>
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<td>3</td>
<td>&gt;3</td>
<td>&gt;3</td>
</tr>
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<td>PAD 3 Moolarben Coal</td>
<td>Rock Shelter with Artefacts (1 artefact) and PAD</td>
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<td>1</td>
<td>&gt;3</td>
<td>&gt;3</td>
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<tr>
<td>S2MC010</td>
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<td>14.0</td>
<td>0.55</td>
<td>0.50</td>
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<td>S2MC011</td>
<td>Isolated Find</td>
<td>925</td>
<td>40.0</td>
<td>1.60</td>
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</table>
S2MC012 Isolated Find 225 6.0 0.40 0.35
S2MC324 Isolated Find 50 2.0 0.09 0.08
S2MC347 Rock Shelter with Artefacts (2 artefacts) and PAD 225 5.0 0.40 0.35
S2MC348 Rock Shelter with PAD 600 30.0 1.00 0.95
S2MC349 Rock Shelter with PAD 2300 12.0 > 3 > 3
S2MC350 Rock Shelter with PAD 2300 1.0 > 3 > 3
S2MC351 Rock Shelter with Artefacts (1 artefact) 2250 14.0 > 3 > 3
S2MC278 Artefact Scatter (3 artefacts) 2200 0.5 > 3 > 3
S2MC279 Artefact Scatter (3 artefacts) 1750 50.0 > 3 2.80

Open sites containing artefact scatters and isolated finds can be potentially affected by cracking of the surface soils associated with mine subsidence movements. The UG1 Subsidence Impact Assessment (MSEC 2017: 53) concludes that “it is unlikely that the scattered artefacts or isolated finds themselves would be impacted by mine subsidence, it is possible that, if remediation works to the surface areas around the archaeological sites was required after mining, these works could potentially impact on the Aboriginal heritage sites”. This assessment is concurred with.

MSEC (2017) also assessed potential subsidence impacts to Aboriginal rock shelters, and concluded that there is potential for fracturing of sandstone and subsequent rock falls which have the potential to affect the artefacts and/or PADs associated with the rock shelters. Sites PAD 2 Moolarben Coal and PAD 3 Moolarben Coal are at isolated rock outcrops, which are generally considered to be at lower risk of impact from subsidence than continuous lengths of rock outcrop. Site PAD 3 Moolarben Coal was assessed to have the highest risk that a subsidence impact will likely occur resulting from the extraction of Longwalls 101-103. Site PAD 1 Moolarben Coal is a small isolated feature and subsidence impacts to this site were considered unlikely to occur.

There are likely to be previously unrecorded open sites, but unlikely to be further rock shelter sites in the UG1 study area above Longwalls 101-103. Risks to these unknown sites from subsidence are minimal given MSECs (2017) assessment of potential impacts.
8. Management, mitigation measures and recommendations

The Moolarben Coal Complex Heritage Management Plan (Moolarben Coal 2016) sets out the strategies, processes and requirements for management of subsidence and surface works impacts for the Moolarben Coal Complex. The below recommended management and mitigation measures are made consistent with the requirements of the approved Moolarben Coal Complex Heritage Management Plan.

8.1 Baseline Recording

Although subject to initial recording, prior to the commencement of secondary extraction of Longwalls 101-103, a detailed baseline record should be obtained for Aboriginal heritage sites PAD 1 Moolarben Coal, PAD 2 Moolarben Coal and PAD 3 Moolarben Coal.

All other Aboriginal heritage rock shelter sites within the UG1 Study Area are considered to have been sufficiently recorded.

Where required, the baseline recording would include, at a minimum:

- a photographic record of the site;
- a detailed scaled plan of the site including physical characteristics and features; and
- detailed information regarding the dimensions, composition and features of the site.

8.2 Monitoring of Aboriginal Heritage Sites

There have been no sites identified in Appendix D of the Moolarben Coal Complex Heritage Management Plan as requiring monitoring in the UG1 study area. However, consideration should be given as to whether or not to monitor a representative sample of sites from the UG1 study area based on MSECs subsidence impact assessment. The Moolarben Coal Complex Heritage Management Plan (when originally drafted) did not include the sites PAD 1 Moolarben Coal, PAD 2 Moolarben Coal and PAD 3 Moolarben Coal as rock shelters, but rather mistakenly attributed the sites as open sites. As such the Moolarben Coal Complex Heritage Management Plan did not consider subsidence impacts on these three sites as rock shelters, but rather considered the sites open sites with a low risk of impact.

As described in Section 7, PAD 3 Moolarben Coal (a rock shelter with one artefact) is considered to have the highest risk of impact as a result of subsidence. In this regard, it is recommended that MCO undertake subsidence monitoring of site PAD 3 Moolarben Coal.

In order to identify and document whether any subsidence impacts have arisen from mining activities at PAD 3 Moolarben Coal, the monitoring requirements described in section 5.9.1 of the complex-wide HMP should be implemented for this site as follows:

- MCO will engage an appropriately qualified expert to monitor the Aboriginal archaeological sites described as requiring monitoring. This may include the establishment of a percentage estimate of the likelihood of subsidence occurring in sensitive areas.
- Where insufficient pre-existing information is available for any of the specific Aboriginal archaeological sites to permit comparison with the condition post-mining, more detailed recording will occur prior to undermining.
• Monitoring will involve inspecting and recording the condition of these specific Aboriginal archaeological sites within three to six months after undermining has occurred. Each inspection will involve recording of data on environmental conditions, pre-existing human and natural impacts, heritage evidence present and any identified changes to these environmental and heritage conditions compared with previous inspections. The potential cause (subsidence or other impacts) of changes to the condition of individual sites will be assessed.

• Monitoring will be focussed on the features of the site that make it significant (e.g. grooves, art, artefacts and/or PAD).

• A report documenting the results of monitoring will be prepared that details the methodology of the inspections, conditions of the environment and Aboriginal heritage evidence at the relevant sites, comparisons with previously reported conditions at each site, identification of any natural and/or human impacts during the intervening period, identification of any implications for the ongoing management and protection of Aboriginal heritage evidence at the Moolarben Coal Complex, and documentation of the actual impacts of operations on the Aboriginal archaeological sites.

• Copies of this report will be distributed to the RAPs, OEH and the DP&E and a summary included in the Annual Review.

It is recommended that monitoring for subsidence related impacts will occur at PAD 3 Moolarben Coal within three to six months of undermining. If, during the above monitoring, significant subsidence impacts are identified, then the salvage and excavation procedures outlined in Section 8.3 should be considered.

Monitoring and/or salvage and/or excavation would only occur where safe to do so, as determined with relevant MCO safety personnel.

For the purpose of determining what constitutes a significant subsidence impact on Aboriginal heritage sites, a site is considered to be “affected by significant subsidence impacts” if it exhibits one or more of the following consequences that cannot be attributed to natural weathering or deterioration:

  • overhang collapse;
  • cracking of sandstone that coincides with the feature(s) of the site that make it significant; and
  • rock fall that damages the feature(s) of the site that make it significant.

8.3 Salvage and Excavation

In the event that significant subsidence impacts due to the secondary extraction of Longwalls 101-103 are identified at PAD 3 Moolarben Coal during monitoring, then salvage and/or excavation should be considered in consultation with a suitably qualified archaeologist. Monitoring and/or salvage and/or excavation would only occur where safe to do so, as determined with relevant MCO safety personnel.

Protocols for the salvage and excavation of Aboriginal heritage sites are detailed in sections 5.6.1 and 5.6.2 of the complex-wide HMP as follows:

Aboriginal archaeological sites that are considered to hold research potential and are scheduled to be impacted will undergo a two-phase program of archaeological excavation. This program will include an initial exploratory phase followed, when warranted, by a more targeted investigation of the site’s research potential as follows:

1. initial subsurface testing using one or more linear transects of hand excavated, regularly-spaced shovel test pits (Section 5.6.1); and
2. controlled salvage excavation of areas with high research potential as identified through Phase 1 (the initial subsurface testing) (Section 5.6.2).

If the initial program of shovel test pits determines that the site does not hold high scientific significance in accordance with the Burra Charter (Australia ICOMOS 1999) and the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011), then the second phase of investigation (i.e. open area excavation) will not be undertaken. For instance, if initial subsurface testing revealed evidence of poor spatial integrity at the site (e.g. ground disturbance, sheet erosion) or few subsurface artefacts, there will remain little value in a more detailed scientific investigation of the site through controlled salvage excavation.

5.6.1 Initial Subsurface Testing

The objective of the initial phase of the archaeological excavation program is to determine the nature, extent and composition of each site. Data collected during this phase will be used to inform the need for a further controlled salvage excavation phase (where required), which is designed to target in situ concentrations of sub-surface cultural deposits.

Following the initial subsurface testing (shovel test pits), any sites that reveal poor spatial integrity, significant ground disturbance, shallow soil profiles and/or few subsurface cultural material, will not be subject to further subsurface investigation (i.e. the second phase of more detailed investigation and controlled salvage excavation will not occur).

Initial subsurface testing will be undertaken as follows:

- One or more transects of shovel test pits spaced no more than 20 m apart will be excavated along the length and/or width of the site (as determined from surface expression of artefacts). Areas of grossly modified terrain (e.g. dams) will be excluded from the sampling process.
- Approximately 0.5 m x 0.5 m (0.25 square metres [m²]) test pits will be dug by hand (shovel) at each designated shovel test pit point (approximately 20 m apart along the length of the transect).
- For the initial subsurface testing, all excavated material will be sieved through 5 millimetre (mm) aperture screens.
- The number of transects and shovel test pits may be reduced depending on the nature and scale of the site being assessed, subject to advice from a suitably qualified and experienced archaeologist and in consultation with the attending RAPs.
- The spacing of transects and shovel test pits may be reduced depending on the nature and scale of the site being assessed, subject to advice from a suitably qualified and experienced archaeologist and in consultation with the attending RAPs. For example, when undertaking test pits within a rockshelter, testing will be undertaken in closer proximity.

5.6.2 Controlled Salvage Excavation

Where controlled salvage excavation is determined to be warranted in consultation with a suitably qualified and experienced archaeologist and the attending RAPs, the following process will be generally implemented at a level appropriate to the extent and nature of the site:

- Controlled salvage excavation will be undertaken by a suitably qualified archaeologist(s), with assistance provided by the RAPs.
- All excavation will be carried out manually using trowels, shovels and mattocks (where appropriate).
- Open area excavation will proceed in 1 m² units.
• All excavation units (i.e. shovel test pits and open area 1 x 1 m2 squares) will be assigned an alpha-numeric identifier.

• The first excavation unit will be excavated and documented in 5 cm spits at each area – either PAD or site – being investigated. Based on the evidence of the first excavation unit, 10 cm spits or sediment profile/stratigraphic excavation (whichever is smaller) may then be implemented.

• Excavation will cease at culturally sterile units or bedrock in all instances – the identification of sterile stratigraphic units will draw upon a geomorphological understanding of the wider Moolarben Coal Complex.

• Photographic and/or scale-drawn records of exposed soil profiles in open area excavations will be made.

• If specific archaeological features (e.g. hearths) are identified, the entire feature will be excavated and recorded prior to the continuation of excavation. Features will be photographed and scale plans drawn.

8.4 Ground Disturbance Permit Process

In the event that any surface disturbance works are required (e.g. in relation to subsidence remediation activities), MCO should apply the ground disturbance permit process outlined in the currently approved Moolarben Coal Complex Heritage Management Plan.
References


# Annex 1. AHIMS Search Results

## AHIMS Web Services (AWS)

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Represents generated by AHIMS Web Services on 24/03/2017 for Jamie Browner for the searching for sites 3385, AHIMS.SHP with a buffer of 0 meters. Additional Risk / Heritage assessment, number of Aboriginal sites and Aboriginal objects found is 99

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