

Donaldson Coal Pty Limited

**ABEL UNDERGROUND MINE
PART 3A ENVIRONMENTAL
ASSESSMENT**

Appendix K

Aboriginal Heritage Assessment



**ABEL UNDERGROUND MINE
PART 3A PROJECT APPLICATION
ABORIGINAL HERITAGE**

A report to

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1 INTRODUCTION

Donaldson Coal Pty Limited (Donaldson) is proposing to extract coal by underground mining methods within a lease area south of Donaldson Coal Mine. The proposed underground mine, named 'Abel Underground Mine' has been subject to an Aboriginal heritage assessment by South East Archaeology with reference to the draft Department of Environment and Conservation (NSW) (DEC) *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation*, as specified in the Director-General of the Department of Planning's Environmental Assessment Requirements. This assessment has also involved reference to the DEC *Interim Community Consultation Requirements for Applicants* policy and the DEC *Aboriginal Heritage Standards and Guidelines Kit*.

The heritage assessment investigation area for the Abel Underground Mine consists of the underground mining lease of approximately 2,750 hectares south of John Renshaw Drive (the 'southern investigation area') and the area north of John Renshaw Drive that will be used for surface facilities, primarily within the existing Donaldson open cut mine and adjacent Bloomfield mine lease area (the 'northern investigation area'). These areas are shown on Figure 1. The objectives of this assessment were to:

- Identify important Aboriginal heritage issues and the relevant performance criteria;
- Outline the methodology and results of impact modelling;
- Analyse whether or not the impacts meet the relevant performance criteria; and
- Identify management and mitigation measures and any residual impacts after their implementation.

2 METHODOLOGY

The heritage assessment involved:

- Research into the environmental, cultural, historical and archaeological background of the heritage investigation areas;
- Searches of the DEC Aboriginal Heritage Information Management System (AHIMS) and other relevant heritage registers such as the State Heritage Register, Register of the National Estate, National Heritage List and Commonwealth Heritage List, along with the Maitland, Cessnock and Newcastle Local Environmental Plans and the Hunter Regional Environmental Plan;
- Development of a predictive model of Aboriginal site location for the heritage investigation areas;
- Field survey of areas to be disturbed by surface infrastructure;
- Reconnaissance inspection of the underground lease area in order to refine the predictive model;
- Consultation with the local Aboriginal community; and
- Preparation of a report outlining the results of the investigation.

3 ABORIGINAL HERITAGE EVIDENCE

3.1 Identified Heritage Evidence

The names and locations of Aboriginal heritage evidence within the study area are marked on Figure 1 and listed in Table 1 as best can be determined from the available evidence. This is based on information about previous recordings contained in archaeological reports, the DEC AHIMS register and DEC site records, along with information recorded during field inspections by South East Archaeology.

Approximately 38 Aboriginal heritage sites are present within the heritage investigation areas, including approximately 17 within the area north of John Renshaw Drive and approximately 21 within the underground lease area south of John Renshaw Drive. The identified sites comprise approximately 33 stone artefact occurrences (ie. open artefact scatters and 'isolated artefacts'), four grinding groove sites (including one with an associated artefact scatter) and one scarred tree. Apart from one grinding groove site, the remainder of the sites within the northern investigation area are artefact occurrences. The southern investigation area hosts three grinding groove sites and a single scarred tree, with the remaining evidence comprising artefact occurrences.

Variations in definitions, surface visibility conditions over time and methods between the different archaeological surveys, along with errors evident in previous recordings (for example, conflicting grid references and mapped location data), have created uncertainty regarding the location or present status of some of this previously recorded evidence. The DEC AHIMS register itself contains inaccuracies in relation to the grid references of listed sites (resulting in the initial omission of evidence from the study area or inclusion of evidence which does not actually occur within the study area) and several previously recorded sites have not been listed on the AHIMS register. These issues have been corrected to the extent possible within Figure 1 and Table 1.

No Aboriginal heritage sites are listed within the heritage investigation areas on other heritage registers or planning instruments, including the Maitland, Cessnock and Newcastle Local Environmental Plans and the Hunter Regional Environmental Plan and other registers under the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*, the *Environment Protection and Biodiversity Conservation Act 1999* or the *Australian Heritage Council Act 2003* such as the Register of the National Estate, Commonwealth Heritage List and National Heritage List.

3.2 Previous Archaeological Investigations

Much of the northern investigation area has been subject to detailed archaeological investigations for the Donaldson Mine and other projects. Portions of the southern investigation area have been subject to previous archaeological survey.

An initial survey by Effenberger (1997) on both sides of John Renshaw Drive identified six artefact scatters, two isolated artefacts, a scarred tree and a grinding groove site with associated artefacts. Subsequent investigations of this area by Umwelt (1998, 2001a) relocated many of these sites, along with additional evidence. As part of an ongoing monitoring program at Donaldson Mine, Umwelt (2000, 2002a, 2002b, 2004, 2005a) monitored heritage site locations in seven areas in the 'Bushland Conservation Areas' of which two are located within the northern investigation area and two within the

southern area. Ongoing monitoring revealed several new sites, including two within the northern investigation area.

Brayshaw (1985) surveyed parts of both the southern and northern investigation areas for the proposed Ironbark Colliery, identifying two Aboriginal sites. ERM (1998) and Umwelt (2002c) surveyed a narrow corridor encompassing parts of both the surface and underground areas for an upgrade of John Renshaw Drive. Umwelt (2001b) surveyed portions of both the southern and northern areas resulting in the identification of eight sites (CA1-8), three of which are in the southern area. Ruig (1993a) undertook a survey for the proposed installation of Telstra cables within the northern area, identifying two sites.

Bowdler and Happ (1982) surveyed a proposed transmission line between West Wallsend and Tomago that traverses the southern area, but did not identify any evidence in the Abel investigation area. A similar result was obtained by Kuskie (1992, 1993) during an investigation of Optus Communications fibre optic cable in the same locality. Greer and Brayshaw (1983) and Ruig (1993b) undertook assessments of the Black Hill quarry resulting in the identification of two sites.

While portions of the investigation areas have previously been subject to archaeological investigation, only the more recent surveys are likely to have been undertaken and reported to a standard consistent with present DEC requirements and guidelines.

3.3 Cultural Values

Places may be of traditional or historical cultural significance to Aboriginal people, but do not necessarily host physical remains. Although no such places have been identified during the present consultation process with the Aboriginal community, historical accounts identify at least two places of potential cultural significance within the southern investigation area.

Interviews by Kuskie (in Kuskie & Kamminga 2000) with long-time Black Hill residents Mrs Beryl Harde and Mrs Judith Crockett identified knowledge that the Black Hill Spur (within the southern investigation area) was a route or pathway used by Aboriginal people. It is likely that this pathway extended from Hexham Swamp to Mount Sugarloaf (*cf.* Umwelt 2005b:4.4) as marked approximately on Figure 1.

One ceremonial site has been reported within the southern investigation area. Known as 'the Doghole', it is described as a ceremonial ground for weddings and initiations of the Pambalong clan located "on the hills of Doghole, between Minmi and Black Hill, west of Lenaghans Drive" (Wallsend & Plattsburg Sun 3/1/1891, also 13/12/1890, 7/1/1891), in the vicinity of Stockrington and Long Gully. These accounts in the Wallsend and Plattsburg Sun extended back forty or fifty years from 1890 and appear to be based on information from early non-indigenous settlers. The aim of the series was to generate public interest with the hope of revealing more information on the local Aboriginals for the education and benefit of future generations. It does not appear that the exact location of this site has been physically relocated (its approximate location is marked on Figure 1) although Hartley (1990) notes that it is in the area now called 'Stockrington' and rock shelves and small caves were nearby. Resource Planning (1992: Figure 2) mark it in approximately the same location as Figure 1.

3.4 Potential Heritage Evidence

Although the northern investigation area, which is mainly contained within the active mine leases of Donaldson and Bloomfield mines, has been comprehensively sampled, inspections within the

southern investigation area, where underground mining will occur, have been confined to general reconnaissance and limited direct sampling in order to refine a predictive model of Aboriginal site location. More detailed inspection of the underground lease area is proposed as a staged process in advance of underground mining (refer to Section 6).

The area south of John Renshaw Drive generally consists of low undulating forested hills with patches of cleared land for rural/residential properties. There are approximately 1900 hectares of undisturbed vegetation and 900 hectares of fragmented vegetation in a farmland mosaic. The ridgeline associated with Black Hill runs east-west through the proposed underground mine lease, with tributaries of Buttai Creek, Viney Creek/Weakleys Flat Creek and Four Mile Creek draining northwards from this ridgeline. Long Gully/Blue Gum Creek drains the southern side of the ridgeline eastwards towards Pambalong Nature Reserve. Some limited clifflines and steeper gullies are located along sections of the ridge.

A predictive model of Aboriginal site location has been constructed to identify areas of high archaeological sensitivity (ie. locations where there is a high probability of archaeological evidence occurring). This model assists the planning and management of Aboriginal heritage. Predictive modelling involves reviewing existing literature to determine basic patterns of site distribution. These patterns are then modified according to the specific environment of the study area to form a predictive model of site location. A sampling strategy is employed to test the predictive model and the results of the survey used to confirm, refute or modify aspects of the model.

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

The predictive model has been based on information from the following sources:

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

The following is a brief description of the heritage evidence that is predicted to occur within the underground area (refined through conduct of the present survey and reconnaissance inspection).

ARTEFACT SCATTERS: An artefact scatter contains stone artefacts and may consist of surface material only, which has been exposed by erosion, or it more typically involves a sub-surface deposit of varying depth within the A unit or upper soil horizon. Other features may be present within artefact scatter sites, including hearths or stone-lined fireplaces, and heat treatment pits. Artefact scatters may represent the evidence of encampments, hunting or gathering events, tool production or maintenance, or other activities such as transitory movement. The detection of artefact scatters depends upon conditions of surface visibility and ground disturbance and whether recent sediment deposition has occurred (*cf.* Dean-Jones and Mitchell 1993). Vegetation cover and deposition of sediments generally obscures artefact scatter sites and prevents their detection during surface surveys. High levels of ground disturbance can also obscure or remove evidence of a site.

Within the southern investigation area there is a high potential for stone artefacts to occur in a widespread distribution of variable density across all landform units, apart from areas subject to a high level of existing impacts (eg. where the upper soil horizon has been totally removed). The widespread presence of stone artefacts has been confirmed in the limited surface surveys undertaken to date. However, virtually all of the stone artefact evidence potentially present is likely to be currently obscured by vegetation and/or soil and therefore primarily can only be detected by archaeological excavation.

The stone artefact evidence is predicted to be generally of a low density consistent with background discard (manuport and artefactual material which is insufficient either in number or in association with other material to suggest focused activity in a particular location; cf. Rich 1993, Kuskie & Kamminga 2000), interspersed by a number of activity areas (with consequent higher artefact density). Higher densities may also result where superimpositioning of evidence has occurred through repeated visits over time. The potential for artefact scatter sites representing focused occupation (eg. encampments, or events of longer duration or involving larger numbers of people) and potentially being of higher scientific significance is assessed as high along the margins of the swamps and wetlands (eg. Pambalong Nature Reserve), along the margins of the former Hunter River estuary (eg. margins of the Blue Gum Creek flats during the mid-late Holocene period), and in close proximity to higher order watercourses (eg. Blue Gum Creek and the lower reaches of Long Gully and Viney Creek). There is potential for deposits of sufficient integrity to be of research value. A higher density of evidence is generally anticipated to occur on landform units of lower gradient (eg. level to gentle) and as outlined above, in proximity to potable water and/or multiple resource zones.

BORA/CEREMONIAL SITES: Bora grounds are a type of ceremonial site associated with initiation ceremonies. They are usually made of two circular depressions in the earth, sometimes edged with stone. Bora grounds can occur on soft sediments in river valleys and elsewhere, although occasionally they are located on high, rocky ground where they may be associated with stone arrangements.

One ceremonial site has been reported within the southern investigation area. Known as 'the Doghole', it is described as a ceremonial ground for weddings and initiations of the Pambalong clan located "on the hills of Doghole, between Minmi and Black Hill, west of Lenaghans Drive" (Wallsend & Plattsburg Sun 3/1/1891, also 13/12/1890, 7/1/1891), in the vicinity of Stockrington and Long Gully. It does not appear that the exact location of this site has been physically relocated (although its general location is marked on Figure 1). However, the potential for additional bora/ceremonial sites to occur within the area is assessed as low, due in part to the recent history of land use.

BURIALS: Human remains tended to be placed in hollow trees, caves or sand deposits. The location of burials may once have been marked by carved trees (eg. Etheridge 1918:85), although subsequent tree clearing and the long passage of time since the disruption of this practice has rendered these markers extremely rare. Usually burials are only identified when eroding out of sand deposits or creek banks, or when disturbed by development. The probability of detecting burials during archaeological fieldwork is extremely low.

The potential for burial sites to occur is considered to be low, although cannot be discounted, particularly in softer sediments on the flats associated with higher order watercourses such as Blue Gum Creek and the margins of Pambalong Swamp.

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

Both vegetation removal and the long passage of time since the practice of tree carving was prevalent have rendered this site type extremely rare. Consequently, the potential for carved trees to occur

within the area is considered to be low, although given the presence of 'the Doghole' ceremonial site and remnant mature native trees, cannot be discounted.

CULTURAL SITES: Certain sites may be of traditional or historical cultural significance to Aboriginal people but do not necessarily host physical remains (ie. 'Aboriginal objects'). This category does not include the contemporary significance or cultural value that may be attributed in the present time to physical evidence such as artefact scatters or shell middens (refer to other specific site types).

Sites of traditional significance may include places related to beliefs that date from the pre-contact period and have persisted until the present time (Creamer 1984) such as mythological sites. Sites of historic significance may include places related to Aboriginal use or knowledge during the post-contact period (Creamer 1984) such as massacre sites (the location of violent clashes between early settlers and local Aboriginals), historic camp sites and resource-use areas, and contact sites.

Consultation with the local Aboriginal community is essential to identify these site types within the investigation area. Some knowledge of cultural sites of historic significance has been identified within the southern investigation area, including probable Aboriginal travel routes along Black Hill Spur, possibly extending south to Mount Sugarloaf. Other locations of cultural significance may occur, but have not yet been identified because the consultation has been preliminary in nature or such knowledge was not divulged by the persons consulted.

GRINDING GROOVES: Elongated narrow depressions in soft rocks (particularly sedimentary), generally associated with watercourses. The depressions are created by the shaping and sharpening of ground-edge hatchets.

Grinding grooves are typically located in sedimentary bedrock along watercourses. Several grinding groove sites have been identified in such contexts in the southern investigation area. Many sandstone rock formations occur within the area, particularly in the elevated terrain associated with Black Hill (eg. the steeper slopes and lower order drainage depressions that are situated on those slopes). There is a high potential for further grinding groove sites to occur within the area, particularly within drainage depressions where sandstone bedrock outcrops, but the potential occurrence of grooves in other areas of outcropping sandstone (eg. ridge crests, spur crests and simple slopes) cannot be discounted. Areas of higher potential for grinding grooves therefore include the lower order tributaries of Long Gully, Blue Gum Creek and Buttai Creek.

LITHIC QUARRIES: In a general sense, a quarry or stone procurement site is the location of an exploited stone source (Hiscock & Mitchell 1993:32). In a more specific sense, a lithic quarry refers to outcrops of bedrock where there is clear evidence of procurement activity such as pits, discarded hammerstones and large deposits of primary flaking debris. Lithic quarry sites will only occur where exposures of a stone type suitable for use in artefact manufacture occurs.

Within the investigation area and its immediate vicinity, sources of suitable stone materials (indurated rhyolitic tuff and silcrete) are known to occur. Outcrops of tuff have been identified within watercourses by Kuskie and Kamminga (2000), including at Stockrington, and by Dean-Jones (1990). Silcrete gravels and cobbles have been identified immediately north of John Renshaw Drive by Kuskie (2004) and ERM Mitchell McCotter (1995, 1996). There remains potential for evidence of lithic quarry sites, in the specific sense of quarried outcrops of tuff (particularly in drainage depressions) and in the general sense of exploited stone sources for both silcrete (particularly the low elevation northeastern fringes of the southern investigation area) and tuff (where-ever surface cobbles and gravels are exposed).

MIDDENS: Shell middens are a common site type in the coastal region. Middens are deposits of shell, the remains of what formed part of the Aboriginal diet. Middens may also include stone, bone or shell artefacts, charcoal, or the remains of small terrestrial or aquatic fauna, which were also a part

of the diet. Middens exhibit wide variation in terms of their size, preservation and contents, and can provide significant information on land-use patterns, diet, chronology of occupation and environmental conditions.

Considering the close proximity of parts of the southern investigation area to shellfish sources in the former mid-late Holocene Hunter River estuary and wetlands which subsequently formed in these locations (margins of Pambalong Swamp and flats and valley of Blue Gum Creek), the potential for midden evidence in these locations is high. Such evidence is likely to be presently obscured by vegetation and/or soil. However, much of the area is further from shellfish sources and exhibits a low potential for shell midden evidence.

ROCK SHELTER WITH ART AND/OR OCCUPATION DEPOSIT: Rock shelters include rock overhangs, shelters or caves which were used by Aboriginal people. Rock shelter sites may contain artefacts, deposits and/or rock art. These sites will only occur where suitable geological formations are present.

Within the southern investigation area, sandstone rock formations are present in a number of areas, including low cliffs and escarpments on the margins of the main ridgeline leading south from Black Hill to Mount Sugarloaf and associated lower order drainage depressions (eg. Long Gully and tributaries of Blue Gum Creek). Where sandstone rock formations are present, there is potential for overhangs, shelters or caves which may host evidence of Aboriginal occupation (eg. stone artefacts, deposits and/or art). Elsewhere within the area the potential for rock shelter sites is low.

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

One scarred tree site has been identified in the southern investigation area. There is potential for further scarred tree sites to occur where mature native trees have been retained, however considering the long time period elapsed since this practice was prevalent and the extent of vegetation removal/timber harvesting, the potential for further scarred tree sites to occur is assessed as moderate to low.

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

Hill tops and ridge crests which contain stone outcrops or surface stone, and have been subject to minimal impacts from recent land use practices, are potential locations for stone arrangements. There is some potential for stone arrangement sites to occur within the southern investigation area, particularly in association with 'the Doghole' ceremonial site. Similar sites have been recorded several kilometres south of the investigation area.

3.5 Potential Significance of Aboriginal Heritage Evidence

The significance of Aboriginal heritage evidence, including scientific, cultural, educational, historic and aesthetic values, can be assessed against a range of criteria commonly used in Aboriginal heritage management. Scientific value involves assessment of the potential usefulness of the heritage evidence to address further research questions (research potential), the representativeness of the evidence, the nature of the evidence and its state of preservation. Cultural significance refers to the contemporary, historic or traditional value placed upon the evidence by the local Aboriginal

community. All heritage evidence tends to have some contemporary significance to Aboriginal people, because it represents an important tangible link to their past and to the landscape.

The significance of Aboriginal heritage sites recorded within the investigation areas will be assessed prior to any impacts occurring, as specified in the Aboriginal Heritage Management Plan. Further consultation with the Aboriginal community will be undertaken to establish the level of cultural significance of the identified evidence. This will assist in determining the specific management strategies that can be implemented for individual heritage sites.

4 ABORIGINAL COMMUNITY CONSULTATION

Consultation has been undertaken and is ongoing with the local Aboriginal community, with reference to the DEC *Interim Community Consultation Requirements for Applicants* policy. This has involved a formal consultation procedure with various government agencies and Aboriginal groups, along with media advertisements, to seek initial registrations of interest in the project. Field inspection of the northern investigation area and reconnaissance inspection of the southern investigation area has been undertaken with representatives of the Mindaribba and Awabakal Local Aboriginal Land Councils. All registered stakeholders were forwarded a detailed statement of the project methodology for comment and were invited to attend an inspection of the area. Copies of the draft report were forwarded to Aboriginal stakeholders and their comments sought and addressed within the final report.

5 KEY HERITAGE ISSUES

The *National Parks and Wildlife Act 1974* (NP&W Act) provides the primary basis for the legal protection and management of Aboriginal heritage sites within NSW. The Act provides various controls for the protection, management and destruction of Aboriginal objects. Under the Part 3A Major Project amendments to the *Environmental Planning and Assessment Act 1979* (EP&A Act), subsequent to approval being granted, Section 90 Consent under the NP&W Act may not be required to impact Aboriginal objects. *In lieu* however, a Part 3A application involving a Statement of Commitments outlining proposed heritage management and mitigation measures must be approved.

While the primary legislation offering protection to Aboriginal heritage in NSW is enacted by the state, several Acts administered by the Commonwealth may also be relevant. The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* provides for the protection of areas and objects which are of significance to Aboriginal people in accordance with Aboriginal tradition. The amended *Environment Protection and Biodiversity Conservation Act 1999* and the *Australian Heritage Council Act 2003* include a National Heritage List of places of national heritage significance, a Commonwealth Heritage List of heritage places owned or managed by the Commonwealth and continued management of the Register of the National Estate. In addition to these Commonwealth acts, local planning instruments also contain provisions relating to indigenous heritage and development. At present, no Aboriginal sites identified within the investigation area are listed on these registers or plans.

Impacts of the proposal on Aboriginal heritage may occur in two distinct ways: directly through construction, maintenance or use of surface facilities, and indirectly, through mining induced subsidence. These issues are discussed separately below.

Construction, maintenance or continued use of surface facilities (eg. vehicle tracks) may cause direct impacts to identified Aboriginal objects or potential evidence. Given the comprehensive nature of the surface inspections of the northern investigation area, the potential for evidence other than a widespread distribution of stone artefacts (currently obscured by vegetation and/or soil) is very low, with the exception of a low to moderate potential for further grinding groove sites to occur along Four Mile Creek. Proposed surface impacts will largely be confined to narrow corridors or areas within the northern investigation area. Most impacts will be confined to the existing approved open cut mine limit or existing areas of ground disturbance in which the potential for heritage evidence is negligible. However, where impacts do occur to ground in which there are identified stone artefacts or potential for stone artefacts to occur (ie. less disturbed land), mitigation measures will generally be implemented to reduce potential impacts (refer to Section 6). Mitigation measures as described in Section 6 will also be implemented to reduce the risk of potential impacts to the single grinding groove site or any further grinding groove sites along Four Mile Creek.

Impacts from underground mining in the area south of John Renshaw Drive are limited to mining induced subsidence which could affect two forms of heritage evidence, rock shelters and grinding groove sites.

Mining subsidence has the potential to cause both tensile and compressive fracturing that can affect the integrity and/or context of grinding groove sites. It also has the potential to cause rock fall and cracking that could affect rock shelter sites. Rock falls may affect the integrity of a shelter and sterilise a portion of the archaeological deposit or destroy rock art, but unless major rock falls occur, the effects on a deposit may not be substantial. Nevertheless, rock fall may reduce the visual integrity of a site and aspects of its heritage significance. Cracking is also a potential cause of substantive impacts to heritage. Although cracking may not directly affect archaeological deposits, major cracking

has the effect of rendering a shelter susceptible to collapse or rock fall, and effectively unsafe. Such cracking may effectively sterilise the Aboriginal heritage resource within the shelter, as it is not available for Aboriginal community members to safely visit or for any future scientific research (eg. excavation) to be safely conducted. Cracking may also reduce the visual integrity of a site and aspects of its heritage significance.

Further assessment (through archaeological survey in advance of mining and detailed analysis of the potential subsidence effects at individual site locations) and mitigation measures will be implemented to avoid subsidence impacts occurring to the identified grinding groove sites and any other grinding groove or rock shelter sites that may exist in the investigation area (refer to Section 6). A range of factors may affect the extent of subsidence impacts, including the depth of the coal seam removed, method of coal extraction, size and location of extraction area and nature of the geological strata. Any rock shelters identified through further detailed surveys in advance of underground mining (refer to Section 6) can also be assessed in relation to the presence of any rock art, size of the habitable floor area, roof height, nature of the deposits and potential integrity.

The potential impacts of subsidence on other site types such as stone artefact scatters, burials, lithic quarries, middens, stone arrangements, ceremonial sites, scarred or carved trees, or sites of cultural significance to the Aboriginal community is assessed as generally low. Temporary cracking during the period of active mining may affect the ground surface in the locality of those sites situated directly above the mined area. However, previous experience elsewhere indicates that these tension cracks gradually fill in over a period of years (Mills 2005). Any effects are likely to be short-term in duration, minimal in extent and confined to the context of the sites (sediments in which the evidence is located) rather than direct impacts or damage to the Aboriginal objects themselves.

6 MITIGATION AND MANAGEMENT STRATEGIES

The key Aboriginal heritage resources susceptible to impacts from surface facilities are stone artefact occurrences, and to a lesser extent, grinding grooves. The key Aboriginal heritage resources susceptible to impacts from underground mining are grinding grooves (and rock shelter sites should any be identified within the underground area during future surveys).

A range of mitigation and management measures have been considered to address the potential impacts on this evidence. Strategies that are typically available for the management of identified and potential Aboriginal heritage evidence include further investigation (eg. survey and/or sub-surface test excavation), unmitigated impact, mitigated impact (ie. salvage), conservation and monitoring. In the selection of appropriate management strategies for indigenous heritage in relation to Project Abel, the salient points that have been considered include:

- A number of recent archaeological investigations have resulted in a comprehensive sampling of the northern investigation area and the identification of a number of artefact occurrences and a single grinding groove site;
- Impacts to the northern investigation area will largely be confined to narrow corridors or areas, mainly within the existing approved open cut mine limit or existing areas of ground disturbance;
- Where impacts occur in the northern investigation area and the fan site south of John Renshaw Drive to ground in which there are identified stone artefacts or potential for stone artefacts to occur (ie. less disturbed land), the impacts to heritage evidence in these locations may be total in the absence of mitigation measures;
- Where impacts occur in the northern investigation area and the fan site south of John Renshaw Drive to ground in which there are identified grinding grooves or potential for grinding grooves to occur (ie. less disturbed areas of Four Mile Creek where sandstone bedrock outcrops), the impacts to heritage evidence in these locations may be total in the absence of mitigation measures;
- Although several archaeological investigations have obtained minor samples of the southern investigation area, resulting in the identification of a number of artefact occurrences and three grinding groove sites and a scarred tree, large portions of the area have not been subject to systematic archaeological survey;
- A predictive model of Aboriginal site location has been constructed and refined through a reconnaissance inspection of the southern investigation area. The predictive model indicates that stone artefact evidence is likely to occur in a widespread distribution of variable density across virtually all landform units within the southern investigation area. Other types of heritage evidence are known to occur or have some potential to occur within the area, particularly ceremonial sites, cultural sites, grinding grooves, lithic quarries, rock shelters, shell middens and scarred trees;
- Impacts to the southern investigation area will largely be confined to mining induced subsidence. Subsidence is only anticipated to result in impacts to two forms of heritage evidence, rock shelters and grinding groove sites. In the absence of appropriate mitigation measures, these impacts may include damage through cracking to grinding grooves and their context, and damage through rock fall and cracking to

rock shelter sites ranging from minor to total impact. The potential impacts of subsidence on other site types is assessed as generally low;

- The nature, level of integrity, potential impacts and scientific and cultural significance of any evidence within the area can only be assessed with reference to detailed recording of that specific evidence and consultation with the local Aboriginal community. Considering the general absence of systematic survey within the southern investigation area, in order to identify if any grinding groove or rock shelter evidence (which is susceptible to impacts from subsidence) is present, systematic survey is necessary in advance of underground mining.

In the absence of appropriate management and mitigation measures, the impacts of Project Abel on Aboriginal heritage may be high.

Management and mitigation measures proposed to minimise the potential impacts of Project Abel on Aboriginal heritage are outlined below and summarised in the 'Statement of Commitments'. The key measures include:

- An Aboriginal Heritage Management Plan will be formulated in consultation with the relevant Aboriginal stakeholders to specify the policies and actions required in every conceivable circumstance to mitigate and manage the potential impacts of the proposal on Aboriginal heritage. The plan will include procedures for ongoing Aboriginal consultation, maintenance of an Aboriginal site database, management of recorded sites within the investigation area, further archaeological investigation, identification of previously unrecorded sites and skeletal remains and annual verification of the plan, along with a programme of monitoring;
- Continued use of surface infrastructure and construction of new surface infrastructure will be assessed against the location of identified Aboriginal heritage evidence and where impacts may occur, mitigation measures will be implemented. For artefact scatter sites this may involve surface collection of items and for grinding groove sites this may involve redesign of facilities to avoid impacts;
- Staged systematic archaeological survey of each section proposed to be undermined will occur with the participation of the Aboriginal stakeholders prior to any underground mining in each section. The survey will sample the geographic extent of each section. The nature, level of integrity, potential impacts and scientific and cultural significance of any evidence identified will be assessed in consultation with the Aboriginal stakeholders;
- Where site types susceptible to subsidence impacts (grinding grooves and rock shelters) are identified within the southern investigation area, an assessment of the potential impacts of subsidence will be undertaken by an appropriately qualified expert. Where it is determined that subsidence may impact a grinding groove or rock shelter site (including shelters with 'Potential Archaeological Deposits'), the mine plan will be altered to avoid all risk of subsidence impacts to that site.

After implementation of these management and mitigation measures, it is concluded that the risk of residual impact to Aboriginal heritage from Project Abel is low.

7 REFERENCES

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Disclaimer

The information contained within this report is based on sources believed to be reliable. Every effort has been made to ensure accuracy by using the best possible data and standards available. The accuracy of information generated during the course of field investigation by South East Archaeology is the responsibility of the consultant. However, as no independent verification is necessarily available, South East Archaeology provides no guarantee that the base data (DEC AHIMS) or information from informants (obtained in previous studies or during the course of this investigation) is necessarily correct, and accepts no responsibility for any resultant errors contained therein and any damage or loss which may follow to any person or party. Nevertheless this study has been completed to the highest professional standards.

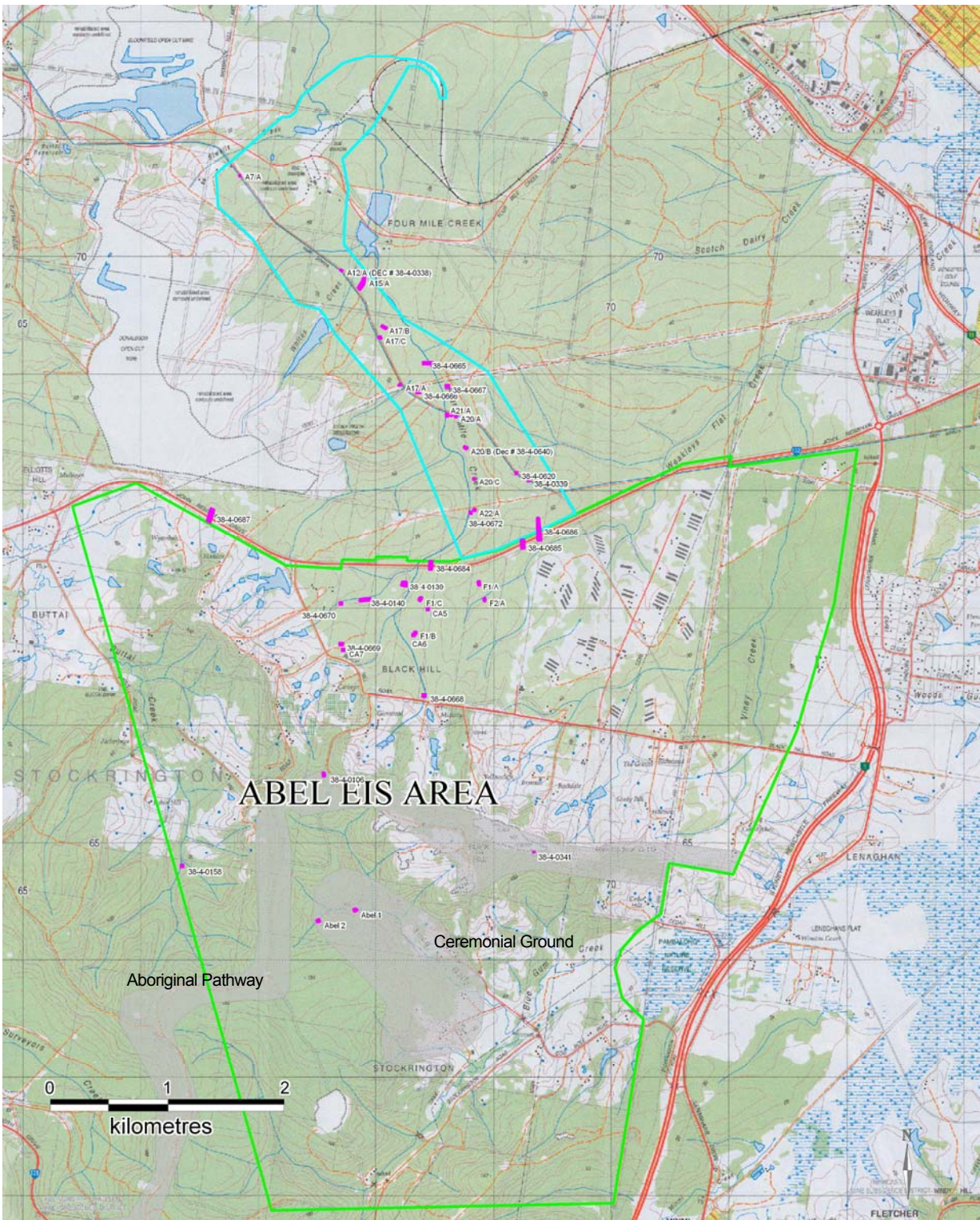
Table 1 Aboriginal Sites Previously Recorded Within the Abel Study Area

| DEC Site # ¹ | Site Name ² | Site Type ³ | AMG Grid Reference Eastings ⁴ | AMG Grid Reference Northings | MGA Grid Reference Eastings ⁵ | MGA Grid Reference Northings | Locality Within Project Abel Study Area |
|-------------------------|--|-----------------------------------|--|------------------------------|--|------------------------------|---|
| 38-4-0106 | Black Hill Open Site | Artefact scatter | 367450 | 6365400 | 367555 | 6365589 | Underground Area |
| 38-4-0139 | Four Mile Creek 1 | Artefact scatter | 368130 | 6367020 | 368235 | 6367209 | Underground Area |
| 38-4-0140 | Four Mile Creek 2 | Artefact scatter | 367820 | 6366880 | 367925 | 6367069 | Underground Area |
| 38-4-0158 | Reynolds Rock | Grinding groove | 366250 | 6364610 | 366355 | 6364799 | Underground Area |
| 38-4-0338 | Ironbark 1 ¹⁴ | Artefact scatter | 367603 | 6369690 | 367708 | 6369879 | Surface Area |
| 38-4-0339 | Ironbark 2 | Artefact scatter | 369190 | 6367890 | 369295 | 6368079 | Surface Area |
| 38-4-0341 | Black Hill Quarry 1 | Artefact scatter | 369240 | 6364730 | 369345 | 6364919 | Underground Area |
| 38-4-0620 | Donaldson Monitoring Site 3 (DMS3) | Artefact scatter | 369090 | 6367962 | 369195 | 6368151 | Surface Area |
| 38-4-0640 | Donaldson Monitoring Site 4 (DMS4) ¹⁵ | Artefact scatter | 368663 | 6368173 | 368768 | 6368362 | Surface Area |
| 38-4-0665 | FMC3 Donaldson Mine | Artefact scatter, Grinding groove | 368300 | 6368900 | 368405 ¹⁶ | 6369089 | Surface Area |
| 38-4-0666 | FMC4 Donaldson Mine | Artefact scatter | 368250 | 6368650 | 368355 ¹⁹ | 6368839 | Surface Area |
| 38-4-0667 | FMC5 Donaldson Mine | Artefact scatter | 368500 | 6368700 | 368605 | 6368889 | Surface Area |
| 38-4-0668 | FMC6 Donaldson Mine | Artefact scatter | 368305 | 6366060 | 368410 ^{12, 17} | 6366250 | Underground Area |
| 38-4-0669 | FMC7 Donaldson Mine | Artefact scatter | 367600 | 6366500 | 367705 | 6366689 | Underground Area |
| 38-4-0670 | FMC8 Donaldson Mine | Scarred tree | 367600 | 6366850 | 367705 | 6367039 | Underground Area |
| 38-4-0672 | ISF3 Donaldson Mine | Artefact scatter | 368695 | 6367620 | 368800 ^{12, 20} | 6367810 | Surface Area |
| 38-4-0684 | ERM site 1-3 | Artefact scatter | 368360 | 6367205 | 368465 ²¹ | 6367394 | Underground Area ²¹ |
| 38-4-0685 | ERM site 5-6 | Artefact scatter | 369148 | 6367385 | 369253 ⁶ | 6367574 | Underground Area ⁶ |
| 38-4-0686 | ERM site 4 | Artefact scatter | 369275 | 6367572 | 369380 ⁷ | 6367761 | Underground Area |
| 38-4-0687 | ERM site 7 | Artefact scatter | 366500 | 6367650 | 366604 ⁸ | 6367839 | Underground Area ⁸ |
| | Abel 1 ¹⁸ | Grinding groove | 367718 | 6364241 | 367823 | 6364430 | Underground Area |
| | Abel 2 ¹⁸ | Grinding groove | 367405 | 6364148 | 367510 | 6364337 | Underground Area |
| | A7/A ¹⁸ | Artefact scatter | 366734 | 6370498 | 366839 | 6370687 | Surface Area |
| | A15/A ¹⁸ | Artefact scatter | 367776 | 6369588 | 367881 | 6369777 | Surface Area |
| | A17/A ¹⁸ | Artefact scatter | 368095 | 6368717 | 368200 | 6368906 | Surface Area |
| | A17/B ¹⁸ | Artefact scatter | 367965 | 6369204 | 368070 | 6369393 | Surface Area |
| | A17/C ¹⁸ | Artefact scatter | 367929 | 6369123 | 368034 | 6369312 | Surface Area |
| | A20/A ¹⁸ | Artefact scatter | 368574 | 6368448 | 368679 | 6368637 | Surface Area |
| | A20/C ¹⁸ | Artefact scatter | 368728 | 6367911 | 368833 | 6368100 | Surface Area |
| | A21/A ¹⁸ | Artefact scatter | 368515 | 6368461 | 368620 | 6368650 | Surface Area |
| | A22/A ¹⁸ | Artefact scatter | 368733 | 6367650 | 368838 | 6367839 | Surface Area |
| | CA5 ^{9, 13} | Isolated artefact | 368335 | 6366800 | 368440 ¹² | 6366990 | Underground Area |
| | CA6 ^{10, 13} | Isolated artefact | 368215 | 6366580 | 368320 ¹² | 6366770 | Underground Area |
| | CA7 ^{11, 13} | Isolated artefact | 367615 | 6366450 | 367720 ¹² | 6366640 | Underground Area |
| | F1/A ¹⁸ | Artefact scatter | 368767 | 6367030 | 368872 | 6367219 | Underground Area |
| | F1/B ¹⁸ | Artefact scatter | 368229 | 6366601 | 368334 | 6366790 | Underground Area |
| | F1/C ¹⁸ | Artefact scatter | 368269 | 6366888 | 368374 | 6367077 | Underground Area |
| | F2/A ¹⁸ | Artefact scatter | 368816 | 6366887 | 368921 | 6367076 | Underground Area |

1. DEC Site # - site number as listed on DEC AHIMS;
2. Site name of visible, spatially separate locations of heritage evidence/Aboriginal objects;
3. Description of site as recorded. 'Isolated artefacts' often comprise the only visible evidence of a larger artefact scatter and the terms can be used interchangeably;
4. AMG grid reference listed here is approximate to within 100 metres only and is, on the basis of available evidence, believed to be the most accurate reference in the case where multiple and conflicting grid references occur. The listed grid reference only refers to a single point within a site - often sites extend over broader areas of land, as mapped in Figure 1;
5. MGA grid reference - conversion of AMG reference (eastings +105m, northings +189m);
6. ERM Sites 5 and 6 (probably a single artefact scatter) have the same reported grid references, placing the site on the northern side of John Renshaw Drive. However, ERM (1998) mapping places the sites on the southern side of John Renshaw Drive. The site locations are mapped here to include both localities. The evidence may have been impacted by improvements to John Renshaw Drive;
7. ERM Site 4 reported grid references place the site on the northern side of John Renshaw Drive, although ERM (1998) mapping places the site on the southern side of John Renshaw Drive. The site location is mapped here to include both localities. The evidence may have been impacted by improvements to John Renshaw Drive;
8. ERM Site 7 may be located within the John Renshaw Drive road reserve and marginally outside of the underground study area. ERM Site 7 reported grid references place the site on the northern side of John Renshaw Drive, although ERM (1998) mapping places the site on the southern side of John Renshaw Drive. The site location is mapped here to include both localities. The evidence may have been impacted by improvements to John Renshaw Drive;
9. CA5 was recorded by Umwelt (2001b) but is not registered on the DEC AHIMS. It may correspond with F1/C located during the present study;
10. CA6 was recorded by Umwelt (2001b) but is not registered on the DEC AHIMS. It may correspond with F1/B located during the present study;
11. CA7 was recorded by Umwelt (2001b) but is not registered on the DEC AHIMS. It is located close to site #38-4-0669;
12. New grid references have been created for these sites on the basis of previous mapping and reported site descriptions;
13. Umwelt (2001b) moved artefacts from Sites CA5, CA6 and CA7 0.5 metres off the track on which they were situated;
14. Site 'Ironbark 1' was presumably relocated during the present study and recorded as A12/A;
15. Site DMS4 was presumably relocated during the present study and recorded as A20/B;
16. Description from the DEC #38-4-0665 site record places this site on the eastern side of Four Mile Creek, although reported grid references place this site on the western side of the creek. Umwelt (2002a) also map this site on the western side of the creek;
17. Umwelt (2002a) map this site 3.5 kilometres east of the reported grid references. It is inferred that the DEC AHIMS grid reference is incorrect with interchanging of the easting "6" and "8";
18. Site identified and recorded during the present study;
19. Description from the DEC #38-4-0666 site record places this site 100 metres west of Four Mile Creek, although reported grid references place this site approximately 200 metres west of the creek. Umwelt (2002a) also map this site 200 metres west of the creek;
20. DEC site record has incorrect grid references (c. 1 kilometre in error, probably a single digit error). The description from the DEC site record states that the site is under a powerline easement c. 30 metres east of Four Mile Creek. The mapping in Umwelt (2002a) concurs. This item probably corresponds with A22/A located during the present study;
21. ERM sites 1, 2 and 3 (probable a single artefact scatter) have the same reported grid references, placing the site on the northern side of John Renshaw Drive. However, ERM (1998) mapping places the sites on the southern side of John Renshaw Drive. The site locations are mapped here to include both localities. The evidence may have been impacted by improvements to John Renshaw Drive;

Additional Notes: While DEC grid references place site #38-4-0552 within the present underground study area, descriptions from the site card place this site on the northern side of John Renshaw Drive outside of the present study area and it has therefore been omitted from this table. Sites of potential cultural significance are excluded from the Table and do not represent 'Aboriginal Objects' under the NP&W Act.

Figure 1 Approximate Location of Aboriginal Sites Previously Recorded Within the Abel Study Area



- Southern Investigation Area
- Northern Investigation Area
- Aboriginal Heritage Site (approximate location)
- Area of Potential Cultural Significance