

Dendrobium Coal Mine - Area 3A

Aboriginal Heritage Plan

Report for BHP Billiton Illawarra Coal

April 2010

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PROJECT Dendrobium Coal Mine Area 3A


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REPORT FOR BHP Billiton Illawarra Coal

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ABBREVIATIONS

AHIMS	Aboriginal Heritage Information Management System
BHPBIC	BHP Billiton Illawarra Coal
AHP	Aboriginal Heritage Plan
DA3A	Dendrobium Area 3A
DA3B	Dendrobium Area 3B
DA3C	Dendrobium Area 3C
DECC	NSW Department of Environment and Climate Change
DoP	NSW Department of Planning
DPI	NSW Department of Primary Industries
SCA	Sydney Catchment Authority
SEMP	Subsidence Environmental Management Plan
SMP	Subsidence Management Plan

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SUMMARY

In accordance with the Conditions of Consent subsequent to the Modification Application for DA 60-03-2001, BHP Billiton Illawarra Coal (BHPBIC) is preparing an Environmental Management Plan for the Dendrobium Coal Mine to manage mine subsidence in Dendrobium Area 3A. This document is a Aboriginal Heritage Plan (AHP) that sets out the requirements to satisfy the Consent Conditions for Aboriginal Heritage management in Dendrobium Area 3A (DA3A).

There are fourteen (14) Aboriginal cultural heritage sites within the DA3A AHP area (refer to Table 1). Three (3) of these sites are open artefact sites and are not considered further in this report, as these sites are not considered at risk of impact from subsidence effects at the ground surface (Biosis Research 2007, Mine Subsidence Engineering Consultants 2007). The remaining eleven (11) sites are sandstone shelter sites with art and/or archaeological deposit.

<i>SITE NUMBER</i>	<i>SITE NAME</i>	<i>SITE TYPE</i>
52-2-0458	Browns Road Site 33	Shelter with Art
52-2-1646	Browns Road Site 32	Shelter with Art
52-2-1647	Browns Road Site 20	Shelter with deposit
52-2-2043	Sandy Creek Road 28	Stone Artefacts
52-2-3052	SCA Special Area Fire Trail 6C	Stone Artefacts
52-5-0273	Sandy Creek Road 21	Shelter with art and deposit
52-5-0274	Sandy Creek Road 22	Shelter with art
52-5-0277	Sandy Creek Road 25	Shelter with art and deposit
52-5-0278	Sandy Creek Road 26	Shelter with art
48-2-0056	DM13	Shelter with deposit
52-2-3638	DM14	Stone Artefacts
52-2-3639	DM15	Shelter with art
52-2-3644	DM20	Shelter with art
52-2-3651	DM23	Shelter with deposit

Table 1: Aboriginal cultural heritage sites in Dendrobium Area 3A.

Sandstone shelter sites are required to be monitored before, during and subsequent to longwall mining. This management plan describes the methodology of the monitoring program.

There are no historical cultural heritage sites within the DA3A SMP area.

1.0 INTRODUCTION

In accordance with the Conditions of Consent subsequent to the Modification Application for DA 60-03-2001, BHP Billiton Illawarra Coal (BHPBIC) is preparing an Environmental Management Plan for the Dendrobium Coal Mine to manage mine subsidence in Dendrobium Area 3A. Coal extraction for the Dendrobium Mine is from the Wongawilli Seam using longwall mining methods, approximately 300 m below ground.

This document is an Aboriginal Heritage Plan (AHP) that sets out the requirements to satisfy the Consent Conditions for Aboriginal Heritage management in Dendrobium Area 3A. The management plan is based on the Consent for the project granted in January 2009. This plan also fulfils the requirements of the Department of Primary Industries in relation to their SMP Guidelines.

The methodology outlined in this document details the procedures that will be undertaken to collect baseline data and monitor known sites that are within the predicted area of subsidence associated with mining Dendrobium Area 3A.

Aboriginal Heritage Impact Permit (AHIP) No: 1098243 was issued to BHP Billiton Illawarra Coal on 27 March 2009. AHIP No: 1098243 allows for potential impacts (associated with subsidence movements from longwall mining) to Aboriginal archaeological sites within Dendrobium Area 3A. The management measures described in this Aboriginal Heritage Plan are the same as those to be implemented as per the conditions of AHIP No: 1098243.

1.1 Objectives

The objectives of the Aboriginal Heritage Plan are to:

- Describe protocols for ongoing Aboriginal Community engagement.
- Establish methods for suitable baseline recording.
- Establish and conduct a monitoring program to detect and measure any changes at the sites due to mining subsidence.
- Propose management options for any sites that may be affected due to mining subsidence.
- Specifically record and if necessary mitigate impact to site 52-2-1646.

1.2 Project Background

The initial environmental assessments for the Dendrobium Coal Project were completed in 2000-2001, and included an area within the Sydney Metropolitan Catchment known as Dendrobium. This included Dendrobium Areas 1, 2 and 3. BHPBIC has completed mine operations in Area 1 and Area 2 of the

Dendrobium Colliery, one of three operating underground mines managed by Illawarra Coal south of Sydney. BHPBIC propose to continue its underground coal mining operations at Dendrobium by extracting coal from the Wongawilli Seam in Area 3 using longwall mining techniques. The current mining schedule forecasts that longwall mining will commence in Area 3 in 2009. The description of the current proposal is derived from *Preliminary Environmental Assessment for Modification to Dendrobium Area 3* Cardno Forbes Rigby (2007).

In 2006 the proposed alignment of the Area 3 longwall panel was redesigned to include areas outside the perimeter of the original Area 3 alignment. In accordance with the existing development consent conditions revised subsidence predictions for Aboriginal cultural heritage sites within the DA3A SMP Area have been made (Mine Subsidence Engineering Consultants 2007) and Modified Consent Conditions have been issued. DA3A and the proposed longwall layout are shown in Figure 1.

In February 2010 BHPBIC submitted an application to amend the Area 3A SMP Mine Plan, as exploration activities identified that the Nepheline Syenite intrusion was larger than previously expected. As such, revised subsidence predictions were issued in report MSEC437 (2010) and were assessed and reported in *Variation to Dendrobium Area 3A Longwall Layout: Implications for Cultural Heritage and Monitoring* Biosis Research (2010). The revised layout is shown in Figure 1. While predicted subsidence movements at site 52-2-1646 (shelter with art) slightly increased, predictions for the remaining sites are of the same magnitude or less than those originally indicated. The potential impacts on these archaeological sites did not change significantly as a result of the proposed longwall modifications and the management strategies remain the same.

This Aboriginal Heritage Plan has been prepared specifically for Aboriginal heritage sites within the DA3A SMP area.

1.3 Cultural Heritage Issues

In 2007 Biosis Research was engaged to update the cultural heritage component of the initial Dendrobium Coal EIS (Navin Officer 2000). The Biosis Research report (2007) identifies, records and assesses the heritage value of Aboriginal and historical archaeological sites within Dendrobium Area 3 as a component of the identification of potential impacts to sites and the broader cultural heritage values of the study area as a result of the proposed underground mining of a revised longwall layout. Biosis Research was again engaged in 2010 to assess for further proposed amendments to the Area 3A layout.

The impact assessment for Dendrobium Area 3 identified 14 Aboriginal archaeological sites within the predicted subsidence area of Dendrobium Area 3A. It concluded that there was generally a low risk of impact to these sites from the proposed longwall extraction in Dendrobium Area 3A, and that the sites should be subject to monitoring in accordance with the Consent Conditions and the previous monitoring programs established in the Southern Coalfield. There are no built historical cultural heritage sites inside the predicted DA3A subsidence area. There are historical heritage sites adjacent to the area, but these are not predicted to be impacted by the mining of DA3A.

1.4 Addressing the Consent Conditions

The proposal to undertake mining operations in Dendrobium Area 3 was approved dependant on the following Conditions relevant to Aboriginal cultural heritage.

ABORIGINAL HERITAGE

12. The SMPs prepared under condition 7 must include an Aboriginal Heritage Plan, which must include a:

- (a) description of known Aboriginal heritage sites;
- (b) protocol for the ongoing consultation and involvement of the Aboriginal community in the conservation and management of Aboriginal heritage;
- (c) description of the measures that would be implemented to protect Aboriginal sites generally, including measures that would be implemented to secure, analyse and record sites at risk of subsidence;
- (d) description of the measures that would be implemented to protect Aboriginal site 52-2-1646, including:
 - a full recording and assessment of the site's rock art;
 - a more detailed subsidence assessment for the site;
 - measures which seek to avoid any significant impact on the site and any necessary contingency plans to protect the site against collapse or substantial impact on its rock art; and
- (e) description of the measures that would be implemented if any new Aboriginal objects or skeletal remains are discovered during the development.

BHP Billiton Illawarra Coal has made a statement of commitments regarding Subsidence Impact Monitoring and Subsidence Impact Avoidance, Mitigation and Rehabilitation for Dendrobium Area 3. For Aboriginal cultural heritage the commitments are as follows.

Aboriginal Places of Cultural Significance - Archaeological sites

Predicted Impacts

Unlikely that the sites will sustain structural impacts. Empirical data suggests the probability of impacts to a site is less than 10%.

Avoidance & Mitigation

Baseline, active subsidence and post mining monitoring. Appropriate consultation and approvals.

Impacts Exceeding Those Predicted

Change in shelter conditions not attributable to natural weathering or preservation – cracking or exfoliation of art panel, movement of existing planes and joints at panel, block fall within shelter or overhang, shelter or overhang collapse.

Contingent Measure

Site and event specific mitigation and rehabilitation will be developed with appropriate Aboriginal representatives, DECC and SCA. Techniques may involve installing artificial drip lines, detailed recording of art, stabilising and cleaning rock faces.

1.5 Consultation with the Aboriginal Community

In accordance with the DECC's *Part 6 Approvals – Interim Community Consultation Requirements for Applicants* Biosis Research notified the following bodies regarding the Dendrobium Area 3 Longwall Mine Area:

- Illawarra Local Aboriginal Land Council;
- The Registrar of Aboriginal Owners;
- Native Title Services;
- Wollongong City Council; and
- The NSW Department of Environment and Climate Change (DECC).

Public notifications following the DECC *Interim Community Consultation Requirements for Applicants* were made in March 2007 in the following local print media:

- *The Illawarra Mercury*

A register for interested parties was opened on 9 March 2007 and registrations were received by Biosis Research until 23 March 2007. Written response to the notifications was received from the following:

- Illawarra Local Aboriginal Land Council (Sharralyn Robinson)
- The Wadi Wadi Coomaditchie Aboriginal Corporation (Peter Carriage)
- Northern Illawarra Aboriginal Collective (NIAC – Chris Illert)
- Korewal Elouera Jerrungarugh Tribal Elders Aboriginal Corporation (KEJ – Reuben Brown)
- Cubbitch Barta Native Title Claimants Aboriginal Corporation (Glenda Chalker)
- Aboriginal and Historic Archaeological Solutions (Scott Franks)

Additional responses to the project were received from:

- Bellambi Aboriginal Tent Embassy (Kim Moran)
- Gary Caines
- Kullila Welfare and Housing Aboriginal Corporation (Maria Maher)

In accordance with the DECC's *Part 6 Approvals – Interim Community Consultation Requirements for Applicants* stakeholders were provided with a methodology for the proposed cultural assessment and given 21 days to review the methodology and provide feedback. No formal responses to the methodology were received.

Meetings to discuss broad cultural heritage issues with the project, and the general approach were held with the following organisations:

- Illawarra Local Aboriginal Land Council
- The Wadi Wadi Coomaditchie Aboriginal Corporation
- Bellambi Aboriginal Tent Embassy
- Korewal Elouera Jerrungarugh Tribal Elders Aboriginal Corporation

- Cubbitch Barta Native Title Claimants Aboriginal Corporation
- Aboriginal and Historic Archaeological Solutions

Representatives from the following organisations participated in the fieldwork:

- Cubbitch Barta Native Title Claimants Aboriginal Corporation
- Illawarra Local Aboriginal Land Council
- Korewal Elouera Jerrungarugh

Comments from the Aboriginal communities have been incorporated into the Cultural Heritage Assessment Report prepared for the Consent Modification Application.

2.0 DESCRIPTION OF KNOWN ABORIGINAL HERITAGE SITES

This section of the Aboriginal Heritage Plan describes the known Aboriginal heritage sites within Dendrobium Area 3A, in accordance with Condition 12(a) (Table 2). The descriptions and significance assessments are also presented in the Dendrobium Area 3 Archaeological and Cultural Heritage Assessment (Biosis Research 2007).

<i>SITE NUMBER</i>	<i>SITE NAME</i>	<i>SITE TYPE</i>	<i>PAGE NO.</i>
52-2-0458	Browns Road Site 33	Shelter with Art	8
52-2-1646	Browns Road Site 32	Shelter with Art	9
52-2-1647	Browns Road Site 20	Shelter with deposit	10
52-2-2043	Sandy Creek Road 28	Stone Artefacts	11
52-2-3052	SCA Special Area Fire Trail 6C	Stone Artefacts	12
52-5-0273	Sandy Creek Road 21	Shelter with art and deposit	13
52-5-0274	Sandy Creek Road 22	Shelter with art	14
52-5-0277	Sandy Creek Road 25	Shelter with art and deposit	15
52-5-0278	Sandy Creek Road 26	Shelter with art	16
48-2-0056	DM13	Shelter with deposit	17
52-2-3638	DM14	Stone Artefacts	18
52-2-3639	DM15	Shelter with art	19
52-2-3644	DM20	Shelter with art	20
52-2-3651	DM23	Shelter with deposit	21

Table 2: Aboriginal cultural heritage sites in Dendrobium Area 3A, with description page references.

2.1 Browns Road Site 33(52-2-0458)

2.1.1 Site Description

The site is located on the upper level of a ridgeline on a small stand alone sandstone outcrop, situated 300 m west of Fire Road 6F and the 330kV overhead power line, and north of the junction of Fire Trails 6F and 6C. It is situated approximately 300 m north of a Wongawilli tributary. The sandstone overhang faces west and is 9.6 m x 1.5 m x 1.2 m in size. The living area formed by block fall and cavernous weathering is 5.0 m x 1.0 m in size.

The original recording of the site noted 6 charcoal outline indeterminate motifs on three separate panels. The recent survey identified only two panels; both contains the charcoal motifs previously recorded (Plate 1). The third panel could not be relocated. The current survey recorded a fourth panel 2.0 m x 3.0m of red ochre and potential infill of indeterminate features (Plate 2).



Plate 1: Charcoal motifs on 52-2-0458 shelter surface.

Plate 2: Indistinguishable red ochre motifs on 52-2-0458 shelter surface.

The floor of the shelter consists of pale yellow sandy loam estimated to be between 5 cm and 15 cm deep. This floor deposits appear to be a recent accumulation of exfoliation and weathering processes. No stone artefacts were identified within the deposit.

The site conditions remain relatively stable, although one art panel could not be identified. It is most likely that this panel has been subject to weathering or exfoliation. The two charcoal panels that were re-assessed remain protected by a thin silica skin. The shelter is dry without the presence of micro-organisms.

2.1.2 Statement of Significance

This site is a shelter with art is located on a small upper ridgeline on a small outcrop of sandstone. The small to moderate overhang contains 6 charcoal outline indeterminate motifs on three separate panels. The art is in poor condition, and deteriorated since originally being recorded due to natural weathering processes. It is a common site type and representative of other such sites within the region. The living floor is moderate in size and has some research potential. The site has limited aesthetic values and no historical associations.

Significance: **LOW**

2.2 Browns Road Site 32 (52-2-1646)

2.2.1 Site Description

This art shelter site is located 200 m south east of the junction of the 8th eastern tributary of Wongawilli Creek. The site is under the second top ledge. The sandstone overhang measures 18 m x 4 m x 2.8 m in size and the living area is 8 m x 2 m (Plate 3). The site was formed by block fall and cavernous weathering. The floor deposit is yellow orange loamy sand up to 10 cm deep, although most of the floor is rocky and the deposit is less than 5 cm deep. The rear wall contains: 10 red ochre hand imprints which included 5 right hands and 2 left hands ranging in size from small to large; 1 red ochre child's left hand stencil; 1 red ochre adult hand stencil; 1 child red ochre hand stencil; 1 charcoal outline kangaroo; 1 charcoal outline bat; 3 charcoal outline possums in a frieze; 5 charcoal indeterminates; 2 charcoal outline and infill indeterminates; 2 charcoal outline frontal human figures; 1 charcoal outline and infill kangaroo and 2 charcoal outline fishes (Plate 4).



Plate 3: sandstone overhang and archaeological deposit, site 52-2-1646 **Plate 4:** Charcoal fish motifs site 52-2-1646.

The art is in good condition. The shelter has water seepage over the lip of shelter and heavy water down the face of the shelter, across the roof and at the centre of the shelter. Ferns, moss and white mould is growing on the surfaces of the shelter. The shelter is suffering continued cavernous weathering and exfoliation.

2.2.2 Statement of Significance

This site is a shelter with art that includes 10 red ochre hand prints, 3 hand stencils and 17 charcoal motifs including macropods, anthropomorphic figures, possums, fish, bats and indeterminate motifs. The presence of a diversity of motifs in good condition provides an assemblage of high representational value, and of some rarity. The high numbers of both stencils and motifs contribute to a strong sense of place at the site, giving it high aesthetic value.

Significance: **HIGH**

2.3 Browns Road Site 20 (52-2-1647)

2.3.1 Site Description

This artefact shelter site is located in a large sandstone overhang located on the top ridgeline at the end of a point above Wongawilli Creek. The sandstone overhang measures 10 x 4 x 4 m in size and the living area is 8 x 4 m. The floor deposit is red cream sand 10 cm deep. The floor also has block and smaller sandstone rocks that have fallen from the roof (Plate 5). There is no artwork within this shelter but a number of artefacts have been located. The artefacts include a complete basalt flake, a complete quartz flake, a quartz core and an agate core (Plate 6).



Plate 5: interior of artefact and shelter site 52-2-1647. **Plate 6:** artefacts from site 52-2-1647.

The site is in good condition. The shelter is cavernously weathered but is very dry.

2.3.2 Statement of Significance

This is a shelter with archaeological deposit, with 4 artefacts present on the surface of the deposit. The shelter is a large, dry shelter with a good sized potential living area. Shelters with deposit and artefacts are a common site type, so the site has low rarity value. The site has some representative and low value under the general considerations criteria.

Significance: **LOW**

2.4 Sandy Creek Road 28 (52-2-2043)

2.4.1 Site Description

This is an open site containing stone artefacts, located on the south-east bank of Sandy Creek where it is crossed by Fire Trail 6C. The site is immediately adjacent to Sandy Creek, and has been exposed from the construction of the track and transmission line, and subsequent vehicle movements (Plate 7). The site was originally identified by Caryll Sefton in 1996 with the site area estimated to cover a 31 m x 33 m, and details of 12 artefacts recorded at this time. The site was described by Navin Officer in 2000 with 22 stone artefacts noted across an area of 30 m x 24 m, and then during 2005 by Biosis Research with 7 artefacts observed, with all of these noted to be damaged from vehicles using the track (Plate 8). Areas on either side of the track are generally undisturbed and considered to be of moderate to high potential to contain undisturbed archaeological deposit. The site was subject to a Consent to Destroy in 2005 to allow construction of a new bridge as part of upgrade works to Fire Trail 6C.



Plate 7: 52-2-2043 where Fire Trail 6C crosses Sandy Creek.



Plate 8:Artefacts at site 52-2-2043

2.4.2 Statement of Significance

This site is a stone artefact site that occurs on Fire Road 6C, near the Sandy Creek crossing. The site is heavily disturbed from the vehicle track. Approximately 40 artefacts have been recorded from the site, and it is likely that there is archaeological deposit in the undisturbed areas adjacent to the vehicle track. The site has some representational and rarity value as stone artefact sites are not common in the region.

Significance: **MODERATE**

2.5 SCA Special Area Fire Trail 6C (52-2-3052)

2.5.1 Site Description

This is an open site containing stone artefacts located where Fire Trail 6C crosses a small gully, approximately 1.5km north of the Sandy Creek crossing and site 52-2-2043 (Plate 9). The site was subject to a Consent to Destroy in 2005 to allow cut and fill upgrade works to Fire Trail 6C. Approximately 10 stone artefacts have been noted at the site, with 6 recorded in detail (Plate 10). Areas adjacent to the fire trail are considered to contain undisturbed areas of archaeological potential. The exposed area of the site is defined by the artefact distribution and track margins, and measures 30 m x 4 m.



Plate 9: Site 52-2-3052 on Fire Trail 6C



Plate 10: An artefact from site 52-2-3052

2.5.2 Statement of Significance

This site is a stone artefact site that occurs on Fire Road 6C. The site is heavily disturbed from the vehicle track. Approximately 10 artefacts have been recorded from the site, and it is likely that there is archaeological deposit in the undisturbed areas adjacent to the vehicle track. The site has some representational and rarity value as stone artefact sites are not common in the region.

Significance: **LOW**

2.6 Sandy Creek Road 21 (52-5-0273)

2.6.1 Site Description

The shelter is located on a long narrow sandstone cliff line east of the Fire Trail 6F that has been formed by blockfall and cavernous weathering. The shelter is situated on an eastern facing overhang on the upper ridge cliff line and is located 150 m south east of a Sandy Creek tributary.

The art within the shelter includes one outline and infill human anthropomorph with large eyes, one charcoal outline and infill indeterminate and one charcoal outline indeterminate (Plate 11).



Plate 11: Charcoal anthropomorph with large eyes at site 52-5-273
Plate 12: Stone artefacts located in site 52-5-273

The deposit in the shelter comprises a dark grey brown sandy loam. A number of smothered quartz pebbles were identified in the drip line. A total of five artefacts were recorded and of which were found in the drip line. This included 1 silcrete flake, 1 silcrete core fragment, 1 broken quartz flake, 1 chert flake fragment and 1 petrified wood flake (Plate 12).

The shelter is mostly dry however there is some water seepage over the lip of the shelter which has caused erosion at the drip line of the shelter, and caused lichen and mould growth on some surfaces of the shelter roof. The art, however, remains in the same condition despite being slightly faded. Since the original time of recorded some surface exfoliation has occurred.

2.6.2 Statement of Significance

This is a shelter with art and deposit. The deposit consists of a dark sandy loam, with 5 artefacts present on the shelter floor surface. The art is charcoal outline and infill anthropomorphic figures, one of which has large eyes. The art is in a moderate state of preservation, although anthropomorphic figures with eyes are relatively rare, and have representative value. The deposit has some potential to contain informative archaeological assemblages.

Significance: **LOW**

2.7 Sandy Creek Road 22 (52-5-0274)

2.7.1 Site Description

This sandstone overhang is situated 400 m north of the Fire Trail 6C on upper cliff lines of a small ridge line, 400 m northwest of Sandy Creek, and has been formed by blockfall and cavernous weathering. The sandstone overhang measures 7 m x 2.8 m x 1.8 m in size (Plate 13), with a living area measuring approximately 10 m x 4 m in size.

The art is located on the rear wall and comprises 3 charcoal indeterminate motifs on two separate panels (Plate 14).



Plate 13: Moderate sandstone overhang at site 52-2-274 **Plate 14:** Charcoal motif at shelter site 52-2-274

The deposit consists of shallow yellow brown sand that is no more than 15 cm deep. The deposit appears to be relatively undisturbed, however, no stone artefacts were identified.

The art within the shelter appears to be in the same condition as when it was originally recorded. The shelter is relatively dry, although is exposed to several hours of direct sunlight every day (Plate 13), contributing to the deterioration of the art. No seepage was noted and there are no micro-organisms present on the surface of the art. There are some horizontal bedding planes present at this site and significant exfoliation process adjacent to the art panels.

2.7.2 Statement of Significance

This is a shelter with art. The art consists of three indeterminate charcoal outline motifs, on two panels. The art is in poor condition being exposed to direct sunlight. The site is a poorly preserved example of the most common site type, with no exceptional characteristics.

Significance: **LOW**

2.8 Sandy Creek Road 25 (52-5-0277)

2.8.1 Site Description

This art and artefact shelter site is located under a small power line that runs from fire trail 6C down to the mouth of Sandy creek. The site is located on the northern face of the upper sandstone outcrops north of Sandy Creek, the closest drink water is a tributary 200 m away. The small sandstone cavern was formed by block fall and cavernous weathering, and is situated on a large angular block. The overhang measures 4.0 m x 0.7 m x 1.7 m in size and there is no living area.

The original recording of this site identified 9 red ochre hand stencils located on the rear wall. All the stencils were adult and 6 were of the left hand wand 3 were of the right hand (Plate 15). The current survey identified one more red ochre hand stencil within the shelter making a total of ten. The current survey also recorded an artefact within the site, a quartz core (Plate 16). The deposit on the shelter floor is yellow sand up to 15 cm deep, deposited from the erosion of the shelter surface.



Plate 15: Red ochre hand stencil in shelter site 52-5-277



Plate 16: Quartz core artefact located within shelter site 52-5-277

The shelter shows no signs of water seepage, and no micro-organisms are present, however, the site is exposed to the elements such as wind erosion and weathering which causes continuous exfoliation. There has been some disturbance by wombats on the floor of the shelter. The art is in poor to fair condition.

2.8.2 Statement of Significance

This is a shelter with art and archaeological deposit. The archaeological deposit consisted of a single quartz artefact on the surface of the shelter deposit, which is shallow yellow sand, of low potential. The art at the shelter is an assemblage of 9 red ochre hand stencils in poor-moderate condition. Shelters with high stencil counts are relatively uncommon, giving the site moderate rarity and representative value.

Significance: **MODERATE**

2.9 Sandy Creek Road 26 (52-5-0278)

2.9.1 Site Description

This art shelter site is a small cavernously weathered cavern on the western face of the same sandstone outcrop as 52-2-277. The overhang is situated below the top cliff line on small sandstone outcrop, on the northern edge of the 66kV power line easement that runs from Fire Trail 6C down to the mouth of Sandy Creek. The closest water source to this site is located 200 m away at a tributary of Sandy Creek. The shelter was formed by block fall and cavernous weathering and the sandstone overhang measures 3 m x 2 m x 3 m in size (Plate 17). The shelter has a stone floor with no deposit or living area. The art is located on the rear wall and is one charcoal indeterminate (Plate 18).



Plate 17: Art shelter site 52-5-278



Plate 18: Charcoal motif in shelter site 52-5-278

The site is in poor condition. The surface of the shelter has been significantly weathered causing deterioration of the charcoal art. The surface of the shelter has evidence of water leeching, however there are no micro-organisms growing on the surfaces. Ongoing weathering is an additional conservation concern.

2.9.2 Statement of Significance

This is a shelter with art. The art consists of a single indeterminate charcoal outline motif, situated in a chemically weathered alcove. The art is in very poor condition, apparently being weathered by both water leeching and exposure. The site is a poorly preserved example of the most common site type, with no exceptional characteristics.

Significance: **LOW**

2.10 DM13 (48-2-0056)

2.10.1 Site Description

This shelter (cliff) with deposit is situated on the bottom cliff line on a significant ridgeline on the northern side of Sandy Creek. It is situated in the centre of a large, high sandstone cliff line, 150 m from the creek channel. The cliff line is large, and continuous, and has been formed by block fall. It would not be considered a typical shelter, but does have a narrow roof line. This section of the cliff line measures 23.0 m x 5.6 m x 3.5 m in size (Plate 19), and a living floor of 3.0 m x 10 m, although the cliff line does continue further to the north-east and south-west. No art is present along this cliff line as the conditions are very damp and surfaces of the sandstone are unsuitable.

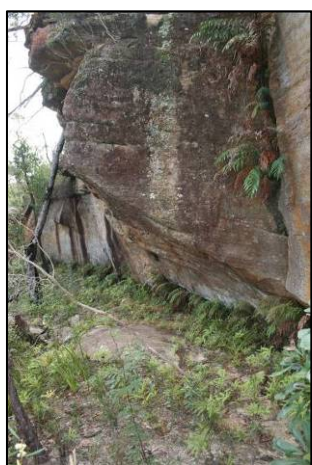


Plate 19: Steep cliff line overhang at site DM 13



Plate 20: Stone artefacts recorded at site DM 13

The deposit within the living area consists of yellow brown sand that is quite coarse in texture. It is estimated to be between 30 cm and 40 cm deep across the living floor. The surface of the floor has been partly disturbed by wombat diggings, as there is a wombat hole situated at the centre base of the cliff line. A small number of stone artefacts were exposed on the spoil from the wombat hole. These included one silcrete scraper, 3 quartz flakes and one petrified wood flake fragment (Plate 20).

No major bedding planes at this section of the cliff line. There is one horizontal plane where the narrow roof meets the top of the cliff line. Major sandstone block fall has occurred at the front of the shelter, reducing the size of the liveable area. No water seepage was evident although the surface of the cliff line does contain some lichen and micro-organism growth. Small ferns are growing from some cracks and in the drip line along the front of the shelter.

2.10.2 Statement of Significance

This is a shelter with deposit, with five artefacts recorded on the surface of the deposit. The site is an example of a common site type. The deposit is partially disturbed from animal digging / burrowing, and is a medium-coarse yellow sand. The site has low representative value, and no other notable features.

Significance: **LOW**

2.11 DM14 (52-2-3638)

2.11.1 Site Description

This isolated artefact occurrence is situated in the centre of Fire Trail 6C, north of the intersection of Fire Trail 6C and the access track to the 66kV overhead power line, east of the site (Plate 21). The site comprises a single broken mudstone artefact (Plate 22).



Plate 21: View north along Fire Trail 6C across site DM14

Plate 22: Single mudstone flake at site DM 14

Fire Trail 6C is a well used fire trail that consists of medium yellow brown sand. The sand on the track is from continual use, erosion and maintenance.

2.11.2 Statement of Significance

This site is a single stone artefact site that occurs on Fire Road 6C. The site is heavily disturbed from the vehicle track, and contains only the single artefact. Given the artefact's location it is unlikely that there is archaeological deposit in the undisturbed areas adjacent to the vehicle track. The site has little representational and rarity value as isolated finds can and do occur virtually anywhere, in any landscape.

Significance: **LOW**

2.12 DM15 (52-2-3639)

2.12.1 Site Description

This shelter with art site is situated on the mid slopes of a ridgeline above one of the major Wongawilli tributaries. The small sandstone shelter is located on a discontinuous sandstone outcrop and has been formed by block fall and cavernous weathering. The shelter faces south, within damp woodland vegetation. The overhang measures 6.5 m x 1.5 m x 1.9 m (Plate 23), with a very limited living floor area of approximately 2 m x 2 m. The overhang is approximately 200 m north of the major Wongawilli tributary, and 400 m east of Wongawilli Creek.

The art comprises a single solid charcoal anthropomorphic or possibly bat figure on a small panel measuring 30 cm x 50 cm (Plate 24). It is situated at the western end of the overhang and has been preserved by a thin silica skin. It is also one of the only remaining areas across the surface of the overhang that has not been exfoliated.

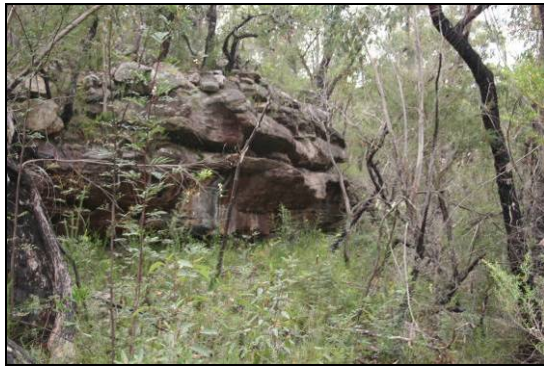


Plate 23: Small outcrop at site DM 15



Plate 24: Single solid charcoal motif at site DM 15

The limited living space on the floor of the shelter consists of medium yellow grey brown sand, estimated to be 40 cm deep. No stone artefacts could be identified however.

2.12.2 Statement of Significance

This shelter with art contains a single, reasonably well preserved anthropomorphic, or possibly bat / flying fox motif. The shelter and art is an example of the most common type of site in the region. As a well preserved motif the site has some representative value, however it has no other outstanding characteristics or values.

Significance: **LOW**

2.13 DM20 (52-2-3644)

2.13.1 Site Description

This small shelter with art is situated on the mid slopes of a moderate ridgeline, 300 m east of Fire Trail 6C and 200 m north of the drainage line. The small sandstone overhang has been formed by block fall and cavernous weathering, and is situated in a small continuous cliff line. The shelter faces north towards a Sandy Creek drainage line and measures 5 m x 2.5 m x 2 m (Plate 25), and comprises a small, flat living area approximately 3 m x 2 m in size (Plate 26).



Plate 25: Small overhang at site DM 20, southeast



Plate 26: Lower cavern contains art at site DM 20

The art comprises charcoal outline and infill indeterminate motifs across the rear wall of the small cavern (Plate 25), and 1 anthropomorph on the edge of the cavern (Plate 26). The majority of the art cannot be distinguished.

The deposit consists of medium grey brown sand estimated to be no more than 20 cm deep. No stone artefacts were identified on the floor of the shelter.

The motifs are in poor condition due to extensive water seepage, leeching and micro-organism growth. The small cavern in which they are situated is also subject to continuous weathering processes, although no major cracks or bedding planes are present within the small cavern. Some horizontal bedding planes are present in the larger overhang in which the small cavern is located. Overall, the site is in a degraded condition.

2.13.2 Significance Assessment

This shelter with art contains a row of charcoal outline and infill indeterminate motifs and a partial outline anthropomorphic motif, all located in a small alcove at the back of the shelter. The art is in poor condition, and an example of the most common art type present in the area. The site and small art assemblage has some representational value, but contains no outstanding characteristics.

Significance: **LOW**

2.14 DM23 (52-2-3651)

2.14.1 Site Description

This site is a shelter with archaeological deposit, located directly below the Sandy Creek waterfall, near where Fire Road 6C crosses Sandy Creek. The shelter measures 80 m x 30 m x 8m and has been formed by block fall on a large scale, with most of the shelter floor forming a steep slope and being strewn with very large angular boulders. However, the western end of the shelter contains approximately 20 m of reasonably flat floor, which has a well developed, though very damp deposit, of red soil (Plate 27). There were 6 artefacts, including cores and a retouched flake, located in the drip line and eroded parts of the deposit (Plate 28).



Plate 27: Archaeological deposit at DM23



Plate 28: Artefacts at DM23

2.14.2 Statement of Significance

This site is a shelter with deposit, located beneath the Sandy Creek waterfall. The site is a massive cavern with cascading water falling across the front of the shelter, giving it a strong aesthetic. The shelter contains a dark brown, damp loamy deposit at its western end, otherwise the floor consists of large, angular boulders of block fall, making a rugged, steeply sloping floor. Four artefacts were located in the drip line associated with the deposit. The deposit is slumping and eroded from water rilling, and possibly historical use of the shelter, which contains a lot of graffiti. Whilst impressively large, the shelter is very damp, and whilst there was a reasonable area of deposit only a few artefacts were located here, despite heavy erosion, suggesting the deposit may be of limited potential. Nevertheless, large areas of deposit are rare, as are large overhangs giving rarity and representational value to this site.

Significance: **MODERATE**

3.0 PROTOCOL FOR ONGOING COMMUNITY CONSULTATION

3.1 Aboriginal Stakeholders

The following organisations registered an interest in the Aboriginal Cultural Heritage Assessment Project for Dendrobium Area 3. These organisations are referred to below as the Aboriginal Stakeholders:

- Illawarra Local Aboriginal Land Council (Sharralyn Robinson)
- The Wadi Wadi Coomaditchie Aboriginal Corporation (Peter Carriage)
- Northern Illawarra Aboriginal Collective (NIAC – Chris Illert)
- Korewal Elouera Jerrungarugh Tribal Elders Aboriginal Corporation (KEJ – Reuben Brown)
- Cubbitch Barta Native Title Claimants Aboriginal Corporation (Glenda Chalker)
- Aboriginal and Historic Archaeological Solutions (Scott Franks)

Additional responses to the project outside of the registration period were received from:

- Bellambi Aboriginal Tent Embassy (Kim Moran)
- Gary Caines
- Kullila Welfare and Housing Aboriginal Corporation (Maria Maher)

Representatives from these groups were able to participate in the fieldwork for the Aboriginal Cultural Heritage Assessment Project for Dendrobium Area 3:

- Cubbitch Barta Native Title Claimants Aboriginal Corporation
- Illawarra Local Aboriginal Land Council
- Korewal Elouera Jerrungarugh

3.2 Archaeological Activities

3.2.1 Scheduled recording and monitoring

For all baseline recording and scheduled monitoring visits the Aboriginal Stakeholders will be notified in writing – either by letter, facsimile or e-mail - no later than two weeks prior to the scheduled work commencing, and be invited to attend and participate in the archaeological fieldwork.

Attendance and participation in the archaeological activities will be subject to attendees satisfying standard requirements for contractors. These requirements will be advised to the Aboriginal Stakeholders in the written notification described above.

Written correspondence describing the results of scheduled monitoring activities will be provided to all Aboriginal Stakeholders subsequent to each monitoring visit.

3.2.2 Recording of new sites

As described in Section 6.0 Aboriginal Stakeholders will be notified of the discovery of previously unknown Aboriginal objects, or skeletal remains. The notification will be made in writing via either letter, facsimile or e-mail, or a combination of these.

3.3 Review of protocol and processes

At the conclusion of each of the longwalls in Dendrobium Area 3A the Aboriginal Stakeholder list will be subject to review. If Aboriginal Stakeholders are consistently unable to be contacted, or if they have requested no further involvement in the project, they will cease to be notified.

4.0 DESCRIPTION OF GENERAL MANAGEMENT MEASURES

This section of the Aboriginal Heritage Plan describes the measures that would be implemented to protect Aboriginal sites generally, including measures that would be implemented to secure, analyse and record sites at risk of subsidence within Dendrobium Area 3A, in accordance with Condition 12(c). Management measures for the site 52-2-1646 are described separately in Section 5.0 of this Aboriginal Heritage Plan. For ease of reference the section begins with a review of the subsidence predictions and subsidence impact assessments presented in the Dendrobium Area 3 Archaeological and Cultural Heritage Assessment (Biosis Research 2007).

4.1 Subsidence Impact Assessment

Predicted mining subsidence data were calculated for the study area by Mine Subsidence Engineering Consultants for the SMP layout (MSEC 2007) and revised for the proposed 3A layout submitted February 2010 (MSEC 2010). Table 3 shows the results of the subsidence modelling of Aboriginal cultural heritage sites in Dendrobium Area 3A associated with both mine plans.* An impact assessment for each of the sites is presented in more detail following:

(a) Initial Predictions Based on SMP Layout						
Site Number	Site Name	Site Type	Maximum Predicted Cumulative:			
			Subsidence (mm)	Travelling Tilt (mm/m)	Travelling Tensile Strain (mm/m)	Travelling Compressive Strain (mm/m)
52-2-0458	Browns Road Site 33	Shelter with Art	220	2.9	0.6	0.2
52-2-1646	Browns Road Site 32	Shelter with Art	150	3.9	0.8	0.3
52-2-1647	Browns Road Site 20	Shelter with deposit	<20	0.1	<0.1	<0.1
52-2-2043	Sandy Creek Road 28	Stone Artefacts	<20	0.1	<0.1	<0.1
52-2-3052	SCA Special Area Fire Trail 6C	Stone Artefacts	75	1.0	0.2	0.1
52-5-0273	Sandy Creek Road 21	Shelter with art and deposit	1485	5.7	1.6	1.3
52-5-0274	Sandy Creek Road 22	Shelter with art	235	4.6	1.9	1.5
52-5-0277	Sandy Creek Road 25	Shelter with art and deposit	1540	7.4	1.8	3.6
52-5-0278	Sandy Creek Road 26	Shelter with art	1540	7.6	1.8	3.6
48-2-0056	DM13	Shelter with deposit	1615	15	2.5	2.0
52-2-3638	DM14	Stone artefacts	1400	10	1.4	2.5
52-2-3639	DM15	Shelter with art	1265	15	2.8	2.1
52-2-3644	DM20	Shelter with art	1660	6.0	1.4	1.1
52-2-3651	DM23	Shelter with deposit	<20	<0.1	<0.1	<0.1

* A more detailed subsidence assessment for site 52-2-1646 is included in Section 5.0 of this AHP as per Condition 11(d).

(b) Predictions for Modified Area 3A Layout					
Layout	Archaeological Site	Maximum Predicted Subsidence (mm)	Maximum Predicted Tilt (mm/m)	Maximum Predicted Hogging Curvature (km ⁻¹)	Maximum Predicted Sagging Curvature (km ⁻¹)
SMP Layout (Report No. MSEC311)	DM13	1625	15	0.17	0.14
	DM15	1250	15	0.18	0.14
	DM20	1650	6.0	0.09	0.07
	52-2-1646	150	4.0	0.05	0.02
	52-2-2043	<20	<0.5	<0.01	<0.01
	52-5-0273	1475	5.5	0.11	0.09
	52-5-0274	225	4.5	0.13	0.03
Modified Layout (Report No. MSEC437)	DM 13	1100	17	0.34	0.12
	DM 15	1675	18	0.15	0.34
	DM 20	825	7.0	0.20	0.05
	52-2-1646	<20	<0.5	<0.01	<0.01
	52-2-2043	<20	<0.5	<0.01	<0.01
	52-5-0273	750	12	0.17	0.05
	52-5-0274	75	1.0	0.01	0.01

Table 3: (a) Subsidence, tilt and strain predictions for each of the Aboriginal archaeological sites within the Study Area (results provided by MSEC 2007). (b) Modified predictions for February 2010 proposed Area 3A mine plan (results provided by MSEC 2010).

As shown by the above tables, the updated predictions issued for the February 2010 proposed layout are mostly similar or less than those for the original longwall layout.

4.1.1 Site specific impact assessments Area 3A

The site specific impact assessments for the sites in Dendrobium Area 3A are presented below and are summarised in Table 4. The impact assessments are described in terms of risk of impact. The method of assessment is to consider risk factors as being present or absent at each site, and “summing” the presence of factors to produce an overall risk category. Hence, the more risk factors exhibited by a site then the greater the risk category. Previous studies have identified the following factors as important determinates in the potential and likelihood of a shelter site being impacted by mine subsidence (Sefton 2000, Biosis Research 2007):

- overhang size (particularly volume);
- presence of existing water seepage;
- topographic location in relation to a valley bottom;

This site has very high predicted systematic tensile strains, as it is located directly over a goaf. The site's volume is 40m³, which places it outside the risk category of larger sites. Fracturing and shear movements of strata, and rock falls associated with cliffs have been reported in similar situations. There is a low risk of impact to this site.

DM20**52-2-3644*****Shelter with Art***

This site has moderate predicted systematic tensile strains, as it is located directly over a goaf. The site's volume is 53m³, which places it just in the risk category of larger sites. Fracturing and shear movements of strata, and rock falls associated with cliffs have been reported in similar situations. Hence, there a moderate risk of impact to this site.

DM23**52-2-3651*****Shelter with Deposit***

This site has very low predicted systematic tensile strains, and is situated well outside the goaf area. The site is a very large overhang with a volume of 19,200m³. Although a very large and a highly weathered, inherently unstable shelter the shelter is not likely to be impacted as it is outside of the zone where rock falls have been previously observed. The shelter is a shelter with deposit, and impacts are not likely to occur to the archaeological deposit. Overall the risk of impact to the shelter is low.

Table 4 presents a summary of the predicted risk of impact to the archaeological sites in Dendrobium Area 3A, as well as the sites' assessed archaeological significance.

Site Number	Site Name	Site Type	Significance	Risk of Impact
52-2-0458	Browns Road Site 33	Shelter with Art	Low	Very Low
52-2-1646	Browns Road Site 32	Shelter with Art	High	Very Low
52-2-1647	Browns Road Site 20	Shelter with deposit	Low	Very Low
52-2-2043	Sandy Creek Road 28	Stone Artefacts	Moderate	Negligible
52-2-3052	SCA Special Area Fire Trail 6C	Stone Artefacts	Low	Negligible
52-5-0273	Sandy Creek Road 21	Shelter with art and deposit	Low	Moderate
52-5-0274	Sandy Creek Road 22	Shelter with art	Low	Low
52-5-0277	Sandy Creek Road 25	Shelter with art and deposit	Moderate	Low
52-5-0278	Sandy Creek Road 26	Shelter with art	Low	Moderate
48-2-0056	DM13	Shelter with deposit	Low	Moderate
52-2-3638	DM14	Stone artefacts	Low	Negligible
52-2-3639	DM15	Shelter with art	Low	Low
52-2-3644	DM20	Shelter with art	Low	Moderate
52-2-3651	DM23	Shelter with deposit	Moderate	Low

Table 4. Summary of risk of impact to sites in Area 3A

There are 6 sites with either negligible or very low risk of impact from the proposed mining, including the only site assessed to have high archaeological significance in Area 3A. There are 4 sites that have a low risk of impact, including 2 shelters with deposit; of these 4 sites 2 have moderate archaeological significance and 2 have low archaeological significance. The highest risk category – moderate – contains 4 archaeological sites; these are all shelters with art and / or archaeological deposit, however all these sites have been assessed as having low archaeological significance.

All sites except DM23, SCR28 and BR20 will be subject to vertical subsidence. Situated beneath the Sandy Creek waterfall, DM23 may be subject to non-systematic subsidence movements.

It has been suggested previously that stone artefact sites in an open context, and shelters with archaeological deposit or potential archaeological deposit, are not likely to be impacted by subsidence related ground surface movements (Sefton 2000: , Biosis Research 2007: 95-96). In recognition of this it is not proposed to monitor the open stone artefact sites in Dendrobium Area 3A.

4.2 Measures to Protect Aboriginal Sites Generally

The principal measure to protect the Aboriginal sites within Dendrobium Area 3A will be the implementation of a monitoring program with appropriate action triggers and management / mitigation responses, as described in this Aboriginal Heritage Plan. In addition to this, during the mine planning process, cultural heritage values (the presence of sites) are considered in addition to other values when assessing areas or major structures that will not be mined beneath (site DM23 for example).

4.2.1 Recording of Sites in Dendrobium Area 3A

All the currently known Aboriginal archaeological sites within Dendrobium Area 3A have been subject to recording at the level appropriate for registration on the *Aboriginal Heritage Information Management System* (AHIMS) at DECC. The purpose of the detailed recording proposed in this Aboriginal Heritage Plan is to:

- Mitigate the risk of potential impact through more detailed archival recording of all shelter sites.
- Provide a set of baseline records for the monitoring program.

A monitoring regime established by Sefton (2000) and amended and continued by Biosis Research, has proven effective in observing changes to Aboriginal shelter sites due to subsidence movements at the ground surface. The recording and monitoring regime described in this Aboriginal Heritage Plan aims to implement a similar monitoring program, and to establish recording procedures that are up-to-date with current technologies and practice and capture a record of the rock art in its current context. To this end, the following activities will be undertaken:

- Recording of each shelter site and rock art on specifically produced recording forms
- Comprehensive photographic coverage of shelters and art panels using slide and high resolution digital photography, showing art and panels in their wider context and in relation to each other;
- Art panels will be digitally and slide photographed at scales appropriate to their size and complexity, including –
 - Single frame coverage of the panel

- If required, set distance scale photography for montage of the panel (digital only)
- Single frame coverage of individual motifs
- If required, set distance scale photography for montage of individual motifs (digital only)
- Where informative close-up photography of notable features of the rock art (eg. superimposition of motifs or media) and its context (eg. joints, cracks, seepage, mineral or organic accretions);
- Spherical photographic coverage of shelters using high resolution digital photography and appropriate stitching techniques at selected sites;
- Elevation plans of shelter walls recording structural and surface features including but not limited to the art itself, graffiti, joints, bedding planes, exfoliation scars, cracks, mineral and micro-organism growth, drip line and water seepage locations.
- The identification and recording through digital photography of specific monitoring points, informed by Sefton’s and Biosis Research’s previous work, generally being pre-existing cracks, joints, areas of seepage located on or adjacent to art panels, or in other parts of the shelter

Upon completion of the baseline recording and prior to the commencement of mining in Dendrobium Area 3A a report and archival material will be submitted to the NSW Department of Environment and Climate Change. The NSW Department of Planning will be notified when the baseline recording data is submitted to NSW Department of Environment and Climate Change.

The report will include a detailed description of each of the shelter sites recorded, including in the case of rock art sites a full list of the art present describing media, application techniques and motif types. In addition the rock art present at each site will be interpreted using an appropriate level of observation (the more complex the site the more detailed the interpretation), including digital enhancement where appropriate (David *et al.* 2001). The archival material will consist of all digital photographs, spherical photography and written records for each site transferred to archival quality CD-ROM in accordance with the NPWS Standards and Guidelines (NSW NPWS 1997).

4.2.2 Monitoring

The results of the archival recording procedures will be used for ongoing comparisons to determine any actual impact from mining. The following general schedule is proposed for the monitoring of the shelter sites within Dendrobium Area 3A.

General Schedule

- *Baseline archival recording:*
Prior to longwall mining beginning in Dendrobium Area 3A.

- *Impact assessment recording:*
Three to six months after each predicted subsidence movement at the site (that is when a longwall makes it closest traverse to the site).
- *Final assessment recording:*
At the completion of all subsidence movements at the site. The results of the assessment to be reported in Annual Environmental Management Reports and/or End of Panel Reports required by Condition 9 of Schedule 3 of the Development Consent.

Any impacts will be assessed by comparing the results of the impact recording stages with the baseline data. Movement at and within the site will be monitored by comparing monitoring observations of the monitoring points, and general observations of the surrounding landscape and whether it shows evidence of subsidence impact.

Impact and Risk Management Schedule

In the event that there are subsidence impacts to any site being monitored, or impact to the immediate context surrounding the shelter, management strategies specific to the impact will be developed. The management strategies will be implemented in accordance with current conservation practice and the conservation principles contained within the Australia International Council on Monuments and Sites (ICOMOS) *Burra Charter*, and the NSW DECC *Guidelines for Aboriginal Heritage Impact Assessment* (Draft) and the *Aboriginal Cultural Heritage Standards and Guidelines Kit*. The advice of the Aboriginal stakeholders regarding appropriate management methodologies will form an integral part of the development of the management strategies. All contingent management strategies will be developed in consultation with the identified Aboriginal communities, BHPBIC, the SCA and DECC. In all cases monitoring will only be conducted when a site and condition specific risk assessment determines it safe to do so. The triggers and suggested management actions are described in Table 1.

Impact trigger and action response schedule for Dendrobium Area 3A

During & post mining 3-6 months after nearest longwall traverse and at End of Panel

<ul style="list-style-type: none"> - subsidence monitoring - impact monitoring 	<p><i>Minor</i></p> <ul style="list-style-type: none"> - Change in shelter conditions not attributable to natural weathering or preservation - Changes external to shelter that effect the sites context – ground cracking, boulder slumping, rock and/or tree falls 	<ul style="list-style-type: none"> - Continue with monitoring program if safe to do so - Condition assessment and photographic record - Notify other relevant specialists (BHPBIC) - Notify key stakeholders 	<ul style="list-style-type: none"> - Continue with proposed monitoring program - Condition assessment recorded
-	<p><i>Major</i></p> <ul style="list-style-type: none"> - Change in shelter conditions not attributable to natural weathering or preservation –change in drip line or seepage, cracking or exfoliation of overhang or shelter, movement or opening of existing planes and joints 	<ul style="list-style-type: none"> - Review monitoring program and modify if necessary - Report to key stakeholders as required - Condition assessment and photographic record - Consider development of site management plan to mitigate effects - Continue with monitoring program (as reviewed) if safe to do so - Notify other relevant specialists (BHPBIC) - Notify key stakeholders 	<ul style="list-style-type: none"> - Continue with proposed monitoring program
-	<p><i>Severe</i></p> <ul style="list-style-type: none"> - Change in shelter conditions not attributable to natural weathering or preservation – cracking or exfoliation of art panel, movement of existing planes and joints at panel, block fall within shelter or overhang, shelter or overhang collapse 	<ul style="list-style-type: none"> - Review monitoring program and modify if necessary - Report to key stakeholders - Site visit and discussions with DPIM and resource managers - Condition assessment and photographic record - Develop site management plan to mitigate effects - Continue with monitoring program (as reviewed) if safe to do so - Notify other relevant specialists (BHPBIC) - Notify key stakeholders 	<ul style="list-style-type: none"> - Continue with proposed monitoring program

Table 5. Impact trigger and action response schedule for Dendrobium Area 3A

Review of Monitoring Schedule

A review of the methodology and monitoring regime will be undertaken during each reporting phase.

4.2.3 Reporting

Reports will be produced and submitted to the NSW DECC, Aboriginal stakeholders, and SCA at the following project milestones:

- Completion of baseline recording
- Completion of each monitoring activity, including End of Panel assessment

The baseline recording report will include an inventory with a detailed description of each of the shelter sites recorded, including in the case of rock art sites a full list of the art present describing media, application techniques and motif types. In addition the rock art present at each site will be interpreted using an appropriate level of observation (the more complex the site the more detailed the interpretation), including digital enhancement where appropriate (David *et al.* 2001).

The monitoring reports will include observations on any changes observed within the monitored shelters, and an interpretation of the mechanisms effecting those changes. On going review of the factors influencing the preservation of shelters and the rock art within them will be included in each report where relevant observations and findings are made.

5.0 DESCRIPTION OF MANAGEMENT MEASURES AT 52-2-1646

This section of the Aboriginal Heritage Plan describes the measures for the management of the Aboriginal site Browns Road Site 32 AHIMS# 52-2-1646. This section intends to satisfy Condition 12 (d), which requires:

(d) description of the measures that would be implemented to protect Aboriginal site 52-2-1646, including:

- a full recording and assessment of the site's rock art;
- a more detailed subsidence assessment for the site;
- measures which seek to avoid any significant impact on the site and any necessary contingency plans to protect the site against collapse or substantial impact on its rock art;

52-2-1646 Rock Art Recording

Rock art recording at 52-2-1646 will be conducted using the methods described below.

- Recording of the shelter site and rock art on specifically produced recording forms
- New plans and sections of the shelter will be prepared;
- Sketching, measurement and initial interpretation of the art made on site;
- Comprehensive photographic coverage of the shelter and art panels using high resolution digital photography, showing art and panels in their wider context and in relation to each other;
- Art panels will be photographed at scales appropriate to their size and complexity, including –
 - Single frame coverage of the panel;
 - If required, set distance scale photography for montage of the panel;
 - Single frame coverage of individual motifs;
 - If required, set distance scale photography for montage of individual motifs;
 - Close-up photography and sketch notes of notable features of the rock art (eg. superimposition of motifs or media) and its context (eg. joints, cracks, seepage, mineral or organic accretions);
- Spherical photographic coverage of selected shelters using high resolution digital photography and appropriate stitching techniques;
- Digital enhancement and analysis of all rock art panels at site 52-2-1646.

The results and analysis of the rock art recording will be included in the reporting regime described in Section 4.2.1.

52-2-1646 Detailed subsidence assessment

The subsidence impact assessment for the site provided in the Cultural Heritage Assessment report (Biosis Research 2007) determined the following:

This site has very low predicted systematic tensile strains, and is not located over a goaf area. The site's volume is 202m³, which places it in the risk category of larger sites. However, rock falls, fracturing of strata and shear movements near the surface are very rare outside of goaf areas. The risk of impact at this site is very low.

This section of the Aboriginal heritage Plan provides additional detail to this subsidence impact assessment by incorporating observations of the site's structure, and directly considering the site in relation to other sites that have been monitored in the southern coalfields.

The subsidence prediction report prepared by MSEC (2007: 78-79) notes that:

The main mechanisms which can potentially result in impact on sandstone overhang and outcrop sites are the systematic strains and curvatures...Tensile strains greater than 0.5 mm/m may be of a sufficient magnitude to result in the fracturing of sandstone. Compressive strains greater than 2 mm/m may be of a sufficient magnitude to result in the underlying strata buckling, which could result in the fracturing of the sandstone bedrock.

The site 52-2-1646 will be subject to tensile strains that are only marginally above the predicted threshold that may cause fracturing of sandstone, whilst the compressive strains expected at the site are several orders of magnitude below the level of strain predicted to cause underlying strata to buckle.

Long term programs monitoring the impact of subsidence to Aboriginal shelter sites have been conducted in the southern coalfield by Sefton (2000) and more recently by Kayandel (2008) and Biosis Research (2009 in prep). There have been 103 sites with predicted subsidence of greater than 20 mm monitored, and of these 11 have been impacted due to subsidence. The impacts noted can be grouped into four categories: cracking; movement along existing joints/bedding planes; block fall; change of seepage. Sefton identified the following factors as being associated with shelters that were impacted: wet overhangs/shelters; location near valley bottom; location above goaf (longwall void); block fall shelters; shelters greater than 50m³ in volume; high strain values.

Table 6 compares the subsidence predictions (where available) for the 11 sites that have been impacted by subsidence in the past with the predictions for 52-2-1646. The site 52-2-1646 will be subjected to tensile strains only marginally above those predicted to fracture sandstone, and compressive strains well below the threshold for buckling of strata. The measure of subsidence itself does not describe structural strains or pressures on sites, but rather is an estimate of the vertical displacement of a point in space. All the previously impacted sites have been subject to levels of subsidence higher than what is predicted for 52-2-1646. The site Dendrobium 4 is situated in Dendrobium Area 2, and in regard to landscape context provides an analogue for 52-2-1646 as it is in a similar and nearby environment, is situated on a slope, and the depth of cover to the mine is similar or less than Dendrobium Area 3. Impact at the site Dendrobium 4 consisted of the opening of a pre-existing small crack at the back wall and near the base of the shelter. For impact assessment it is noteworthy that the subsidence, tilt and

systematic strain figures for Dendrobium 4 are significantly higher than 52-2-1646, suggesting that, although larger in size, 52-2-1646 should be at a comparatively low risk of impact.

Site Name	Site Type	Maximum Predicted Cumulative:			
		Subsidence (mm)	Travelling Tilt (mm/m)	Travelling Tensile Strain (mm/m)	Travelling Compressive Strain (mm/m)
Flat Rock Creek 4	Shelter with Art	Not available			
Flat Rock Creek 10	Shelter with Art	Not available			
Flat Rock Creek 11	Shelter with Art	Not available			
Flat Rock Creek 49	Shelter with Art	Not available			
Flat Rock Creek 57	Grinding Grooves	Not available			
Browns Road 4	Shelter with Art	900	-	2.5	-
Flat Rock Creek 152	Shelter with Art	345	1.7	-	0.15
P3	Shelter with Deposit	931	-	0.04	-
WR1	Shelter with Art	638	-	0.4	-
WR2	Shelter with Art	341	-	-	0.1
Dendrobium 4	Shelter with Art	993	18.6	4.1	3.5
Browns Road Site 32	Shelter with Art	150	3.9	0.8	0.3

Table 6. Subsidence predictions for 52-2-1646 compared with those of impacted sites

The proposed modifications to the Area 3A mine plan submitted in February 2010 further reduced the predicted impacts to site 52-2-1646, with maximum predicted subsidence and tilt levels of <20mm and 0.5mm/m respectively.

Sefton determined several factors to be associated with the risk of impact to shelters from subsidence, and these were described above. Table 7 lists these factors and specifically comments on whether or not 52-2-1646 falls in or out of each factor risk category. Observations regarding some of the factors have been informed by a site inspection with the specific intent of assessing the shelter's structural make-up, and how this may be affected by any subsidence movements in the locality.

Risk factor	Assessment – Risk ?	Comments
Wet overhang	YES	There is active seepage from the roof/back wall junction and evidence of percolation through the roof
Near valley bottom	NO	The site is situated on the upper slopes of a ridge
Above goaf	NO	The site is not above the goaf. The monitoring has recorded no impact to sites outside of goaf areas
Block fall	NO	The principal mechanism of formation is chemical weathering, not block fall
Greater than 50m ³	YES	The site's internal volume is 202m ³ , placing it in the risk category of sites greater than 50m ³
Systematic strain values	NO	Compared to its closest analogue, Dendrobium 4, the values are not at a level to suggest high risk

Table 7. Assessment of risk factors for 52-2-1646 identified by previous monitoring programs

In addition to the factors identified in Table 7 several observations of the shelter's structural features were made during the specific subsidence impact assessment inspection. These observations and their relevance are discussed below, from three main scales of consideration – shelter context in the local landscape, the shelters immediate structure, and the nature of the surfaces within the shelter.

Context – The site is situated on the upper slopes of a ridge formed by two westerly running tributaries of Wongawilli Creek. More locally the site is an overhang associated with a shallow drainage line, on a

slope of around 30 degrees. There are several medium sized trees on top of the shelter, and these have generally split the sandstone to a depth of approximately 0.5 m, forming small boulder rubble. The larger trees are likely to have roots that extend below this level, and penetrate the soft rock layer that forms the back wall / ceiling intersection of the shelter, which is actively seeping. To the south of the shelter there is an obvious joint in the sandstone running perpendicular to the slope. The joint is evidenced by a large detached boulder and it is likely that this joint runs behind the shelter as well. The large trees atop the shelter and soft rock layer within the shelter demonstrate a level of natural instability with the shelter. The joint running behind the shelter is further evidence of this, however the joint may provide a slot for movement, possibly ameliorating the predicted strain levels and reducing the likelihood of fracturing solid sandstone at the locality.

Seepage – the shelter has seven locations at the junction of the back wall and ceiling that are actively seeping water. The seepage is associated with a layer of soft rock within the sandstone forming the shelter. Wet shelters such as this are generally thought to be more prone to impact through cracking and block fall, as they are generally weaker in structure.

Geological structure – in addition to the seepage from the top layers / roof of the shelter the back wall of the shelter has sandstone of different mineralogy and formation, with the layers weathering distinctively and irregularly across the back wall. Generally the back wall has case hardened surfaces and iron rich formations which weather irregularly, and break / exfoliate off. At the base of northern end of the shelter a very hard, irregular layer of sandstone is differentially weathered to the remainder of the shelter. Overall, the shelter wall and ceiling surfaces are irregularly weathered and generally unstable. The variable geology within the shelter suggests that differential movements due to subsidence would be likely to be expressed at the weakest points within the shelter, most likely an interface between the internal sandstone layers. No major structural features such as pre-existing vertical or horizontal cracks, or semi detached block fall were observed, suggesting that internally the shelter structure is relatively stable.

Art Panels – with the exception of one partial macropod situated on the shelter roof the art is situated on the back wall of the shelter. There are three panels on the back wall, and all occur on similar case hardened surfaces. In some places the surface has exfoliated truncating ochre hand prints and stencils, with charcoal motifs applied subsequently overprinting the ochre pictograms and exfoliated surface. Generally the surface appears structurally sound, with very little active exfoliation, flaking or chemical weathering. There are no major structures such as joints, differentiated sandstone layering or cross bedding directly associated with the art panels. Areas of seepage partially overlap the main art panel. The lack of pre-existing structural features associated with the art panels suggests a low risk of direct mechanical impact to the art from cracking or movement at joints. However, there is potential for change in seepage patterns to potentially impact the art.

In conclusion the shelter site 52-2-1646 satisfies some categories of risk that have been associated with subsidence impact through the previous monitoring programs, namely it is: greater than 50m³; and, the shelter is wet, with active seepage from the roof / back wall junction. More so, however, the shelter is associated with factors that are related to sites that have not been impacted, namely: it is not located over a goaf; it is located on an upper slope; the site is not principally formed by block fall; and, generally the predicted subsidence and strain values are not high, being just on or below the thresholds

predicted to cause damage. Bearing in mind Sefton’s advice that predicting subsidence impacts to individual archaeological sites is ‘difficult and complex’ (Sefton 2000) the considerations presented above suggest that it is unlikely the site 52-2-1646 will be subject to impact from subsidence in Dendrobium Area 3A.

52-2-1646 Management measures to avoid significant impact

As described in Section 4.2 the principal measure to protect the Aboriginal sites within Dendrobium Area 3A will be the implementation of a monitoring program with appropriate action triggers and management / mitigation responses, as described in this Aboriginal Heritage Plan. In addition to this, during the mine planning process, cultural heritage values (the presence of sites) are considered in addition to other values when assessing areas or major structures that will not be mined beneath (site DM23 for example).

If necessary and where practical minor works at the site may be undertaken to protect or stabilise the art surfaces if they are deemed to be suffering impact from subsidence related ground movements. These minor works will be contingent on the specific type of impact, and may include activities such as:

- installation of artificial drip lines;
- non-invasive cleaning of art panels;
- maintenance of art panels to control or remove fungal / algal growth.

Prior to undertaking any such works consideration will be given to the potential for cumulative or secondary impact of the mitigation works. Any such mitigation works will be designed to specifically address subsidence related impacts, and will not attempt to mitigate or alter natural weathering processes at the site.

6.0 DESCRIPTION OF MANAGEMENT MEASURES FOR NEW SITES AND ANCESTRAL REMAINS

This section of the AHP describes the processes that will be followed should previously unknown Aboriginal objects or human skeletal remains be discovered during the development of the Dendrobium Area 3A longwalls. The likelihood of encountering previously unknown material is considered remote because all surface infrastructure is in place, meaning there will be no further development impacting the ground surface for Dendrobium Area 3A. However, there is a possibility that Aboriginal objects may be discovered during the recording and monitoring activities described in this report, or during recording and monitoring activities of other specialist or staff working for BHP Billiton Illawarra Coal.

The process for previously unrecorded archaeological material (that is not skeletal remains) being discovered is as follows.

The find will be recorded in accordance with the *National Parks and Wildlife Act 1974* (NSW) and the NSW NPWS *Aboriginal Cultural Heritage Standards and Guidelines Kit*.

BHP Billiton Illawarra Coal will be notified of the find.

Aboriginal stakeholders will be notified of the find.

This Aboriginal Heritage Plan will be amended to include the newly discovered site in the management regime established by the plan.

In the case of skeletal remains the following process will be implemented.

The find will be reported to police and state coroner

BHP Billiton Illawarra Coal will be notified of the find.

Aboriginal stakeholders will be notified of the find.

NSW DECC will be notified of the find.

If the skeletal remains are of Aboriginal ancestral origin an appropriate management strategy will be developed in consultation with the Aboriginal stakeholders.

The find will be recorded in accordance with the *National Parks and Wildlife Act 1974* (NSW) and the NSW NPWS *Aboriginal Cultural Heritage Standards and Guidelines Kit*.

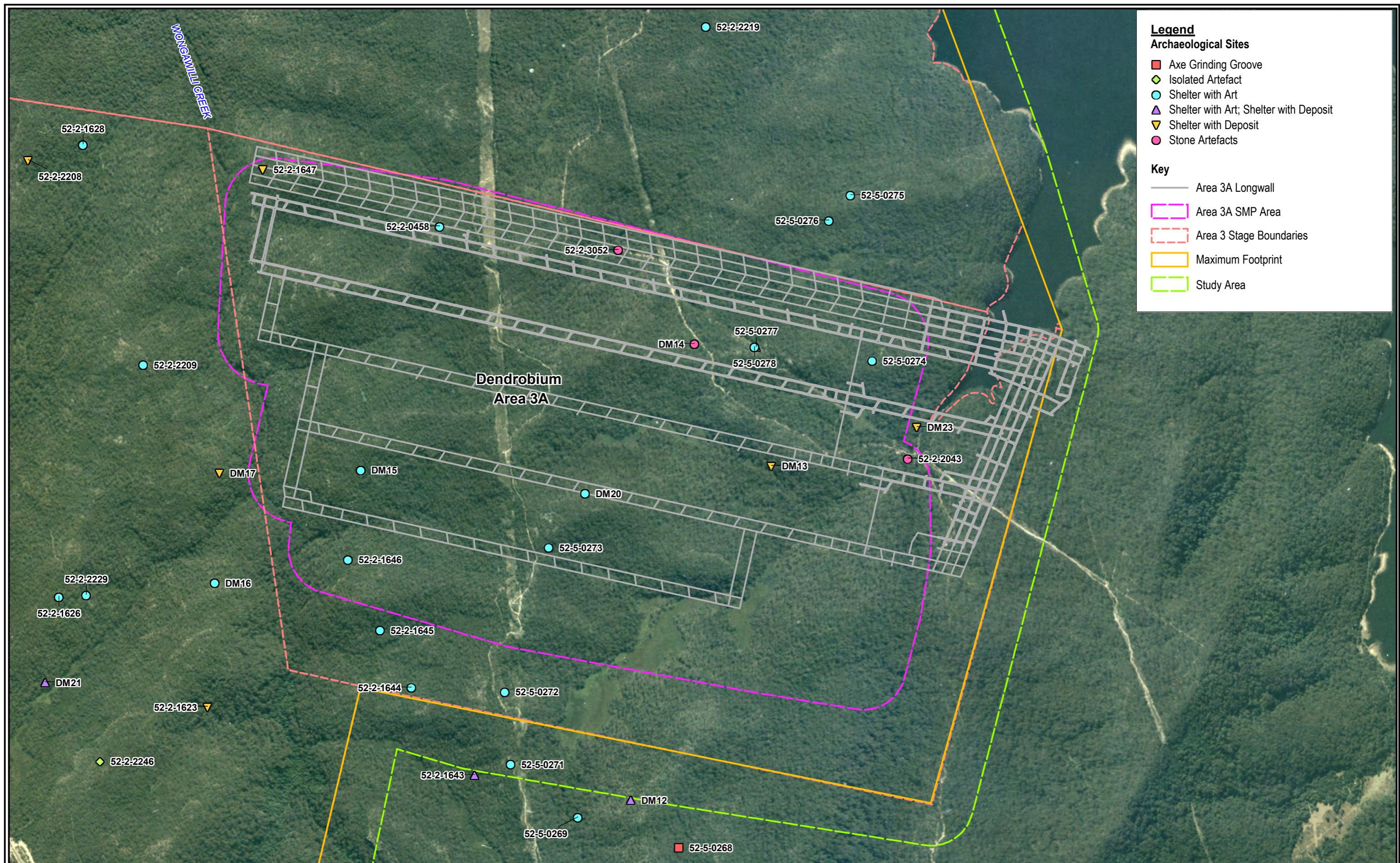
This Aboriginal Heritage Plan will be amended to include the newly discovered Aboriginal ancestral remains in the management regime established by the plan.

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FIGURES

Figure 1: Dendrobium Area 3A



Legend

Archaeological Sites

- Axe Grinding Groove
- ◆ Isolated Artefact
- Shelter with Art
- ▲ Shelter with Art; Shelter with Deposit
- ▼ Shelter with Deposit
- Stone Artefacts

Key

- Area 3A Longwall
- ▭ Area 3A SMP Area
- - - Area 3 Stage Boundaries
- ▭ Maximum Footprint
- ▭ Study Area



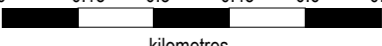
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Figure 8: Recorded Aboriginal and historic sites within the Dendrobium Area 3A longwalls

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0 0.15 0.3 0.45 0.6 0.75
kilometres



Scale: 1:15,000 at A3
Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid of Australia, Zone 56




Figure 8